STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
DESIGN DIVISION

ROADWAY DESIGN GUIDELINES

May 2012

FOREWORD

These guidelines establish uniform procedures for roadway design activities within the Tennessee Department of Transportation. The guidelines do not establish any legal or administration interpretations of the Department's contracts. In the event that the terms of a contract and this guide are in conflict, this guide is subordinate to the contract.

Utilization of these guidelines will ensure more uniformity in the design of roadway plans by the Roadway Design Division. These guidelines are not intended to provide an explanation to every design problem encountered by design personnel. The guidelines should not be a substitute for good engineering knowledge, experience, or sound judgment.

As permitted under 23 CFR 625.3 (e), the roadway design procedures herein do not apply for traffic engineering, spot improvements, road safety audit review (RSAR) projects, and safety projects such as signing, marking, signalization, roadway lighting and traffic barriers which include very minor or no roadway work. This will permit implementation of projects addressing safety and operational concerns in a timely manner without requiring design exceptions for those elements of the roadway that are beyond the scope of purpose and funding for these types of projects.

The Roadway Design Guidelines have been prepared for guidance in the preparation of roadway plans and estimates.

All design personnel should make every effort to become familiar with the Guidelines and the format within which they were developed. An explanation of the format of the Guidelines and the manner in which they will be updated is explained on the next page.

These guidelines will be in a state of constant evaluation for any revisions, additions, and deletions to keep Roadway Design personnel current with improved design procedures.

FORMAT OF ROADWAY DESIGN GUIDELINES

The Roadway Design Guidelines have been categorized by the tasks that occur for the development of roadway plans. The breakdown is as follows:

I. General Roadway Information

II. Preliminary Plans Information

III. Right-of-Way Plans Information

IV. Construction Plans Information

V. List of Current Standard Drawings Revision Dates

VI. General Notes and Special Notes

VII. Index

VIII. Instructional Bulletins

The Roadway Design Guidelines are categorized by the particular design functions that must take place in the process of plans development. A typical set of roadway plans would first have the Preliminary Plans developed, next the Right-of-Way Plans, and finally the Construction Plans. An item will be listed where it first might occur during plans development. Later references will refer back to that previous listing. On rare occurrences an item might be forward referenced.

The Roadway Design Guidelines will be updated as needed on a yearly basis. Directions to designers throughout the year will be in the form of "Instructional Bulletins". Instructional Bulletins will no longer be distributed in hard copy. Updates are going to be posted on the Design Division's web site. Notifications for the updates will be sent via email.

Instructional Bulletins will be issued as the need arises throughout the year. They will have a number that designates the year and the sequence of bulletins for that year (for example 08-01). The practice or principle is to remain in effect for an extended period of time then the bulletin will contain the necessary pages to insert into the guidelines. If the instructions are no longer needed then the bulletin will be voided.

With this approach to updates, the designers shall be able to learn about where the guidelines are contained, and be able to find a particular item more easily.

The Design Division will no longer be updating or revising existing Metric Roadway Design Guidelines, General Notes, and Standard Drawings. As a result of this decision, these documents will no longer be distributed in hard copy or posted on TDOT web site. Designers needing access to metric documents should contact the Design Division, Standards Office at (615)741-0840 to obtain guidance for preparing metric plans.

REVISIONS SINCE THE 2010 EDITION

SECTION	REASON
All of Section I has been updated	Incorporates and voids **IB 10-14**
1-115.00 has been added	Addresses the procedure for archiving plans on to FileNet. Incorporates and voids **IB 11-08**
1-115.10 has been added	Addresses the standard pdf size for FileNet plans. Incorporates and voids **IB 12-02**
1-115.20 has been added	Addresses plan phase stamps to be placed on plans. Incorporates and voids **IB 09-08**
1-120.00 has been added	Addresses field review procedure and FileNet distribution. Incoportates and voids **IB 11-09 and IB 11-10**
1-220.00 has been voided	Incorporates and voids **IB 12-07**
Section I- Chapter 3 has been moved	Is now Section II-Chapter 4
All of Section II has been updated	Incorporates and voids **IB 11-17**
2-132.00 has been added	Addresses procedure for checking sight distance at intersections. Incorporates and voids **IB 08-13**
2-136.00 has been added	Addresses landscaping and voids Standard Drawings **EL-P-10 and EL-P-11**
2-155.00 has been revised	Clarified procedure for showing wetlands on the plans.
2-175.00 has been revised	Minor wording change
2-315.00 has been revised	Revised procedure for sending files to Signal Design.
Section II- Chapter 4	New location of former Section I-Chapter 3
All of Section III has been updated	Incorporates and voids **IB 11-18**
3-400.00 has been revised	Incorporates and voids **IB 12-07**
3-400.05 has been revised	Incorporates and voids **IB 12-07**
3-400.15 has been revised	Incorporates and voids **IB 12-07**
3-400.17 has been added	Incorporates and voids **IB 12-07**
3-400.20 has been revised	Incorporates and voids **IB 12-07**
3-400.25 and Figure 3-5 have been revised	Incorporates and voids **IB 12-07** Added email notification for railroad involved projects, incorporates **IB 09-13**
3-400.30 has been deleted	Incorporates and voids **IB 12-07**
3-405.00 has been revised	Incorporates and voids **IB 12-07**
3-410.00 and all figures therein have been revised	Revised for changes to the new Construction General Permit requirements
All of Section IV has been updated	Incorporates and voids **IB 11-19**
4-112.01 has been revised	Revised to reflect the addition of 1-115.10
4-115.10 has been revised	Incorporates and voids **IB 12-07**
4-136.00 and Figure 4-4 has been added	Addresses Project Commitments Sheet. Incorporates and voids **IB 11-11**
4-137.00 has been revised	Incorporates and voids **IB 12-07**

Section	Reason
4-140.00 and Figure 4-8 have been revisied	Incorporates and voids **IB 12-07**
4-140.01 has been deleted	No longer required due to digital distribution
4-140.02 has been revised	Incorporates and voids **IB 12-07**
4-140.06 has been revised	Incorporates and voids **IB 12-07**
4-150.00 has been revised	Incorporates and voids **IB 12-07**
4-203.02 has been revised	Clarified definition of Transitional Materials.
4-203.35 has been deleted	All excavation for culverts to now be considered culvert excavation
4-204.05 and Figure 4-14 have been revised	Removed mention of channel excavation for culverts, all excavation for culverts to be culvert excavation
4-303.00 (Item 303-10.01) has been revised	Revised for new barrier wall standard drawings
4-403.00 (Item 403-01) has been revised	Application fate for Item 403-01 has been modified
4-411.03 has been revised	Revised to include standard drawings RP-CS-1 and RP-CS-2
4-414.05 (item No 403-01) has been revised	Item No 403-01.01 has been created to differentiate between typical tack coat application and micro-surfacing application
4-115.10 has been revised	Revised for digital signature requirement
4-133.00 has been revised	Added SWPPP Sheets to Index
4-604.35 has been deleted	Excavation at Culverts to no longer include Channel Excavation
4-705.05 has been moved to 4-706.20 Section 4-706.XX has been added	Addresses guardrail end treatments. Incorporates and voids **IB 12-03**
4-712.15 has been revised	Revised to match 4-712.00
4-712.20 has been deleted	Redundant section removed, same information is provided in 4-712.25
4-716.05	Added guidance concerning striping on OGFC pavements
All of Section V has been updated	Incorporates and voids **IB 11-07, IB 12-06, IB 12-08**
6-160.00 has been revised	Revised to include Class A-3 in the exception note.
6-190.xx has been revised (various notes)	Revised to reflect changes in the new Construction General Permit
6-250.03 has been revised	Revised to reflect sign changes in the MUTCD
6-270.00 note 2 has been added	Incorporates and voids **IB 11-14**
6-290.xx has been revised (various notes)	Revised to reflect changes in the new Construction General Permit

The following IBs have been voided by this update:
08-13, 09-08, 09-13, 10-14, 11-07, 11-08, 11-09, 11-10, 11-11, 11-14, 11-17, 11-18, 11-19, 12-02, 12-03, 12-06, 12-07, 12-08

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SECTION I - GENERAL

CHAPTER 1 - PROJECT RECORDS

1-100.00 PROJECT FOLDER (See 2-100.00)

Design Project records consist of a Transportation Planning Report (TPR), survey notes, traffic data, geological reports, correspondence, and daily verbal communications relating to the production of project plans, and all other pertinent information regarding design development.

Each designer will be required to maintain an up-to-date project folder for each project.

Project design folder records will be labeled on the tab as follows:

County:_____ Route No.:_____

Project Description:_____

PIN:_____

A copy of all correspondence, in chronological order by dates will be kept in the folder.

1-103.00 LETTING TO CONTRACT - DESIGN RECORDS

Assemble the following design records for the finalized project, which are to be maintained by the designer or design firm.

1. Final grade computations
2. Final grading quantity computations
3. Final right-of-way computations
4. Final hydraulic computations
5. Final roadway quantity computations

The file containing the items mentioned above will be combined with any office correspondence file on the project, to become a complete "Design Records" file and a part of the legal documents substantiating the final Construction Plans.

1-105.00 ROADWAY DESIGN CHECKLIST (See 2-105.00, 3-100.00 and 4-105.00)

In order to reduce plan revisions, errors, and standardize the preparation, format and content of plans, the following Roadway Design Checklist shall be used by all Designers, Consultants, Managers, Supervisors and personnel checking plans. This form shall be used on all projects.

The procedure for use of the form is as follows:

1. Download the latest Roadway Design Checklist in Word format from TDOT website.

2. Fill in the heading information on each sheet.

3. The designer or project supervisor will check off each blank when sure that each item is completed on the plans. NA (not applicable) may be used if an item is not required in a project.

4. Before submitting plans for a field review, the checklist shall be completed down to that particular stage of plans development.

1-110.00 PROJECT ACTIVITY STATUS SHEET (See 2-110.00 and 4-110.00)

Designers on all projects shall use the Project Activity Status Sheet that follows. This list is intended to help reduce plan errors. An up-to-date copy of this status sheet shall be kept in the project folder at all times.

This sheet shall be handled as follows:

1. Download the latest Project Activity Status Sheet in Word format from TDOT website.

2. Fill in heading information.

3. Each item is listed in the order in which it shall be accomplished and completion dates filled in as the activities are completed.

4. The heavy printed items are those normally shown in the “A&E” schedules and those dates shall be filled in under the "original" column by the TDOT supervisor and/or manager.

5. The other items shall have dates filled in by the designer and his supervisor under the "original" column, which fit within the “A&E”, schedule dates.

6. If schedule problems develop so that the “A&E” dates cannot be met, the Program Development and Scheduling Office shall be notified and the new dates entered on this "Status Sheet" under the revisions column.

7. The TDOT managers and/or supervisors will be responsible for keeping this "Status Sheet" up to date and furnishing an updated copy of this form to each TDOT or Consultant Designer for their information.

1-115.00 FILENET ARCHIVING

Design Managers are responsible for archiving project development files for all new construction, reconstruction and resurfacing projects on the FileNet server utilized by the Department. This includes any consultant design projects being monitored by the Design Manager. For guidance in creating a composite plan set in the *.pdf format, please download the document entitled "Creating PDFs from DGNs.pdf" from the TDOT Design Division website at the following address:

http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/v8/v8design.htm

FileNet archiving is required for all projects (including resurfacing plan sets) and shall include all project deliverables or plan sets completed. The requirement for FileNet archiving began April 3, 2009. All projects should have the most recently completed plan set, estimate file, approved design exception and transportation management plan on the FileNet server. **Table 1-1 – FileNet Project Deliverables and Plan Sets,** should be used as a guide for project deliverables or plan sets that are to be loaded on the FileNet server.

A complete plan set (including cross-sections) in *.pdf format and any required *.xls, *.dgn, *.sht, *.tin, and *.gpk files is required for archiving as defined in the attached table. The project design files (*.dgn, *.sht, *.tin, and *.gpk) will be archived with a software program having the capability of making a self-extracting (*.exe) file. This self-extracting (*.exe) file shall not be password protected.

Plan sets in *.pdf format shall include all roadway plans sheets normally found in the deliverable. Construction field review and construction plans plan sets should include any signal, lighting, signing, geotechnical, landscaping, mitigation sheets, retaining wall or other sheets supplied by structures to be placed in the roadway plans. Structure plans, standard structure drawings and standard drawings are not required. Preliminary structure layout sheets should be included in right-of-way and construction field review plans sets. Utility plans will be placed on FileNet by the Utility Section of the Right-of-Way Division.

For all plan sets added to FileNet as a revision or revised plan set, the revision letter(s) shall be included in the PDF file as the first sheet of the plan set. For subsequent revisions all prior revision letters should be included after the current revision letter.

TABLE 1-1 – FileNet Project Deliverables and Plans Sets

Deliverable / Plan Set	File Format	File Naming Convention (*nnnnnn-nn* is the project PIN)	Comments	PPRM Activity
Structural Grade Approval Plans	*.pdf and *.exe (Includes: *.dgn, *.sht, *.tin, *.gpk)	***nnnnnn-nn-*** **StructuralGradeApproval.pdf** ***nnnnnn-nn-*** **StructuralGradeApproval.exe** The file naming convention for the Bentley MicroStation and Geopak files are defined in the TDOT CADD Standards document entitled "CADDV8.pdf" at the Design Division website.	See Footnotes 1, 2, 3 and 4.	340
Preliminary Field Review Plans	*.pdf Only	***nnnnnn-nn-*** **PreliminaryFieldReview.pdf**	Include a copy of the Field Review Notification Memorandum in the pdf document.	375
Preliminary Plans	*.pdf and *.exe (Includes: *.dgn, *.sht, *.tin, *.gpk)	***nnnnnn-nn*****-Preliminary.pdf** ***nnnnnn-nn*****-Preliminary.exe** The file naming convention for the Bentley MicroStation and Geopak files are defined in the TDOT CADD Standards document entitled "CADDV8.pdf" at the Design Division website.	See Footnotes 1, 2, 3 and 4.	390
Soils and Geological Report	*.pdf and *.exe (Includes: *.dgn, *.sht, *.tin, *.gpk)	***nnnnnn-nn-*** **GeologicalReportRequest.pdf** ***nnnnnn-nn-*** **GeologicalReportRequest.exe** The file naming convention for the Bentley MicroStation and Geopak files are defined in the TDOT CADD Standards document entitled "CADDV8.pdf" at the Design Division website.	See Footnotes 1, 2, 3 and 4.	445

Deliverable / Plan Set	File Format	File Naming Convention (*nnnnnn-nn* is the project PIN)	Comments	PPRM Activity
Right-of-Way Field Review Plans	*.pdf and *.exe (Includes: *.dgn, *.sht, *.tin, *.gpk)	***nnnnnn-nn*-ROWFieldReview.pdf** ***nnnnnn-nn*-ROWFieldReview.exe** The file naming convention for the Bentley MicroStation and Geopak files are defined in the TDOT CADD Standards document entitled "CADDV8.pdf" at the Design Division website.	See Footnotes 1, 2, 3 and 4. Include a copy of the Field Review Notification Memorandum in the pdf document.	540
Preliminary Estimate	*.xls Only	***nnnnnn-nn*-PreliminaryEstimate.xls** or ***nnnnnn-nn*-PreliminaryEstimate-Rev-mm-dd-yy.xls**	See Design Guidelines Section 3-400.15	585
Right-of-Way Plans	*.pdf and *.exe (Includes: *.dgn, *.sht, *.tin, *.gpk)	***nnnnnn-nn*-ROW.pdf** ***nnnnnn-nn*-ROW.exe** ***nnnnnn-nn*-ROW-Rev-mm-dd-yy.pdf** ***nnnnnn-nn*-ROW-Rev-mm-dd-yy.pdf** The file naming convention for the Bentley MicroStation and Geopak files are defined in the TDOT CADD Standards document entitled "CADDV8.pdf" at the Design Division website.	See Footnotes 1, 2, 3 and 4. ROW Plans revisions, if any, will necessitate another uploaded plan set in entirety. (See naming conventions for revisions.) The revision letter should be included as the first page of the pdf document.	600
Permit Sketches	*.pdf Only	***nnnnnn-nn*-PermitSketches.pdf**	See Design Guidelines Section 3-410.00	575
Permit Application Plan Set	*.pdf Only	***nnnnnn-nn*-ROW.pdf** or ***nnnnnn-nn*-ROW-Rev-mm-dd-yy.pdf**	This will be either the original or as revised ROW plans which have incorporated the ecology and permit assessment.	575

Deliverable / Plan Set	File Format	File Naming Convention (*nnnnnn-nn* is the project PIN)	Comments	PPRM Activity
Construction Field Review Plans	*.pdf Only	***nnnnnn-nn*-ConstructionFieldReview.pdf**	Include a copy of the Field Review Notification Memorandum in the pdf document. This plans set will be used for NPDES application and for NEPA Reevaluation.	710
Construction Plans	*.pdf and *.exe (Includes: *.dgn, *.sht, *.tin, *.gpk)	***nnnnnn-nn*-Construction.pdf** ***nnnnnn-nn*-Construction.exe** ***nnnnnn-nn*-Construction-Rev-mm-dd-yy.pdf** ***nnnnnn-nn*-Construction-Rev-mm-dd-yy.exe** The file naming convention for the Bentley MicroStation and Geopak files are defined in the TDOT CADD Standards document entitled "CADDV8.pdf" at the Design Division website.	See Footnotes 1, 2, 3 and 4. These plans will be the final sealed plans set, including the ROW Title Sheet. Construction Plans revisions, if any, will necessitate another uploaded plan set in entirety. See naming convention for revisions. The revision letter should be included as the first page of the pdf document. Signal and Signing Sheets developed for roadway projects should be submitted to the Design Manager for inclusion in this deliverable.	715
Construction Estimate	*.xls Only	***nnnnnn-nn*-ConstructionEstimate.xls** or ***nnnnnn-nn*-ConstructionEstimate-Rev-mm-dd-yy. xls**	See Design Guidelines Section 4-140.05	715

Deliverable / Plan Set	File Format	File Naming Convention (*nnnnnn-nn* is the project PIN)	Comments	PPRM Activity
	*.pdf Only	***nnnnnn-nn*-Utility.pdf** ***nnnnnn-nn*-Utility-Rev-mm-dd-yy.pdf**	See Footnotes 1, 2, 3 and 4.	
Utility Plans	*.exe (Includes: *.dgn, *.sht, *.tin, *.gpk)	***nnnnnn-nn*-Utility.exe** ***nnnnnn-nn*-Utility-Rev-mm-dd-yy.exe** The file naming convention for the Bentley MicroStation and Geopak files are defined in the TDOT CADD Standards document entitled "CADDV8.pdf" at the Design Division website	These plans will be the final sealed plans set. Utility Plans revisions, if any, will necessitate another uploaded plan set in entirety. See naming convention for revisions.	
Utility Rainbow Plans	*.pdf Only	***nnnnnn-nn*-UtilityRainbows.pdf** or ***nnnnnn-nn*-UtilityRainbows-Rev-mm-dd-yy.pdf**	**Utility Plans, CADD , Specifications, and Estimate Files Will Be Loaded onto FileNet by the Utility Section of the Right-of-Way Division.** The Design Division will be responsible for loading Estimated Utility Quantity Sheets developed by the Design Division and included in the Construction Plans.	755
Utility Specifications	*.pdf Only	***nnnnnn-nn*-UtilitySpecs.pdf** or ***nnnnnn-nn*-UtilitySpecs-Rev-mm-dd-yy.pdf**		
Utility Estimate	* xls Only	***nnnnnn-nn*-UtilityEstimate.xls** or ***nnnnnn-nn*-UtilityEstimate-Rev-mm-dd-yy.xls**		

Deliverable / Plan Set	File Format	File Naming Convention (*nnnnnn-nn* is the project PIN)	Comments	PPRM Activity
Initial Work Zone Significance Determination & Transportation Management Plan	*.pdf Only	***nnnnnn-nn*-InitialTMP.pdf**	Signed copy. See TDOT Work Zone Safety and Mobility manual and Transportation Management Plan Workbook.	n/a
Secondary Work Zone Significance Determination & Transportation Management Plan	*.pdf Only	***nnnnnn-nn*-SecondaryTMP.pdf**	Signed copy. See TDOT Work Zone Safety and Mobility manual and Transportation Management Plan Workbook.	n/a
Approved Design Exceptions (if any)	*.pdf Only	***nnnnnn-nn*-DesignExceptions.pdf**	Signed copy. See Design Guideline section 3-110.02	n/a

Footnotes:

1 The Bentley MicroStation files required for placement on the FileNet Server are all sheet files (*.sht) that make up a plan set and all reference files to those sheet files including, but not limited to, the *Survey.dgn, *Alignments.dgn, *Proposed.dgn, and *MainlineXSections.dgn files.

2 The Bentley Geopak *.gpk file required for placement on the FileNet Server is the project *.gpk file containing all project geometry including, but not limited to, all existing and proposed alignments, existing and proposed profiles, and proposed ROW and easements. Documentation concerning how to create proposed ROW and easements in Bentley's Geopak software can be found at the following link:
http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/v8/ProposedROW.pdf

3 The Bentley Geopak *.tin files required for placement on the FileNet Server are the existing ground surface, and all proposed surfaces for the project.

4 The ROW Acquisition Excel file should be included in the executable file.

1-115.10 FILENET PLAN SIZE

PDF plans to be uploaded to FileNet shall be full-size plans (ANSI D, 34" x 22").

Refer to the document 'Creating PDFs from DGNs' for further guidance.
Creating PDFs from DGNs.pdf

1-115.20 PLAN PHASE STAMPS

All roadway plans sets and sheets plotted and placed on FileNet or supplied to others shall have a stamp identifying the appropriate stage of development on each sheet.

The stamp should be located on the right side above the signature block on the title sheet and on the right side above the description block on all other sheets in the plans. If adequate space is not available above the description block, the stamp may be placed where space is available. No stamp is required on the final construction plans or revisions to the construction plans.

Stamps shall match the name of the FileNet deliverable as shown below.

1) STRUCTURAL GRADE APPROVAL
2) PRELIMINARY FIELD REVIEW
3) PRELIMINARY PLANS
4) ROW FIELD REVIEW
5) ROW PLANS
6) ROW PLANS – PERMIT APPLICATION PLAN SET
7) CONSTRUCTION FIELD REVIEW PLANS
8) CONSTRUCTION PLANS (STAMP IS NOT REQUIRED)

For ROW plans and ROW Field Review Plans where no right-of-way is to be acquired and plans are being submitted for "Utilities Only", the designer should use the following stamp.

ROW FIELD REVIEW (UTILITIES ONLY)
ROW PLANS (UTILITIES ONLY)

Sheets sent outside the Department may also have the following stamp added when clarification that the plans are subject to change is needed.

CAUTION - PRELIMINARY PLANS – SUBJECT TO CHANGE

Guidance for placing stamps on pdf files can be found in the document "Adding the Plan Phase Stamp Watermark to the PDF Plan Set" found at this link: Adding the Plan Phase Stamp Watermark.pdf

1-120.00 FIELD REVIEW PROCEDURES (See 2-330.00, 3-140.00 and 4-145.00)

All personnel will follow the following steps when arranging, conducting, and documenting field reviews:

1. Place project files on FileNet (see Section 1-115.00)
2. Develop the Field Review Notification Memorandum (see Figure 1-1)
3. Distribute Field Review Notification Memorandum electronically
4. Distribute Field Review Notification Memorandum and plans by mail
5. Develop and distribute the field review report
6. Place field review documentation in project file

The plans, when placed on FileNet, shall be complete through the appropriate stage of development in accordance to the Roadway Design Checklist. Plans for Construction Field Review that involve a bridge shall include preliminary bridge layout drawings.

1-120.10 SCHEDULING FIELD REVIEWS

All field reviews shall be scheduled, plans placed on FileNet, e-mail notification sent, and plans distributed **a minimum of three weeks** prior to the scheduled date of the field review. The beginning of the three weeks will start on the date the plans are e-mailed and mailed from the Design Division.

Field reviews for new and reconstruction projects on the Interstate System and projects which are part of the current FHWA Stewardship and Oversight Agreement (full federal oversight and partial federal oversight) shall be scheduled in coordination with FHWA. Appropriate project plans should be forwarded to FHWA for review. FHWA is not requiring a Field Review Notification Memorandum for any other Federal-Aid projects.

Field reviews for Demonstration Projects shall be scheduled in coordination with FHWA prior sending the Federal Highway Administration (FHWA) a Field Review Notification Memorandum.

1-120.20 FIELD REVIEW DISTRIBUTION

Field review notifications and documentation will be distributed to all departmental personnel by e-mail. Field review plans will not be provided but will be available on FileNet. For invitees without access to FileNet including FHWA, county officials and local officials, a field review notification letter along with half size plans will continue to be provided by mail or direct distribution.

1-120.21 FIELD REVIEW DISTRIBUTION BY E-MAIL

The e-mail distribution will consist of an e-mail notification (see Figure 1-1). The e-mail notification should contain the Field Review Invitation Memorandum (see Figure 1-2) in MS Word (*.docx) or *.pdf format included as an attachment, the file name of the plans set stored in FileNet, and the date the plans set was added to FileNet. The e-mail notification shall be sent to the recipients using e-mail addresses shown in Table 1-2. The field review distribution by e-mail should occur on the same day as the field review distribution by mail.

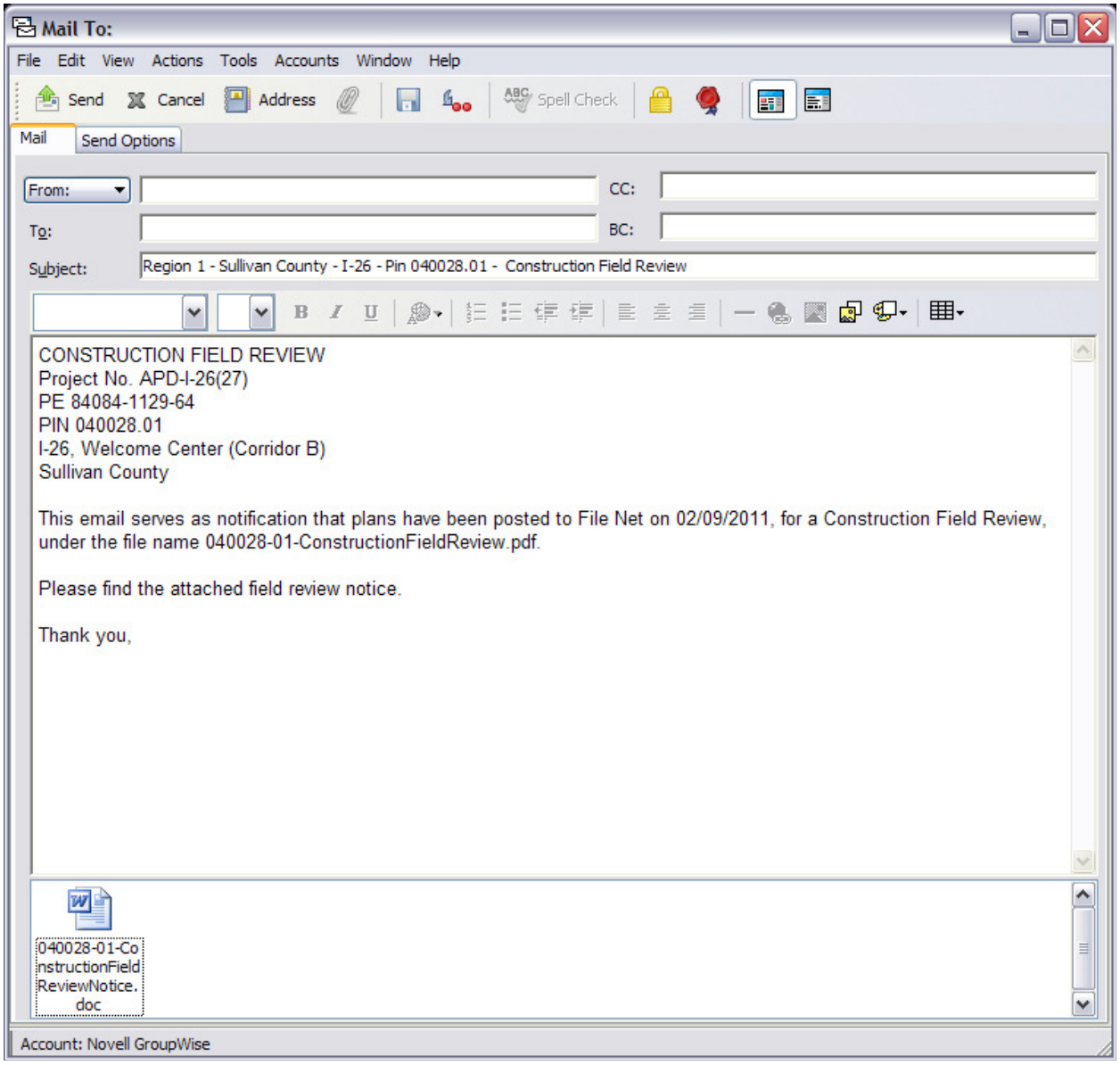


FIGURE 1-1
Sample Email Notification

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
NASHVILLE, TENNESSEE 37243-1402

M E M O R A N D U M

TO: Address to the each TDOT division or section as directed in Table 1-2 and external agency or municipality as directed in Table 1-3.

FROM: Design Manager overseeing the project

DATE:

SUBJECT: Type of field review
Project No (Federal and PE) and PIN No
Project Description
County

This will confirm arrangements made regarding a Field Review for the subject project. Persons desiring to attend this review will meet at (location), (address) on (date) at (time).

The plans have been uploaded to FileNet under the file name: List the field review plan .pdf as it appears on FileNet
List the field review file .exe as it appears on FileNet (if Req'd)

For those addressees without FileNet access, prints of the plans are enclosed.

Please review the plans and have your comments ready before the field review is made.

Enclosure

FIGURE 1-2
Template Field Review Notification Memorandum

TO:	E- MAIL ADDRESS / NOTES
HQ Design Office, CE Manager II over Region	Use Individual email address**
HQ Design Office, CE Manager II over Consultants	Use Individual email address** **Only projects developed by consultants*
HQ Design Office, CE Manager II over ITS, Traffic, and Standards	Use Individual email address** **Only projects with ITS, traffic signals, and roadway lighting*
Regional Director	Use Individual email address**
Regional Design Office, CE Manager I	Use Individual email address**
Its, Traffic, and Standards Section **Construction Field Review on all projects.*	TDOT.ITS.SignalDesign@tn.gov **Preliminary and Right-of-Way Field Review only on projects included traffic signals and/or roadway lighting. (See sections 2-315.00 and 2-315.05)*
Pavement Design Section	TDOT.PavementDesign@tn.gov
Quality Assurance Section	TDOT.QualityAssurance@tn.gov
Structures Division	TDOT.Structures@tn.gov
HQ Right-of-Way Office HQ Utilities Office	TDOT.HQ.ROW@tn.gov
Regional ROW Offices Regional Utilities Office	TDOT.RG1.ROW@tn.gov TDOT.RG2.ROW@tn.gov TDOT.RG3.ROW@tn.gov TDOT.RG4.ROW@tn.gov
Railroad Coordinator	Use Individual email address** **Only projects involving Railroads*
Geotechnical Engineering Section Section Manager	Use Individual email address**
Geotechnical Engineering Section Manager over Region	Use Individual email address** **Only projects in for their Region*
HQ Construction Division	TDOT.HQ.Construction@tn.gov
Regional Construction Supervisor	Use Individual email address**
Environmental Division	TDOT.EnvironmentalDoc@tn.gov Permits.Filenet.TDOT@tn.gov Ecology.Plans@tn.gov TDOT.Historians@tn.gov
Regional Environmental Coordinator	Use Individual email address**
HQ Maintenance Office	TDOT.HQ.Maintenance@tn.gov **Construction Field Review Only*
Regional Maintenance Office **Construction Field Review Only*	TDOT.RG1.Maintenance@tn.gov TDOT.RG2.Maintenance@tn.gov TDOT.RG3.Maintenance@tn.gov TDOT.RG4.Maintenance@tn.gov
Regional Safety Coordinator	Use individual email address**
Regional Traffic Engineer	Use individual email address**
Program Development & Scheduling Office	TDOT.PDSO@tn.gov
Project Manager	Use Individual email address**
CONSULTANT	Use individual email address

** See Contact List at: http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/DesGuide.htm

Table 1-1
Field Review Email Distribution List

1-120.22 FIELD REVIEW PLANS DISTRIBUTION OUTSIDE THE DEPARTMENT

Due to FileNet availability, plan file sizes, and printing considerations, it will be necessary to continue to provide paper copies of the plans to field review invitees outside the department. The distribution should consist of the Field Review Notification Memorandum (see Figure 1-2) and a half size set of plans. The mailing shall be sent to the recipients in accordance to Table 1-3. Field review distribution by mail should occur on the same day as the field review distribution by email.

Design Managers shall also have the option to e-mail field review notifications and provide electronic plans as an attachment or on other electronic media provided the individual has the capability to print the plans and has agreed to the electronic distribution.

TO:	NOTES
FHWA	Letter and ½ size set of plans * *Interstate System Projects, Stewardship and Oversight Agreement Projects, and Demonstration Projects*
Local Utility Offices Electric Gas Water/Sewer Cable Phone	Letter and ½ size set of plans
City and/or County Mayor	Letter and ½ size set of plans
Director of Public Works	Letter and ½ size set of plans
Highway Chief Administration Officer	Letter and ½ size set of plans
Others as directed by Design Manager	Letter and ½ size set of plans

TABLE 1-3
Field Review Mailed Distribution List

1-120.30 FIELD REVIEW REPORT

A complete field review report shall be distributed **within two weeks** of the review to all attendees, individuals providing comments, and personnel sent a Field Review Notification Memorandum. Field review reports should be distributed by e-mail except to those outside the department whose e-mail address is not available. Field review reports should be in MS Word (*.doc) or *.pdf format. FHWA has requested the field review reports not be sent for projects which were not attended by a representative of the FHWA.

The Design Manager should review all field review reports prepared by consultants and then prepare a cover letter to attach to the report for distribution. The cover letter should indicate that the report has been reviewed and is acceptable for distribution.

The Right-of-Way Field Review report shall include at a minimum, a list of comments received during the field review, a statement to the Structures Division if the proposed roadway horizontal and vertical geometry is adequate to continue bridge design, and the number of sets of final right-of-way distribution prints requested by the Regional Right-of-Way Office.

All comments received during the field review should be evaluated and changes shall be included in the plans prior to submission for right-of-way or construction for authorization.

1-120.40 FIELD REVIEW DOCUMENTATION

The following documentation shall be included in the project file:

1. Email Notification
2. Field Review Notification Memorandum
3. Field Review Report (including the Design Manager's cover letter)

1-130.00 INSTRUCTIONS REGARDING PUBLIC HEARING AND PUBLIC MEETING REQUIREMENTS

In order to meet all legal requirements for advertising public hearings or public meetings, the Community Relations Division requests that all information pertaining to public hearings be received 45 days prior to the hearing and all information pertaining to public meetings 20 to 25 days prior to the meeting.

The manager requesting the hearing will be required to submit a cover letter, hearing notice, and location map. The cover letter and notice shall include the date of the hearing or meeting, the place the hearing or meeting is to be held, the project number, the description of the project, and the county in which the project is located. The cover letter shall additionally include the telephone number and address of the contact person. No action can be taken by the Community Relations Office to advertise the hearing or meeting if any of this information is not included in the notice and on the cover letter. Examples of the cover letter, hearing notice, and location map are attached.

The Tennessee Press requires that all advertisements be sent to their office in electronic format. Therefore, the Community Relations Office will need an e-mail of the notice as well as the location map for each project.

The Community Relations Office has requested that the location map be submitted as a Microsoft Word document. TDOT designers and managers may obtain information for converting MicroStation drawings into Microsoft Word at:

http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/v8/locationmaps.pdf

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
NASHVILLE, TENNESSEE 37243-1402

MEMORANDUM

TO: Ms. Judy B. Steele, Director, Community Relations Division

FROM: Michael Agnew, Assistant Director, Design Division

DATE: May 19, 2006

SUBJECT: REQUEST FOR ADVERTISEMENT OF A DESIGN MEETING
Project No. IM-81-1(102)7, 32001-1124-44, PIN 101203.00
I-81, Interchange @ State Route 32 (US 25E) Exit 8
Hamblen and Jefferson Counties

We are requesting you to advertise this project for a design meeting as described in the attached document.

I have arranged with Ms. Janice Brown, principal of North Middle School, at (865-986-9944, ext. 302) to have the school cafeteria available at 421 Hickory Creek Road, Morristown, TN 37771, from 4:30 p.m. to 8:00 p.m. for a 5:00 p.m. to 7:30 p.m. design meeting on Wednesday, December 15, 2004.

A copy of the project location map is attached for your use.

MA/AR/et
Attachment

cc: Jeff C. Jones
Amanda K. Tidwell
Derrick Tibbs
(Regional Design Manager)
(Regional ROW Manager)
File

Figure 1-3
Example Cover Letter

NOTICE OF HIGHWAY DESIGN MEETING

The Tennessee Department of Transportation (TDOT), an equal opportunity affirmative action employer, will conduct a Highway Design Meeting on the 28th day of February 2006 in the gymnasium of Witt Elementary School, 4650 S. Davy Crockett Parkway, Morristown, TN 37814, to discuss project number IM-81-1(102)7, I-81 Interchange (Exit 8) at SR-32 (US-25E) in Hamblen County as shown on the general location map.

The project proposes to modify the I-81/SR-32 interchange and reconstruct SR-32 (US 25E) with five 12' travel lanes and two 12' shoulders within project limits. Out of the five lanes on SR-32, one will be the north bound third lane. The existing west bound I-81 on ramp will be replaced by a new free flow ramp at the northwest quadrant of the interchange. Northbound to westbound traffic from SR-32 to I-81 will also be routed through this new ramp. The existing east bound on and off ramps of I-81 will be realigned. Existing dual bridges on SR-32 will be replaced by a single bridge. Additional right-of-way and easements will be required along SR-32 and I-81.

This meeting will be held from 5:00 – 7:00 p.m. during which time there will be a presentation followed by a question and answer session. The public is invited to ask questions and make comments during the meeting. Representatives of TDOT will be present to answer questions on any aspect of the project.

Plans are available for public inspection at the offices of:

Mr. Paul Beebe
7345 Region Lane
Knoxville, TN 37914
Phone: (865) 594-2442

or

Mr. Ataur Rahman
1300 James K. Polk Bldg.
Nashville, TN 37243-0348
Phone: (615) 741-7958

Persons with a disability, who require aids or services to participate at the meeting, may contact Ms. Margaret Mahler at the following address:

Ms. Margaret Mahler
ADA / Safety Coordinator
Tennessee Department of Transportation
Suite 400, James K. Polk Building
505 Deaderick Street
Nashville, Tennessee 37243

or by e-mail: Margaret.Z.Mahler@tn.gov
Phone (615) 741-4984
Fax (615) 253-1477
TTY Relay (877) 831-0298

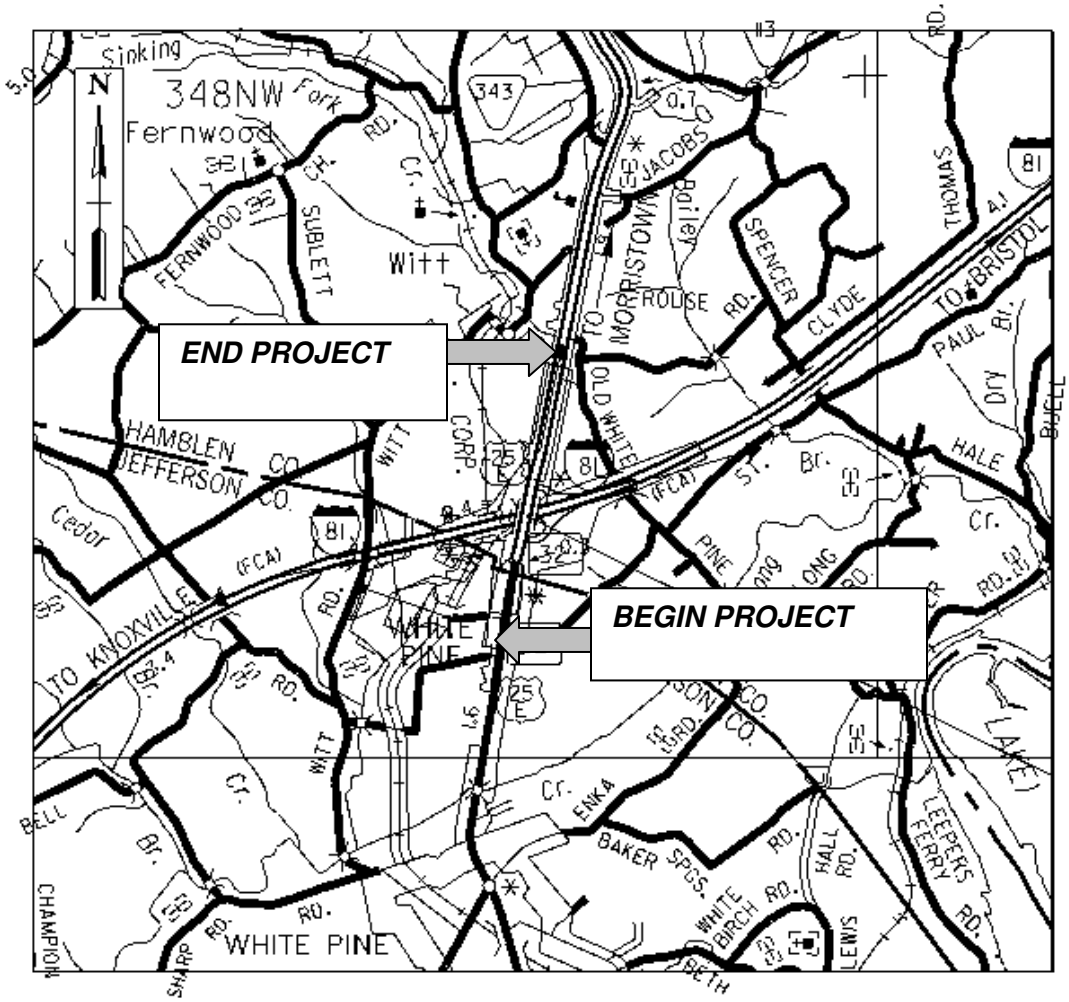
A court reporter will be available to receive oral statements to be included in the project transcript. In addition, comment sheets are available for those who prefer to make written statements. Written statements and other exhibits to be included in the project transcript may be submitted within ten (10) days after the meeting date to the following address:

Project Comments
Tennessee Department of Transportation
Suite 700, James K. Polk Building
505 Deaderick Street
Nashville, Tennessee 37243-0332

Figure 1-4
Example Hearing Notice

HAMBLEN & JEFFERSON COUNTIES

PROJECT NO. IM-81-1(102)7



I-81, INTERCHANGE @ STATE ROUTE 32 (U.S. 25E) EXIT 8

GENERAL LOCATION MAP

Figure 1-5
Example Hearing Notice

CHAPTER 2 – DESIGN PROCEDURES

1-200.00 ROADWAY DESIGN STANDARDS AND GUIDELINES

A list of documents used to design roadways in Tennessee can be found as part of TDOT Department Policy. This policy indicates the current recognized design standards for new construction or reconstruction of existing highways and should be utilized while giving due regard to topography, natural conditions, availability of road material, and prevailing traffic conditions.

1-200.05 LOW VOLUME (ADT ≤ 400) LOCAL ROAD

Standard drawing RD01-TS-1A should be used for the design of low-volume (current ADT ≤ 400) roadways classified as local roads. For additional guidance not covered on the standard drawing, designers should reference AASHTO "Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400)," 2001. For projects with design speeds greater than 40 mph, designers shall continue using standard drawing RD01-TS-1. Any exception to the use of standard drawing RD01-TS-1A on low volume local roads should be approved by the Design Division Director or the appropriate Assistant Director.

1-200.10 RESURFACING PROJECTS

1-200.12 HANDICAP RAMPS ON RESURFACING PROJECTS

In order to assist local governments with compliance with the Americans with Disabilities Act, it will now be the department's intent to repair or install handicap ramps which meet the Americans with Disabilities Act Accessibility Guidelines whenever possible when encountered on resurfacing projects.

Designers should refer to Section 3-310.05 and the RP-H-series Standard drawings for additional guidance regarding design and placement of handicap ramps.

1-200.15 SAFETY IMPROVEMENTS ON RESURFACING PROJECTS

To enhance safety on state routes, low cost safety improvements should be included on all state route resurfacing projects. Eligible safety improvements include the following: installation of skid-resistant surfaces in intersections or curves, installation and upgrade of guardrails and end terminals, improvements for pedestrian or bicycle safety, improvements for safety of the disabled, addition of ADA compliant handicap ramps, installation of centerline rumble stripes, improvement to pavement markings, sign replacement or upgrades, installation of safety headwalls, removal of roadside objects to improve clear zone, correcting super elevation rates, improvements (such as vegetation removal) to improve stopping site distance and/or intersection sight distance without purchasing ROW or relocating utilities, and widening shoulders without purchasing ROW or relocating utilities.

The applicable use of the above various safety improvements will be guided by the "Resurfacing Safety Checklist" (Figure 1-6) and will be completed by the team responsible for each resurfacing project. This checklist will be used as documentation for decisions regarding low cost safety improvements on resurfacing projects.

Installation of shoulder rumble stripes, shoulder rumble strips, and raised pavement markers are also considered low cost safety improvements. Guidance for the application of these measures is found in Section 4 of the Design Guidelines.

For federally funded state route resurfacing projects for pavement designs 2" thick or less and the ADT is greater than 2,000, the project shall provide at a minimum for a minimum 2' paved shoulder; compliance with current guidelines for placement of rumble stripes, rumble strips and raised pavement markers; and replacement of any end terminals not meeting NCHRP 350 requirements. For pavement designs 2" thick or less and an ADT less than 2,000, the project shall provide at a minimum for a minimum 2' paved shoulder and the replacement of any end terminals not meeting NCHRP 350 requirements.

Items for low cost safety improvements shall be funded separately from other resurfacing plan items in both federally funded and 100% state funded resurfacing projects if the total estimated costs of the safety upgrades are greater than $10,000. Therefore, designers should have an additional project number set up for payment of safety improvement items.

Designers will be responsible for obtaining the additional federal project number from the Programming Development and Scheduling Office and correctly identifying items by funding source in the resurfacing plans when safety improvements are identified to be included in a resurfacing project. Designers should advise the Programming Development and Scheduling Office the additional project number is needed for the inclusion of safety improvements in the resurfacing project.

If the total estimated costs of the safety improvements are less than or equal to $10,000, a separate project number will not be required. Safety improvements shall be funded using the same project number and resurfacing funds used for other items in the project.

RESURFACING SAFETY REVIEW CHECKLIST

It is the intent of this checklist to identify "low cost safety improvements" that will provide improvements in the areas of lane departures/run-off-the-road crashes and pedestrian and bicycle safety on this route at a minimal cost. A review of the crash history data for this route will be necessary for completion of this checklist and should be attached to the final report. Special attention should be given to those areas identified in the crash history as "hot spots" where work should be accomplished to provide a significant improvement to safety.

County:
Route:
Description:
Log Miles:
ADT:

1. Is shoulder width greater than or equal to 2' and AADT greater than 2,000? If yes, follow guidance regarding the placement of either rumble stripes or rumble strips found in 4-411.03, 4-411.04 and 4-716.15 of the TDOT – Roadway Design Guidelines

2. If AADT is greater than 2,000 and shoulders are not present or less than 2' wide, can minimum 2' shoulders be added without utility relocations or the purchase of ROW? If so, provide a minimum 2' shoulder.

3. Replace all guardrail and end terminals not meeting NCHRP 350 requirements.

4. Is signing adequate and visible, particularly in areas where curves exist? Does signing meet MUTCD requirements? Provide recommendations for upgrades and/or additional signing.

Figure 1-6
Resurfacing Safety Review Checklist

1. Would the use of centerline rumble strips or rumble stripes or raised pavement markers help in the delineation of curves or areas with a known crash history?

1. Could the condition in curves be improved by correcting superelevation rates or widening shoulders without purchasing ROW or relocating utilities? Would the construction of a specialized skid resistant surface improve conditions in curves or intersections that cannot be addressed by other means? If so, please explain.

1. Are there roadside obstacles (trees, tree stumps more than 4" above the ground, utility poles, culverts, headwalls, mailboxes, etc.) that could be removed, relocated or delineated? Could the installation of safety headwalls improve the site condition? Are signs obscured by brush or trees that could be removed or tree stumps present that are more than 4" out of the ground?

8. Can improvements be made that would enhance pedestrian or bicycle safety (the addition of a bike lane, share the road signing, enhancement or upgrading crosswalks to TDOT standards)? Is the addition of approved handicap ramps needed to comply with ADA requirements?

9. Could improvements be made to ditches to assure proper drainage and/or to reshape ditches to mitigate substandard foreslope or backslope without the relocation of utilities or purchase of ROW?

10. Are there areas along the roadway where stopping sight distance is not adequate that can be improved by measures that would not require additional ROW acquisition or utility relocation? Are there intersections where intersection sight distance is not sufficient that can be improved by vegetation removal or other measures that do not require additional ROW or utility relocation?

Figure 1-6
Resurfacing Safety Review Checklist *(Continued)*

1-200.30 PROJECTS OF LIMITED SCOPE

Projects of limited scope will permit implementation of projects addressing safety and operational concerns in a timely manner without requiring design exceptions for those elements of the roadway that are beyond the scope of purpose and funding for the projects such as, traffic engineering, spot improvements, road safety audit review (RSAR) projects, and safety projects such as signing, marking, signalization, roadway lighting and traffic barriers which include very minor or no roadway work as permitted under 23 CFR 625.3 (e).

1-200.31 ROAD SAFETY AUDIT REVIEW (RSAR) PROJECTS

The primary purpose of Road Safety Audit Review program is to reduce the number of injuries and fatalities on public roads. A RSAR report is written for each RSAR project and should be used as guidance for the development of RSAR plans. Projects currently selected for the program are spot or section locations on interstates, state routes, and functionally classified local roads for the Highway Safety Improvement Program list. Projects may also be selected if qualified for the High Risk Rural Roads funds. Currently project funding comes from either Highway Safety Improvement Program funds ($1,000,000 limit per project) or High Risk Rural Roads funds (approximately $50,000 limit per project).

Scope of work for RSAR projects is developed by a RSAR Team and will consist of a Pre-Briefing Meeting, Onsite Visit, and Post Meeting or Conference Call of team members. A representative from either Headquarters Design or the Regional Design Office will be included on each team. The Assistant Director will coordinate with the Headquarters and Regional Design Managers to ensure Design is represented at each meeting. The representative will be responsible for ensuring design issues are addressed prior to finalizing and submitting the RSAR for approval.

Except as noted herein, guidance provided in the Design Guidelines do not apply to the development of RSAR projects. Proposed improvements should be designed in accordance with current design standards; however, it is not the intent of the RSAR program to bring all design elements up to current standards.

In order to provide consistency in the development of RSAR projects the following guidance should be used during the development of RSAR plans:

1. Plans should be developed in accordance with the approved RSAR report.

2. Scope of the project should be limited to items addressed in the RSAR report.

3. Any deviation from the RSAR report will require a revision to the report and estimate. Proposed changes should first be approved by the Design Division director prior to initiating a request to change the approved RSAR report.

4. Additional improvements should not be added to the project unless required to meet the objective outlined in the RSAR report.

5. Improvements to add additional capacity (except where identified in the RSAR report) should not to be added to RSAR projects.

6. Design Exceptions should only be requested when the proposed element to be improved cannot be brought up to current standard. Design Exceptions shall not be requested for other controlling elements of design that are not addressed in the RSAR report. Designers should document to the project file other controlling elements of design or design criteria identified that are not brought up to current standard.

7. Plans should be developed using the minimal amount of survey and plans detail necessary to provide sufficient detail to acquire right-of-way (if required) and construct the project. Example: Topography of adjacent properties is not needed when the improvement is going to be constructed inside existing right-of-way. However, erosion prevention and sediment control plan may need to be developed to the same detail as a typical roadway project.

8. The acquisition of additional right-of-way and easements and the relocation of utilities should be addressed in the RSAR report. Designs for RSAR projects not proposing additional right-of-way and/or easements or utility relocations acquisition should avoid additional right-of-way or utility relocations whenever possible. In the event that the need for additional right-of-way and/or utility relocation is identified during project development, the Design Manager shall immediately notify the Project Manager or RSAR Coordinator.

9. The Work Zone Significance Determination shall be completed and procedures in the Work Zone Safety and Mobility Manual shall be followed for all RSAR projects.

10. RSAR project development shall follow guidance regarding permits and submittals to the Environmental Division found in the Design Guidelines.

11. Signing and marking shall be in compliance with the current edition of the *Manual on Uniform Traffic Control Devices*.

12. The following note will be place on the Title Sheet directly above the Chief Engineer's signature. **"RSAR Project – Project of Limited Scope"**

1-200.35 LOCAL PROGRAM DEVELOPMENT PROJECTS

The Local program is intended to help Tennessee's Local Governments conduct environmental processes and clearances, design, construct, and maintain transportation facilities. The TDOT Local Program Development Office is the single TDOT point of contact for project correspondence between the department and local governments. The detailed

information about the program may be found at The Local Government Guidelines (LGG) Manual.

Locally Managed Projects may be located on the National Highway System, State Routes, or Local Routes. In addition, the funding for each Locally Managed Project may come from Federal-aid and/or State Funds combined with Local Funds, or solely from Federal-aid, State Funds, or Local Funds. Projects to be designed under the local program are primarily on local roads. In general, they should not involve the state highway system, the national highway system or the interstate system.

All projects developed under the Local Program which involve a roadway shall be designed in accordance to TDOT Design Policies and Procedures, and Federal Regulations.

A TDOT Design Manager will manage all projects on the NHS System, other projects as well may be assigned a manager to provide full oversight. The TDOT Design Manager is responsible for ensuring all TDOT Design Policies and Procedures have followed. The TDOT Design Manager is not responsible for providing guidance or assistance in the actual design of the project. A "Design Certification Letter" will be required for all roadway projects. Any comments provided by the Department shall be incorporated into the design of the project.

Projects such as Bridge Replacement (BRZ) Projects, State Industrial Access (SIA), Local Interstate Connector (LCI), Intersection Improvements, Roadway Resurfacing, Roadway features or Auxiliary to Roadway Features, Roadway Signing and Striping Improvements, as well as Sidewalks-ADA Improvements, Bikeways, Shared-use Paths, Safe Routes to Schools, and Landscape Projects should be considered as a Roadway Project since the project scope would involve roadway design elements.

Projects such as Building Projects, Parking Improvements are non-roadway projects and they are covered under The Local Government Guidelines (LGG) Manual-Chapter 10: Non-Traditional Projects.

Refer to *Local Program Guidelines*, Chapter 5, "Roadway Design Procedures, Including Structural Design" for more information.

1-205.00 SURVEY REQUIREMENTS

1-205.15 COORDINATE VALUES

Survey procedures require that all surveys shall be tied to the State Plane Coordinate System using the Tennessee Geodetic Reference Network (TGRN). All surveyed coordinate values will be based on the North American Datum 1983 (NAD/83) (1995 adjustment) coordinates and appropriate notes indicating such shall appear on the topography plot.

All design computations shall be based on these adjusted coordinate values. This will ensure that all computed points on the project would have coordinate values tied to the State Plane System. Assumed coordinates will not be used.

Coordinate values for all PI's shall be shown on present and proposed (if any are shown) layout sheets within each curve data table. Coordinate values shall also be listed for the beginning and ending points of the project. A **notation** near the title block in lower right hand

corner for each sheet on which coordinates appear shall read, **"Coordinates are NAD/83 (1995), are datum adjusted by the factor of 1.000XXX" and tied to the TGRN. All elevations are referenced to the NAVD 1988.** The "1995" refers to the year of the most recent adjustment of coordinate values in Tennessee and 1.000XXX refers to the actual datum adjustment factor used for the project.

1-205.20 DIMENSIONS AND DIRECTIONS ON PLANS

In order to provide consistency and maintain accuracies, the following criteria are to be adopted for the roadway plans.

1. Distances shown on the plans shall be no more accurate than the nearest 0.01 foot (35 ft, 35.0 ft, and 35.00 ft, are acceptable: 35.001 ft is not acceptable).

2. Bearings shown on the plans shall be no more accurate than 1 second (for example N 35 00' 01" E is acceptable; N 35 00' 01.1" E is not acceptable). P. I. coordinates shall be computed to four decimal places, and then bearings recomputed to even seconds. Bearings and the beginning coordinate point are then held constant and P. I.'s and ending coordinates recomputed to four decimal places.

3. Coordinates of P. I.'s and G. P. S. control points shall be shown to an accuracy of 0.0001 foot. Any other coordinates shall be shown to an accuracy of 0.01 foot.

1-205.30 TRACT NUMBERS ON PLANS

On all design projects, tract, and/or parcel numbers assigned during the survey process **shall not** be deleted, changed, or renumbered. Tract numbers are assigned during the survey process and have the same parcel number in the GEOPAK "GPK" file. The parcel information contained in the GPK file is used in survey and plan preparation and right-of-way processes. There should not be any duplicate tract numbers on any one project.

All survey assigned tract numbers and property owner information will be retained on the plans through the preliminary field review, if one is conducted. After that time the tract information can be removed from the acquisition table, property map, and plan sheets but the previously assigned tract numbers shall not be changed nor deleted from the GPK file. Tract numbers shall not be renumbered on the plans.

No tract shall be deleted after the plans have been submitted for incidental or printed for a design public hearing. The information in the acquisition table, property map, and layout sheets shall be crossed out in all places using a single line to indicate that no acquisition is required. This will insure that all tract information is retained in the GPK file and not deleted nor written over. The tract information is then recoverable and can be used by other sections as the information is passed to the Right-of-Way and Construction Divisions or returned to the Survey Office for updating.

1-210.00 RAILROAD COORDINATION

1-210.02 GRADE SEPARATED RAILROAD CROSSINGS (See 1-210.05 and 2-325.00)

In order to facilitate and expedite the Railroad's review of all future highway plans, which include a highway-railroad grade separation, the following information must be included to the preliminary plans, which are to be sent to the railroad for comments and/or approval:

1. A minimum of five railroad cross-sections shall be provided at the following locations.

   - The roadway grade at the proposed bridge
   - Both faces of the proposed bridge
   - ROW limits (minimum 100 ft.) from face of the proposed bridge (perpendicular to the railroad alignment)

a. The proposed bridge toe of abutment fill slopes, existing railroad drainage structures and ditches, and roadside ditches should be shown on applicable all cross-sections.

b. For any proposed structure (example: retaining wall, end wall); a cross section view showing the location of such structures in relation to the location of a railroad track shall be shown.

c. Cross sections need to show any changes proposed during grading operations to the railroad embankment, drainage ditches, or sub-track structures.

Note: If the distance between the subject cross sections exceeds 50 feet an additional cross sections are required to adequately depict conditions along the tracks. See Figure 1-7

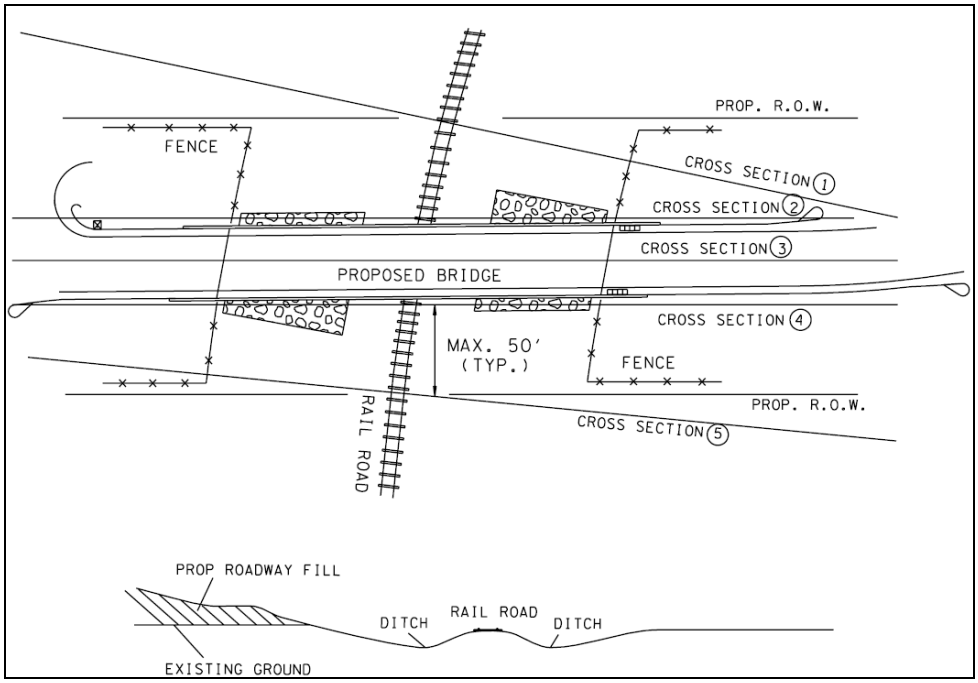


Figure 1-7
Example Cross Section Locations

2. The following information must be on the preliminary plans,

    a. Proposed minimum vertical clearance and horizontal clearance on both sides of track

    b. At skewed crossings, drawing must include a structure elevation view normal to the track

    c. Proposed distance from centerline of track to toe of end slopes at their intersection with natural ground

    d. If end slopes are to be paved, indicate limits of paving

    e. Location of pole lines on railroad right-of-way

    f. Existing and proposed drainage structures

    g. Railroad station at highway-railroad intersection, or distance in feet from nearest railroad mile pole

In general, the information listed above is the minimum information needed by the railroad to enable them to make a logical investigation of the proposed project. To furnish less information would only serve to delay the railroad's approval of the plans. Include easement note as shown in 1-210.05.

Figure 1-8 indicates a method of showing the easement for a roadway bridge crossing over railroad.

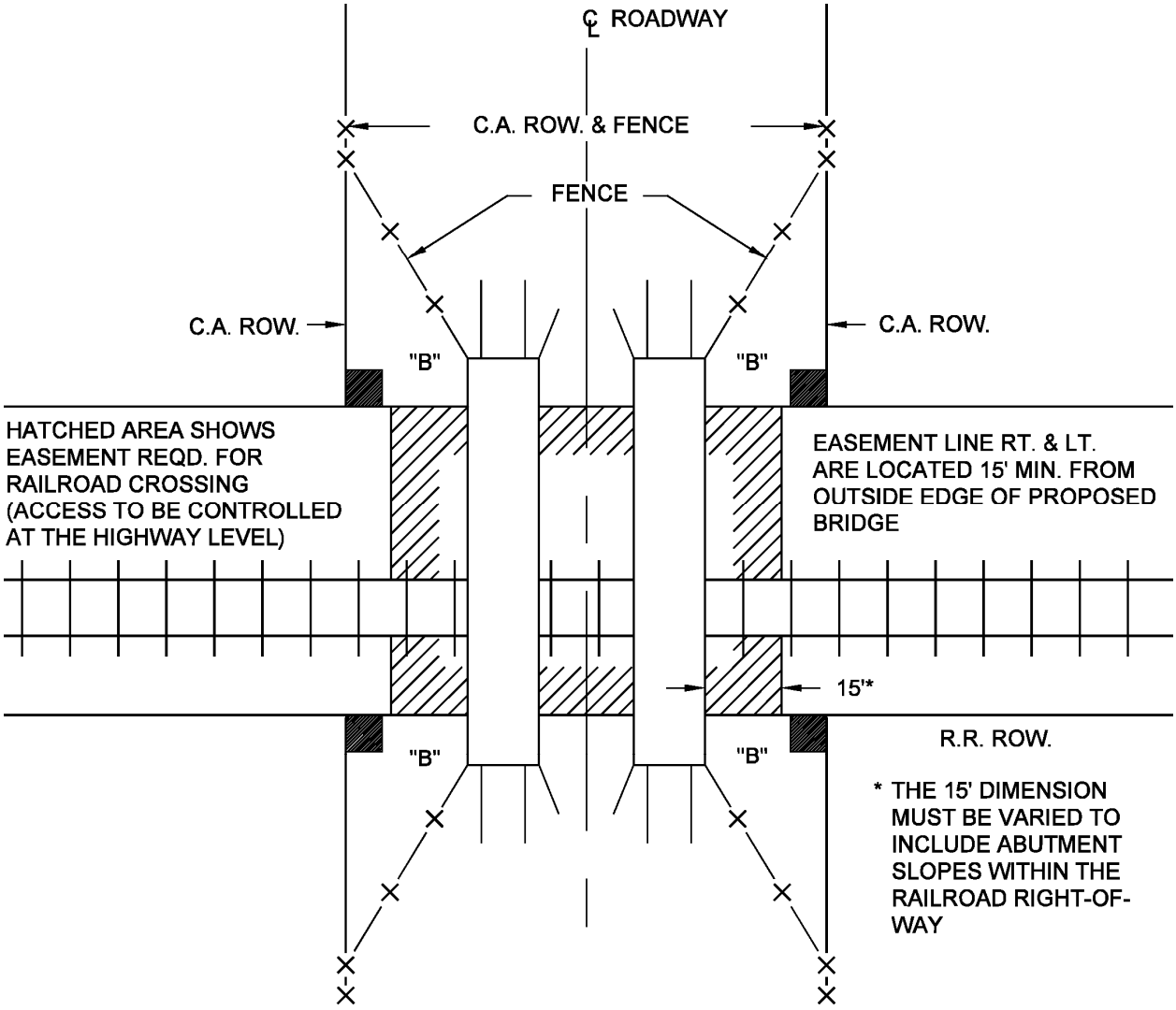


Figure 1-8
Method of Showing "Easement" for Railroad Crossings

1-210.05 AT-GRADE RAILROAD CROSSINGS (See 1-210.00 and 2-325.00)

All designers shall prepare plans for at-grade railroad crossings using the following design criteria where feasible:

Alignment: 90 degrees to the railroad desirable, 70 degrees minimum, with good sight distance in both directions.

Grade: Where crossings involve two or more tracks, the top of rails for all tracks shall be brought to the same plane where practicable. The surface of the highway shall be in the same plane as the top of rails for a distance of 2 feet outside of rails for either multiple or single-track crossings. The top of rail plane shall be connected with the grade line of the highway each way by vertical curves (if necessary) of such length as is required to provide

riding conditions and sight distances normally applied to the highway under consideration. It is desirable that the surface of the roadway be not more than 3 inches higher or 6 inches lower than the top of the nearest rail at a point 30 feet from the rail measured at right angles, thereto, unless track superelevation dictates otherwise. Desirable grades on the tangent immediately adjacent to the grade across the rails of the track shall be 5% or less but no steeper than 7%.

Curbs: Proposed roadway curbs and/or curbs and gutter shall terminate no less than 13 feet from the centerline of the nearest tracks for at-grade railroad crossings.

The roadway right-of-way lines will terminate at the railroad right-of-way as shown on Figure 1-9. No easement will be shown on the plans for this crossing. The easement note as given below will be added to the present layout sheet near the crossing.

> "Easement required for the railroad crossing is to be obtained by the Utilities Engineer by provisions contained in the crossing agreement negotiated with the railroad."

Bearings and distances will be provided along both the railroad right-of-way and the proposed roadway right-of-way lines. The distance to the nearest milepost will be shown at the intersection of the centerlines of the roadway and railroad.

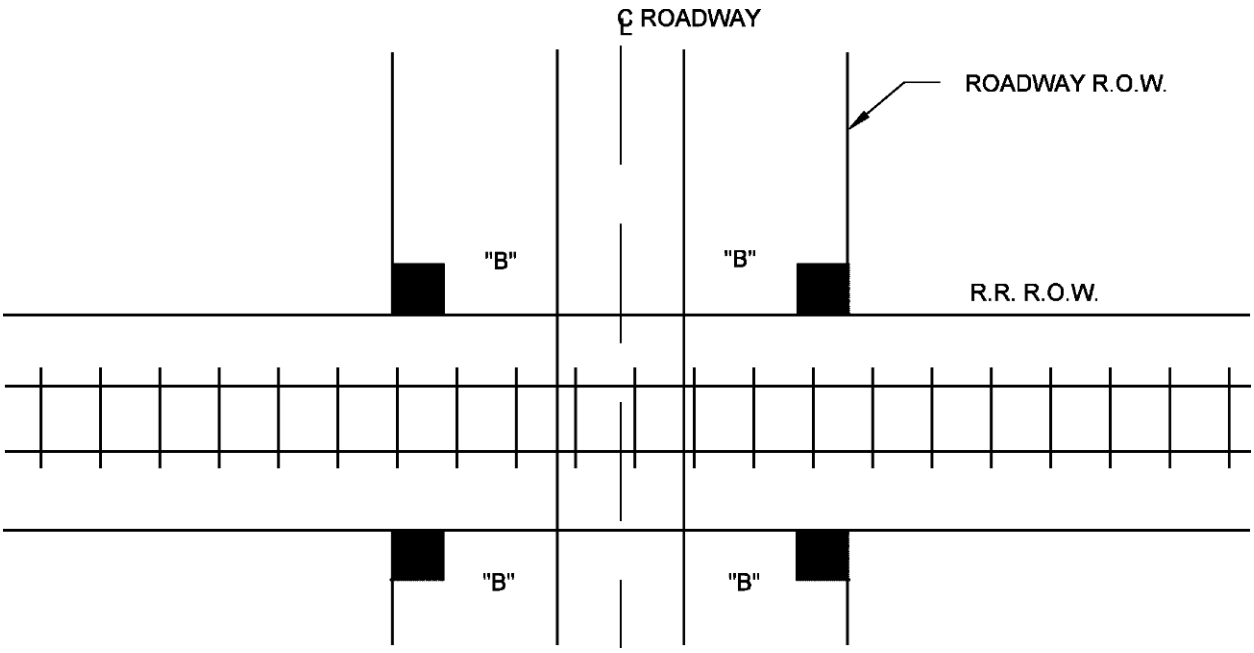


Figure 1-9
Method for Showing Right-of-Way at an At-Grade Railroad Crossing

1-210.10 RAILROAD RIGHT-OF-WAY ENCROACHMENT – PARALLEL CONSTRUCTION

When the proposed roadway is parallel to the railroad, as shown on Figure 1-10, the railroad shall be given a tract number and included in the right-of-way tabulation block as permanent easement to be acquired by the Right-of-Way Division.

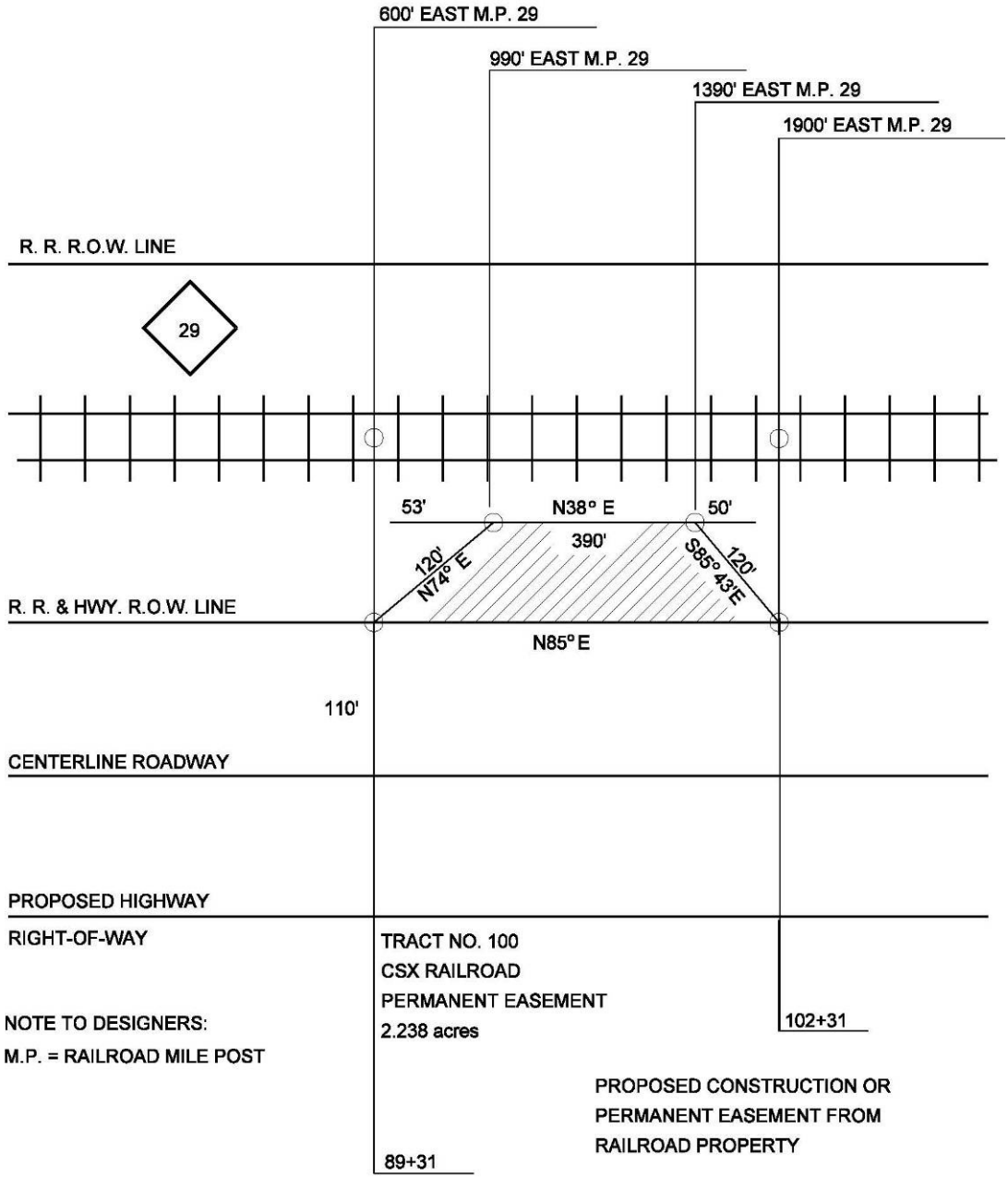


Figure 1-10
Example for Preparation of Right-of-Way Details
when Encroachment is Parallel to the Railroad

When constructing a roadway parallel to a track roadbed, if work is required inside the railroad right-of-way, the preferred construction limit (toe of slope) shall be no closer than 50 feet from the centerline of the nearest track.

If it is necessary to encroach nearer than the 50 feet described above, a set of preliminary plans, including cross-sections, showing how the proposed work ties to the existing railroad roadbed, are to be sent to the Utility Section of the Right-of-Way Office for review, comment and submittal to the railroad. An example is shown in Figure 1-11 below.

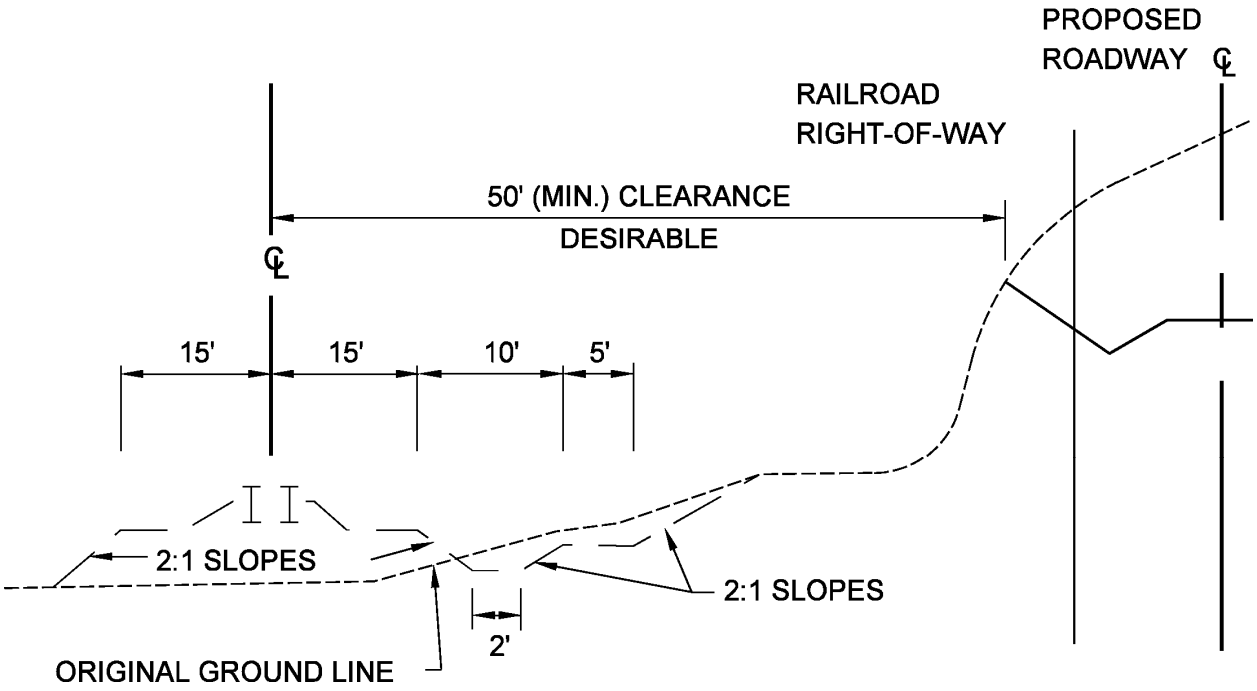


Figure 1-11
Sketch Showing the Minimum Requirement for Railroad Typical Roadbed Section. To Be Used as a Reference for Designers Working Inside Railroad Right-of-Way.

1-215.00 KNOWN ENVIRONMENTAL CONSTRAINTS

Any known environmental constraints identified in the environmental document or other expert sources should be indicated on the plans and brought to the Project Manager's attention as soon as the constraints are recognized. Constraints may include, but are not limited to the following: blue line steams, wetlands, endangered or protected species, registered historical or archeological sites, etc. Ecology, permit assessment, and SWPPP review items encountered are to be addressed prior to the right-of-way plan submittal.

SECTION II - PRELIMINARY PLANS

CHAPTER 1 - DESIGN GUIDELINES

SECTION I - GENERAL

CHAPTER 1 - PROJECT RECORDS

SECTION II - PRELIMINARY PLANS

CHAPTER 1 - DESIGN GUIDELINES

2-100.00 PROJECT FOLDER (See 1-100.00)

2-105.00 ROADWAY DESIGN CHECKLIST - PRELIMINARY PLANS (See 1-105.00)

2-110.00 PROJECT ACTIVITY STATUS SHEET (See 1-110.00)

2-112.00 SIZE OF FULL-SIZE PLAN AND CROSS-SECTION SHEETS (See 3-102.00 and 4-112.00)

All full size plans submitted for printing shall be 34" x 22". No size variation will be allowed.

2-115.00 IDENTIFICATION OF SUPERVISORS, DESIGNERS, AND CHECKERS ON TITLE SHEET (See 3-105.00)

List on the lower left hand corner of the project title sheet: the names of the TDOT Civil Engineering Manager 1, TDOT Design Manager 1 or TDOT Roadway Specialist Supervisor 2 in charge of the project, the name of the firm designing the project if being done by a consultant, the name of the designer and the Design Project (P.E.) number. See examples in Figures 2-1a and 2-1b.

CONSULTANT DESIGN RIGHT-OF-WAY

TDOTDESIGN MANAGER: _____

(FIRM NAME)

DESIGNED BY: _____

(RESPONSIBLE PERSON)

DESIGNER: _____

P.E. NO.: _____

PIN : _____

Figure 2-1a
Title Sheet Identification Format for Consultant Designed Right-of-Way

T.D.O.T. DESIGN RIGHT-OF-WAY

TDOT ROAD SP. SV. 2: _____

DESIGNER: _____

P.E. NO.: _____

PIN : _____

Figure 2-1b
Title Sheet Identification Format for TDOT Designed Right-of-Way

2-115.01 SPECIAL NOTES

The Special Notes shown on the lower left hand corner of the project title sheet shall read as follows:

SPECIAL NOTES

PROPOSALS MAY BE REJECTED BY THE COMMISSIONER IF ANY OF THE UNIT PRICES CONTAINED THEREIN ARE OBVIOUSLY UNBALANCED, EITHER EXCESSIVE OR BELOW THE REASONABLE COST ANALYSIS VALUE.

THIS PROJECT TO BE CONSTRUCTED UNDER THE STANDARD SPECIFICATIONS OF THE TENNESSEE DEPARTMENT OF TRANSPORTATION DATED MARCH 1, 2006, AND ADDITIONAL SPECIFICATIONS AND SPECIAL PROVISIONS CONTAINED IN THE PLANS AND IN THE PROPOSAL CONTRACT.

Figure 2-2
Title Sheet Special Notes Format

2-115.05 EQUATION BLOCKS ON TITLE SHEET (See 4-115.20)

The format for the Equation Block (if needed) is as shown in Figure 2-3.

If no Equation Block is needed it shall be so noted "NO EQUATIONS".

EQUATIONS	
DESCRIPTION	**NET EFFECT ON NUMERATION**
STA. xx + xx BK. = STA. xx + xx AH.	+ xx.xx
STA. xx + xx BK. = STA. xx + xx AH.	- xx.xx
TOTAL	± xx.xx

Figure 2-3
Equation Block Format

2-115.10 EXCLUSIONS ON TITLE SHEET (See 4-115.25)

If there are exclusions on the project, these shall be noted as follows:

EXCLUSION STA. XX+XXX TO STA. XX+XXX
NET EFFECT ON ENUMERATION ± XX.XXX

If there is more than one exclusion, a block shall be drawn similar to the Equation Block.

If there are no exclusions, the sheet shall be noted "NO EXCLUSIONS".

2-115.15 TRAFFIC BLOCK ON TITLE SHEET

The format for the Traffic Block is as shown in Figure 2-4. The first line of data is current year and the other lines are design year.

TRAFFIC DATA	
ADT (20XX)	xxxx
ADT (20XX)	xxxx
DHV (20XX)	xxxx
D	xx - xx
T (ADT)	xx %
T (DHV)	xx %
V	xx mph

Figure 2-4
Traffic Block Format

2-115.20 PROJECT DESCRIPTIONS

Project descriptions on the title sheet and in all correspondence shall be in sequence as follows:

1. FAI number (if an Interstate)
2. State route number (if a State route)
3. U.S. route number (if a U.S. route)
4. Local road name
5. Project limits (from and to)

Typical descriptions are shown in Figures 2-5a and 2-5b.

S.R. 6 (U.S. 16, THOMASVILLE ROAD)
FROM: 0.5 MILES SOUTH OF BANANA TOWN
TO: 1.3 MILES NORTH OF TURTLEDOVE CREEK

Figure 2-5a
Typical Title Sheet Project Description

S.R. 6 (U.S. 16, THOMASVILLE ROAD)
BRIDGE AND APPROACHES OVER TURTLEDOVE CREEK @ L.M. 2.45

Figure 2-5b
Typical Title Sheet Project Description

In all correspondence, remember to include project number and county name.

2-115.25 SPECIAL LOG MILE NOTE

On Interstate plans, both Interstate log miles (based on Interstate mileposts) and stations will be required when designating the beginning and ending points on all projects. To assist in determining the proper log mile, refer to the book *Log of the Interstate Highway System in Tennessee*. This reference also may be used for cross referencing the statewide Interstate log miles with the Interstate milepost miles.

On state highway plans, such as resurfacing projects, when using log miles to designate the beginning and ending points on projects, county log miles (mile posts) are to be used. To assist in determining the proper log mile, refer to the book *Log of the Interstate and State Highway System in Tennessee* for the region that the project is located.

Check with appropriate TDOT Manager for the location of a copy of these books.

2-120.00 TRAFFIC DATA FOR DESIGN

To establish a uniform and systematic method of obtaining desired traffic data for the construction year for all future projects, use the following procedure:

1. Mark two sketches (generally a print of the title sheet) to show the limits of the project and to establish the exact information desired. If crossroad volumes and/or turning movements on certain intersecting streets or roads are needed, this fact shall be clearly indicated by a sketch on the title sheet prints.

2. Regional design engineers shall submit the two sketches along with a properly filled out copy of the Request for Traffic Data Form shown in Figure 2-6 to the Traffic Planning and Statistics Office at the address shown on the form.

3. Headquarters design personnel shall submit two sketches with a properly filled out request form to their supervisor for proper handling.

4. Consultants shall submit two sketches with a properly filled out form to the appropriate Design Manager.

Since the typical cross-section to be used is largely dependent on the anticipated traffic, it is urgent that traffic data for each newly assigned project be requested as soon as possible after beginning work on a project.

To expedite a pavement design from the Pavement Design Section, the following applicable notes shall be included under comments on the form. A copy of the completed form shall be forwarded with the pavement design request.

1. Furnish the 20xx-20xx ADL for pavement design on a four-lane roadway.

2. Furnish the 20xx-20xx ADL for pavement design on a four-lane roadway and the present ADT on all crossroads within the limits of the project.

3. Furnish the 20xx-20xx ADL for pavement design on a two-lane roadway.

4. Furnish the 20xx-20xx ADL for pavement design on a two-lane roadway and the present ADT on all crossroads within the limits of the project.

NOTE: ADL (Average Daily Loading)
ADT (Average Daily Traffic)
DHV (Design Hourly Volume)
D (Directional Distribution)
T (Truck Percentage)

NOTE: For Bridge Replacement Projects, ADL are not required for ADTs of 1,000 or less and percentage trucks of 7 percent or less.

NOTE: ADTs and DHVs are not required for crossroads with ADTs of 1,000 or less.

TENNESSEE DEPARTMENT OF TRANSPORTATION
PROJECT PLANNING DIVISION

PROJECT NO.: _____ ROUTE: _____
COUNTY: _____ CITY: _____
PROJECT PIN NUMBER: _____
PROJECT DESCRIPTION: _____

DIVISION REQUESTING:

		PAVEMENT DESIGN	☐
MAINTENANCE	☐	STRUCTURES	☐
PLANNING	☐	SURVEY & DESIGN	☐
PROG. DEVELOPMENT & ADM.	☐	TRAFFIC SIGNAL DESIGN	☐
PUBLIC TRANS. & AERO.	☐	OTHER _____	☐

YEAR PROJECT PROGRAMMED FOR CONSTRUCTION: _____
PROJECTED LETTING DATE: _____

TRAFFIC ASSIGNMENT:

BASE YEAR		DESIGN YEAR					DESIGN ROADWAY % TRUCKS		DESIGN AVERAGE DAILY LOADS	
ADT	YEAR	ADT	DHV	%	YEAR	DIR.DIST.	DHV	ADT	FLEX	RIGID

REQUESTED BY: NAME _____ DATE _____
DIVISION _____
ADDRESS _____
_____

REVIEWED BY: _____ DATE _____
TRANSPORTATION MANAGER 1
SUITE 1000, JAMES K. POLK

APPROVED BY: _____ DATE _____
TRANSPORTATION MANAGER 2
SUITE 900, JAMES K. POLK BUILDING

COMMENTS:

DHV'S ARE NOT REQUIRED FOR SIDE ROADS LESS THAN 1000 ADT.
NOTE: FOR BRIDGE REPLACEMENT PROJECTS, ADLs ARE NOT REQUIRED FOR ADTs OF 1000 OR LESS AND PERCENTAGE OF TRUCKS OF 7% OR LESS.
SEE ATTACHMENTS FOR TURNING MOVEMENTS AND/OR OTHER DETAILS. (REV. 8/15/08)

Figure 2-6
Request for Traffic Data Form

2-125.00 VERTICAL CLEARANCES FOR NON-INTERSTATE BRIDGES

The minimum vertical clearance for all structures on all systems shall be not less than 16 feet over the entire roadway width, including the usable width of shoulder. The vertical clearance to sign trusses and pedestrian overpasses shall be 17 feet because of their lesser resistance to impacts. The vertical clearance from the deck to the cross bracing on through truss structures shall also be a minimum of 17 feet. The vertical clearance for railroad crossings from structure to top of rails shall be 23 feet.

An allowance of 6 inches shall be added to all vertical clearances to accommodate future resurfacing.

On crossings of low volume roadways where the cost of providing 16 feet of clearance might be considered unreasonable and may justify an exception, the Design and Structures Division personnel shall complete a joint cost analysis justifying a reduction in vertical clearance. This cost analysis shall be submitted to the Director of the Structures Division for approval.

2-127.00 SUBMITTAL OF PLANS FOR STRUCTURAL GRADE APPROVAL

The designer in the Structures Division shall receive all the material applicable to the drainage portion of the project as specified in Section 2.50 of the Survey Manual when receiving the survey. In addition, they shall receive all the material applicable to grade separations at highway and railroad crossings as specified in Section 2.70 of the Survey Manual when receiving the survey. When grade approval is requested the following material shall be placed on FileNet for use by the Structures Division.

1. Floodplain sections (stream crossing)

2. Stream profiles (stream crossing)

3. Roadway and railroad profile (see Section 1-210.00)

4. Topography

    A. See Section 2.50 and 2.70, and the Survey Check List, Box Bridge and Bridge Surveys Section of the latest edition of the Survey Manual

    B. Low girder and bridge deck elevations

    C. Stations for each substructure

5. Complete set of full-size preliminary plans with prints of digital terrain model sheets at bridge locations

An email notification requesting structural grade approval should be sent to the Structures Division once the required materials are placed on FileNet. If a grade or alignment change is made on the project subsequent to the submission for grade approval, all revised information should be resubmitted to the Structures Division if the Design Manager determines it affects a structure. A copy of the email shall be placed in the project folder to document the submittal of structural grade approval request.

2-130.00 SUPERELEVATION RATES AND RUN-OFF

On all major grade and drain projects spirals will be required on horizontal curves below the heavy lines as shown on Standard Drawings RD01-SE series. For horizontal curves above the heavy lines spirals may still be used.

On isolated bridge replacement projects, intersection improvements, widening of existing roadways, etc., where use of spirals would provide no real benefit and/or cause problems in design, spirals will not be required. It will still be necessary to provide superelevation and superelevation lengths as shown on RD01-SE series.

On urban projects, note that the maximum desirable superelevation rate is 4 percent.

On rural projects, the maximum desirable superelevation rate is 8 percent.

On "BRZ" projects with design speed of 30 mph or less and with gravel or "spot" double bituminous surface treatment, a maximum superelevation rate of 6 percent may be used without a design exception being required.

Exceptions to this policy shall be identified in field review reports.

Show the superelevation rate and speed on all plans as a part of the horizontal curve data, thus: "S.E. 5.4% 70 mph". Also, show transition length on non-spiraled curves.

2-132.00 INTERSECTION SIGHT DISTANCE

The designer will ensure that intersection sight distance is provided in addition to adequate stopping sight distance at all intersections, railroad crossing without train activated warning devices and commercial drives. Refer to Standard Drawings: RD01-SD-1, RD01-SD-2, RD01-SD-3, RD01-SD-4, RD01-SD-5, RD01-SD-6, RD01-SD-7; for details.

2-135.00 THE CLEAR ZONE ROADSIDE CONCEPT

Clear zone distance (sometime referred to as clear zone, horizontal clearance to obstructions or roadside recovery area) as defined in the AASHTO *Roadside Design Guide*, other parts of this document and in other official publications shall be maintained on all projects.

2-135.05 CLEAR ZONES ON CURVED ALIGNMENTS

In Chapter 3 of the AASHTO *Roadside Design Guide* a formula is given for increase in clear zone on the outside of curves.

The clear zone on curved alignment is determined by increasing the value obtained from the *Roadside Design Guide* method for a tangent section of highway. The tangent section clear zone is increased by a curve correction factor, which is based on the degree of curvature and the design speed.

One note of caution, the designer must remember that the clear zone values (L_c) obtained are based on a constant side slope throughout the clear zone distance. In situations where the side slope changes within the calculated clear zone, the clear zone must be recalculated based on a weighted average of the side slopes.

2-136.00 LANDSCAPING

Landscaping shall not cause a sight distance or clear zone conflict. See the Environmental Davison – Beautification Office's **Landscape Design Guidelines** for roadside landscaping details. The document may be view at:

http://www.tdot.state.tn.us/environment/beautification/landscapedesign.htm

2-140.00 MEDIAN OPENING SPACING

Safety and improved traffic operations dictate the need for providing roadways with medians in the State of Tennessee. The value of medians has been demonstrated many times in this state. Accident records indicate that the accident rate for non-median roadways in Tennessee is consistently higher than the accident rate for those roadways with medians. Since the number of median openings per mile has a significant effect on accident potential, it is important that such openings be held to a reasonable minimum and in the interests of equity, permitted at predetermined uniformly spaced specific locations. This procedure will provide a high degree of safety to the motoring public and also permit reasonable access to abutting property owners.

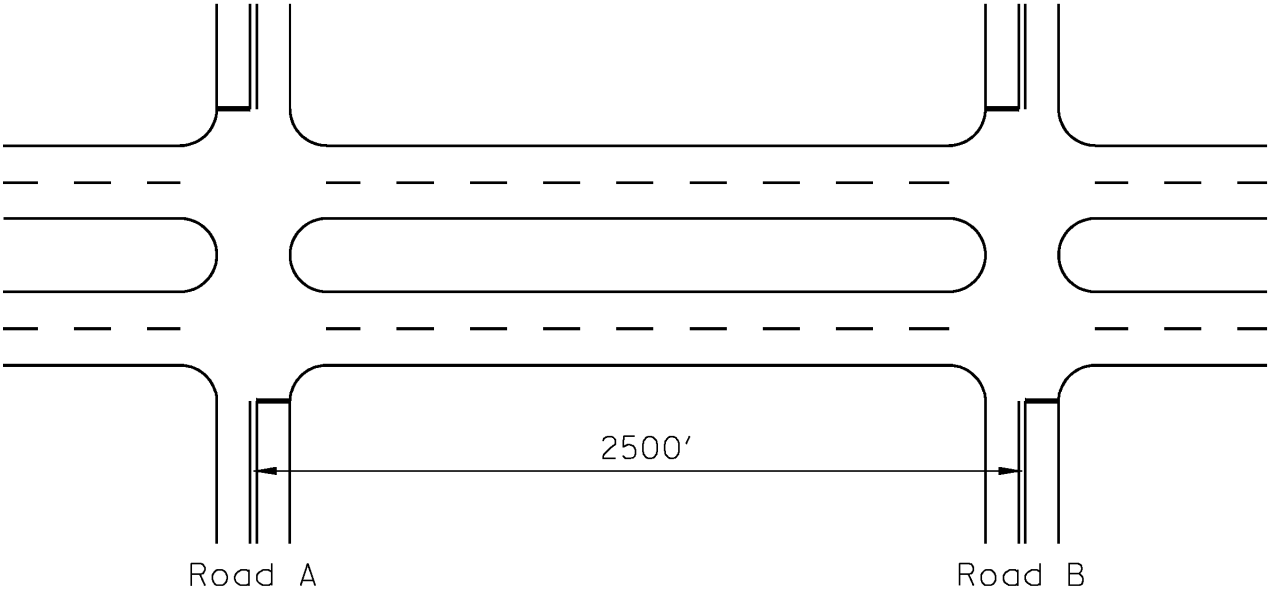
It is the policy of the Department to provide median openings at most existing city streets or county roads. It is also the policy of the Department to provide uniformly spaced openings between median openings for city streets or county roads for U-turn vehicles. The desirable uniform spacing is 1,320 feet (a range of 880 feet - 1,760 feet is acceptable) in rural areas and 660 feet (a range of 440 feet - 880 feet is acceptable) in urban areas.

Location of crossovers set by this policy shall be adjusted if safety considerations so dictate. An example is as follows: in order to minimize the potential for wrong way movements, adjustment of proposed crossover locations to align with an existing driveway shall be considered if the driveway centerline is within 75 feet of the proposed crossover centerline.

2-140.05 MEDIAN OPENING SPACING - EXAMPLE PROBLEMS

Ten example problems detailing the procedure to be used in determining the appropriate median opening spacing are as follows:

Example No. 1 Urban Section



Total distance between Road A and Road B is 2,500 feet. Since this is with an urban section of roadway, the appropriate median opening spacing would be that which most closely approximates 660 feet. It shall not, however, be less than 440 feet nor more than 880 feet.

The first step in determining the proper spacing is to divide the total distance between the intersection openings (2,500 feet) by the desirable urban spacing (660 feet). This will tell us approximate number of spaces required.

This calculates to 3 or 4 spacings (2 or 3 midblock median openings) between Road A and Road B.

The next step is to determine which condition would result in a spacing nearest 660 feet, but which is also no less than 440 feet, nor more than 880 feet. To do this, first divide the total distance between the intersection openings (2,500 feet) by the possible number of spacings (3 and 4). At the same time, check to see if the resulting distances are within the permissible range (440 feet - 880 feet) because if the resulting distance is not within this range, discard it as an alternative.

$$\frac{2500}{3} = 833 \qquad 440 < 833 < 880 \text{ OK}$$

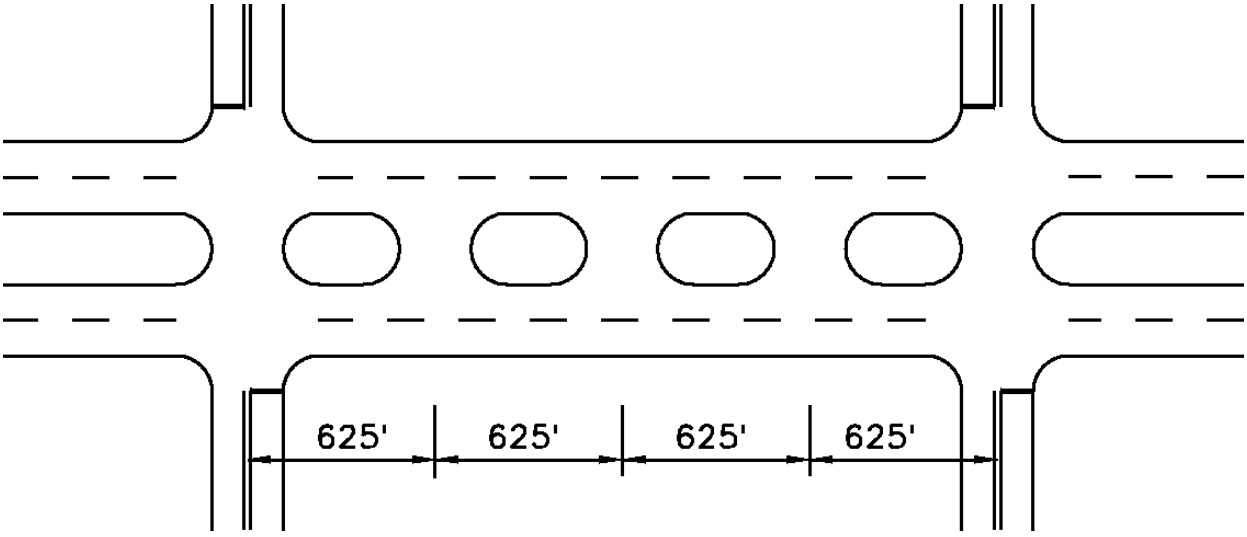
$$\frac{2500}{4} = 625 \qquad 440 < 625 < 880 \text{ OK}$$

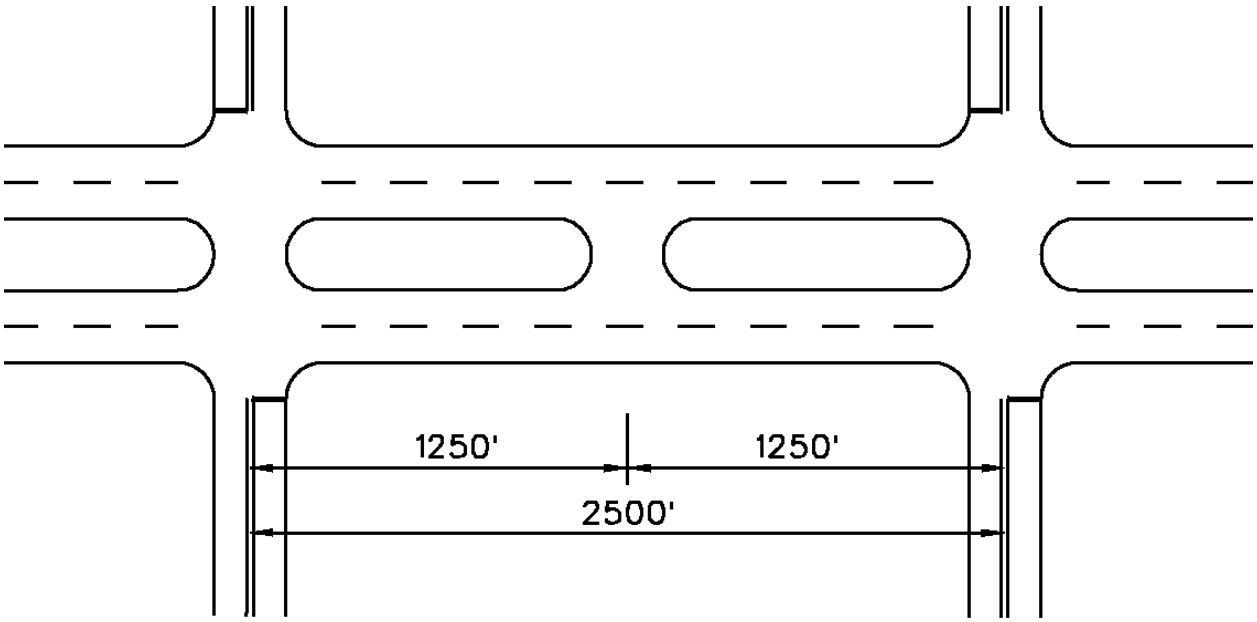
Both possible spacings (833 feet and 625 feet) are within the permissible range. Therefore, it must still be determined which is closest to 600 feet.

833	660
-660	-625
173	35

Since 35 is less than 173, the most appropriate median opening spacing between Road A and Road B would be 625 feet. This would result in 3 midblock median openings 625 feet apart.

Note that the number of midblock median openings is always one less than the number of spaces. Generally the whole number closest to the approximate number of spaces (4 for 3.75 above) will be the number of spaces which will yield the most appropriate median opening spacing (which is true in this particular example). However, this is not always the case (see Example No. 8).





Example No. 2 Rural Section

Total distance between Road A and Road B is 2,500 feet. The desirable rural spacing is 1,320 feet, but no less 880 ft, nor more than 1,760 feet.

$$\frac{2500}{1350} = 1.9$$

Therefore, there can be 1 or 2 spacings (0 or 1 midblock median openings). However, it must be determined which condition would result in a spacing nearest 1,320 feet, but which is also no less than 880 feet nor more than 1,760 feet.

$$\frac{2500}{1} = 2500 \quad 880 < 2{,}500 > 1{,}760 \text{ not acceptable}$$

$$\frac{2500}{2} = 1250 \quad 880 < 1{,}250 < 1{,}760 \text{ OK}$$

The only acceptable median opening spacing between Road A and Road B is 1,250 feet. Therefore, one midblock median opening shall be provided at a point 1,250 feet from each intersection.

Example No. 3 Urban Section

Total distance between intersection openings is 1,100 feet.

$$\frac{1100}{660} = 1.7$$

$$\frac{1100}{1} = 1100 \qquad 440 < 1{,}100 > 880 \text{ not acceptable}$$

$$\frac{1100}{2} = 550 \qquad 440 < 550 < 880 \text{ OK}$$

The only acceptable spacing is 550 feet. Therefore, one midblock median opening shall be provided at a point 550 feet from each intersection.

Example No. 4 Rural Section

Total distance between intersection openings is 1,100 feet.

$$\frac{1100}{1320} = 0.8$$

$$\frac{1100}{0} = \text{infinity} \quad \text{infinity} < 1{,}100 \text{ not acceptable}$$

$$\frac{1100}{1} = 1100 \qquad 880 < 1{,}100 < 1{,}760 \text{ OK}$$

The only acceptable spacing is 1,100 feet and, therefore, no midblock median opening shall be installed.

Example No. 5 Urban Section

Total distance between intersection openings is 1,500 feet.

$$\frac{1500}{660} = 2.3$$

$$\frac{1500}{2} = 750 \qquad 440 < 750 < 880 \text{ OK}$$

$$\frac{1500}{3} = 500 \qquad 440 < 500 < 880 \text{ OK}$$

660	750
-500	-660
160	90

Since 90 feet is less than 160 feet, the most appropriate median opening spacing would be 750 feet. Therefore, 1 midblock median opening shall be installed.

Example No. 6 Rural Section

Total distance = 1,500 feet

$$\frac{1500}{1320} = 1.1$$

$$\frac{1500}{1} = 1500 \quad 880 < 1{,}500 < 1{,}760 \text{ OK}$$

$$\frac{1500}{2} = 750 \quad 750 < 880 \text{ not acceptable}$$

The only acceptable spacing is 1,500 feet. Therefore, no midblock opening shall be installed.

Example No. 7 Urban Section

Total distance = 5,880 feet

$$\frac{5880}{660} = 8.9$$

$$\frac{5880}{8} = 735 \quad 440 < 735 < 880 \text{ OK}$$

$$\frac{5880}{9} = 653 \quad 440 < 653 < 880 \text{ OK}$$

735	660
-660	-653
75	7

Since 7 is less than 75, the appropriate spacing is 653 feet resulting in 8 midblock median openings.

Example No. 8 Rural Section

Total distance = 5,880 feet

$$\frac{5880}{1320} = 4.5$$

$$\frac{5880}{4} = 1470 \quad 880 < 1{,}470 < 1{,}760 \text{ OK}$$

$$\frac{5880}{5} = 1176 \quad 880 < 1{,}176 < 1{,}760 \text{ OK}$$

1470	1320
-1320	-1176
150	144

Since 144 is less than 150, the most appropriate spacing is 1,176 feet resulting in 4 midblock median openings.

Example No. 9 Urban Section

Total distance = 5,940 feet

$$\frac{5940}{660} = 9.0$$

Therefore, the appropriate spacing would be 660 feet resulting in 8 midblock median openings.

Example No. 10 Rural Section

Total distance = 5,940 feet

$$\frac{5940}{1320} = 4.5$$

$$\frac{5940}{4} = 1485 \quad 880 < 1{,}485 < 1{,}760 \text{ OK}$$

$$\frac{5940}{5} = 1188 \quad 880 < 1{,}188 < 1{,}760 \text{ OK}$$

1485	1320
-1320	-1188
165	132

Since 132 is less than 165, the most appropriate median opening spacing is 1,188 feet resulting in 4 midblock median openings.

2-145.00 EXCAVATION AND UNDERCUTTING (See 4-203.00)

2-145.05 EARTHWORK BALANCES (See 2-145.10, 3-315.05 and 3-315.15)

Compute earthwork using select end areas.

2-145.07 SUBMISSION OF GRADING QUANTITIES SHEETS (See 3-315.20 and 4-203.50)

All grading quantities sheets submitted with the Construction Plans shall show the federal and/or state project numbers, route numbers and/or street names and county on each sheet. Each sheet shall be numbered to reflect both the individual sheet number as well as the total number of quantity sheets in the submission. See Figure 2-7.

This data can be added to the top of standard GEOPAK earthwork reports.

GRADING QUANTITIES SHEET

COMPUTED BY: _____ SHEET _____ OF _____

CHECKED BY: _____ PROJECT NO.: _____

ROUTE NO. OR STREET: _____ COUNTY: _____

Figure 2-7
Grading Quantities Sheet Identification Format

2-145.10 SHRINKAGE AND SWELL FACTORS (See 2-145.05, 3-315.10, and 4-203.05)

Shrinkage and swell of earth and rock material vary with:

1. Types of material
2. Weather conditions
3. Equipment used
4. Depth of cuts and fills
5. Length of haul

Light work through wooded areas call for heavier shrinkage.

The following examples are offered as a guide:

1. Light cuts and fills

   1 - 2 foot cuts and fills

   Earth 30% to 50%
   Chert 20% to 30%

   2 - 4 foot cuts and fills

   Earth 25% to 30%
   Chert 10% to 15%

   4 - 6 foot cuts and fills

   Earth 15% to 20%
   Chert 8% to 12%

2. Heavy cuts and fills

   Earth 10%
   Chert 0% to 8%

3. Heavy cuts and light fills

   Cuts 12 feet +, Fills 1 - 2 feet (average)

   Earth 15% to 20%
   Chert 5% to 10%

   Cuts 12 feet +, Fills 2 - 4 feet (average)

   Earth 10% to 15%
   Chert 5% to 10%

4. Shale and slate

   5% to 10% shrinkage; varies with type of material

5. Sandstone

   0% shrinkage to 15% swell; varies with type of material and weather conditions

6. Limestone

   If material is a small percentage and mixed with embankment, 0% shrinkage

   Heavy cuts and fills: 15% to 20% swell

   Light fills: 20% swell

Do not call for rock to be placed in fills less than 3 feet in height unless requested by the Geotechnical Engineering Section.

2-150.00 TRUCK CLIMBING LANES

It is desirable to provide a truck-climbing lane as an added lane for the upgrade direction of a highway where the grade, traffic volumes and heavy-vehicle volumes combine to degrade traffic operations from those on the approach to grade. This section discusses guidelines for determining the location of truck-climbing lanes, critical lengths of grade, design criteria for truck-climbing lanes and guidance on how to develop truck speed profiles. For additional guidance on these topics, see the AASHTO *A Policy on Geometric Design of Highways and Streets.*

2-150.01 LOCATION GUIDELINES

A truck-climbing lane may be necessary to allow a specific upgrade to operate at an acceptable level of service. The following criteria will apply:

1. Two-Lane Highways – On a two-lane, two-way highway, a truck-climbing lane should be considered if the following conditions are satisfied:
    - the upgrade traffic flow is in excess of 200 veh/h; and
    - the heavy-vehicle volume (i.e., trucks, buses and recreational vehicles) exceeds 20 veh/h during the design hour; and
    - one of the following conditions exists:
        + the critical length of grade is exceeded for the 10 mph speed reduction curve (see Figure 2-8), or
        + the level of service (LOS) on the upgrade is E or F, or
        + there is a reduction of two or more LOS when moving from the approach segment to the upgrade; and
    - the construction costs and the construction impacts (e.g., environmental, right-of-way) are considered reasonable.
2. Multilane Highways – A truck-climbing lane should be considered on a multilane highway if the following conditions are satisfied:
    - The directional service volume for LOS D is exceeded on the upgrade; and
    - the directional service volume exceeds 1000 veh/h/lane; and
    - one of the following conditions exists:
        + the critical length of grade is exceeded for the 10 mph speed reduction curve (see Figure 2-8), or
        + the LOS on the upgrade is E or F, or

+ there is a reduction of one or more LOS when moving from the approach segment to the upgrade; and

- the construction costs and the construction impacts (e.g., environmental, right-of-way) are considered reasonable.

Also, truck-climbing lanes should be considered where the above criteria are not met and if there is an adverse crash experience on the upgrade related to slow-moving heavy vehicles.

2-150.02 CAPACITY ANALYSIS

See the *Highway Capacity Manual 2010* for guidance on conducting capacity analyses for climbing lanes on two-lane and multilane highways.

2-150.03 CRITICAL LENGTH OF GRADE

The critical length of grade is the maximum length of a specific upgrade on which a truck can operate without an unreasonable reduction in speed. The highway gradient, in combination with the length of the grade will determine the truck speed reduction on upgrades.

The following will apply to the critical length of grade:

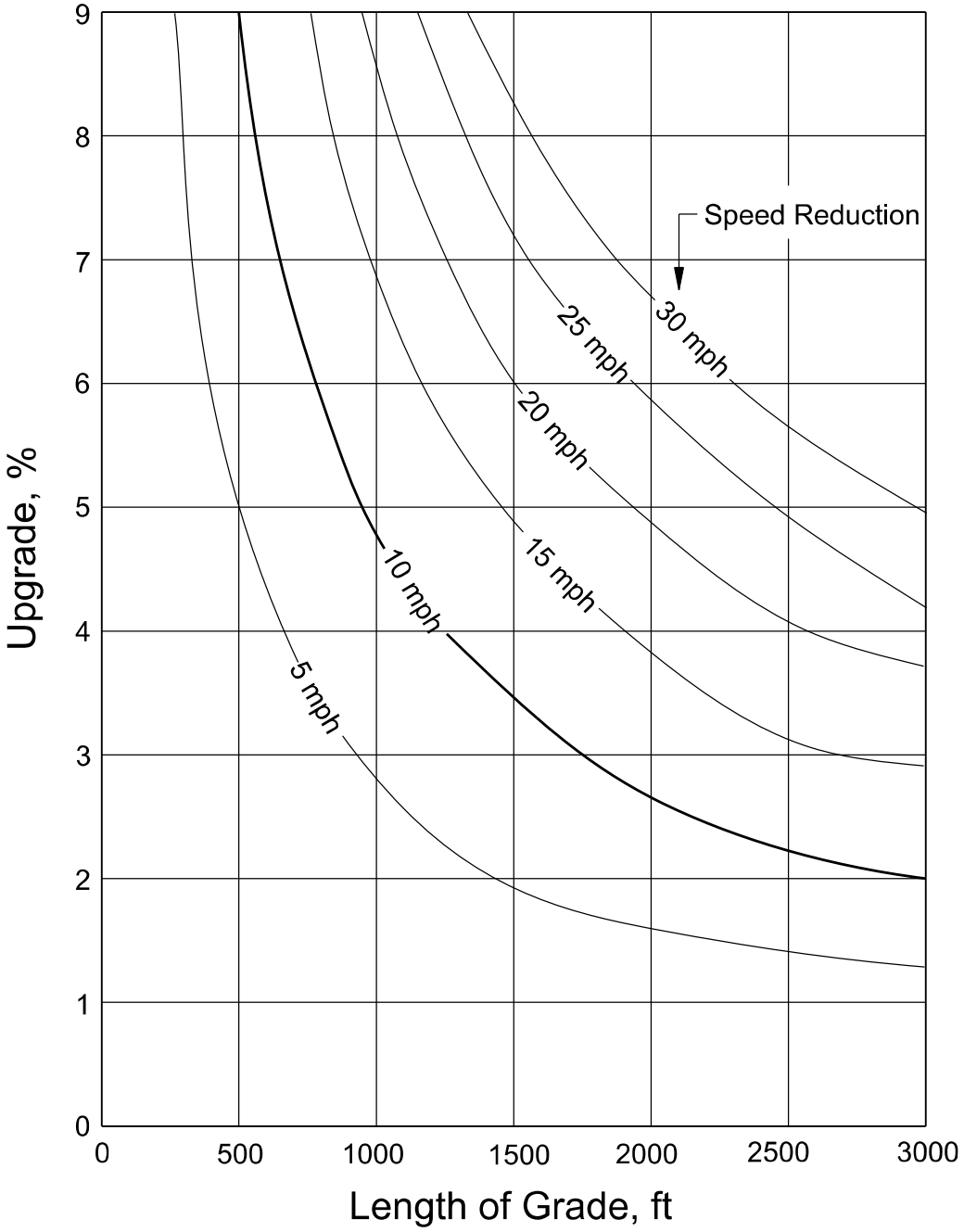
1. Design Vehicle – Figure 2-8 presents the critical length of grade for a 200 lb/hp truck. This vehicle is representative of size and type of a heavy vehicle normally used for design on main roads.

2. Criteria – Figure 2-8 provides the critical lengths of grade for a given percent grade and acceptable truck speed reduction. Although these curves are based on an initial truck speed of 70 mph, they apply to any design or posted speed. For design purposes, use the 10 mph speed reduction curve in the figure to determine if the critical length of grade is exceeded.

3. Momentum Grades – Where an upgrade is preceded by a downgrade, trucks will often increase their speed to ascend the upgrade. A speed increase of 5 mph on moderate downgrades (3%-5%) and 10 mph on steeper downgrades (6%-8%) of sufficient length are reasonable adjustments to the initial speed. This assumption allows the use of a higher speed reduction curve in Figure 2-8. However, the designer should also consider that these speed increases may not always be attainable. If traffic volumes are sufficiently high, a truck may be behind another vehicle when descending the momentum grade, thereby restricting the increase in speed. Therefore, only consider these increases in speed if the highway has a Level of Service C or better.

4. Measurement – Vertical curves are part of the length of grade. Figure 2-9 illustrates how to measure the length of grade to determine the critical length of grade using Figure 2-8.

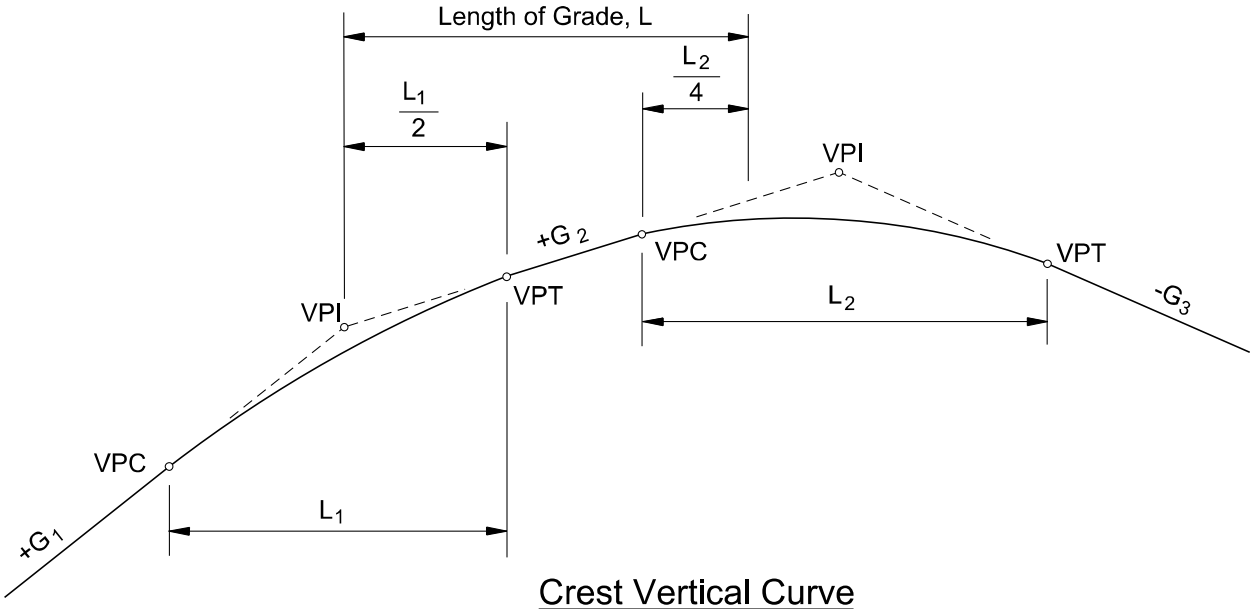
5. Application – If the critical length of grade is exceeded, flatten the grade, if practical, or evaluate the need for a truck-climbing lane. Typically, only two-lane highways have operational problems that require truck-climbing lanes.



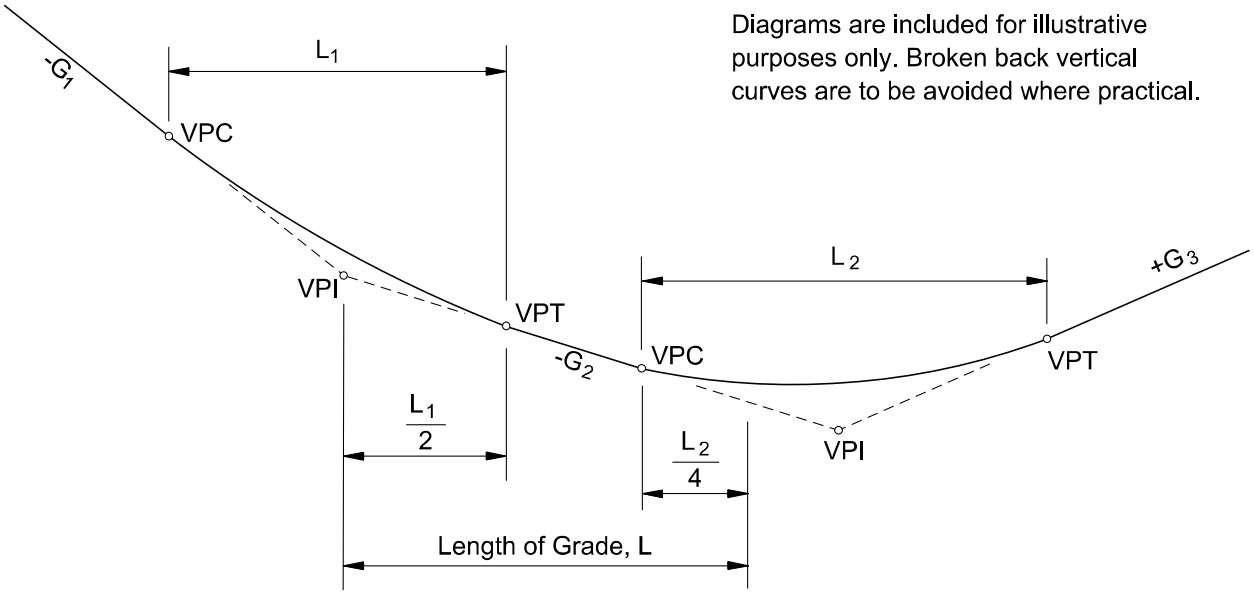
Notes:

1. *Typically, the 10 mph curve will be used.*
2. *See examples in Section 2-150.03 for use of figure.*
3. *Figure is based on a truck with initial speed of 70 mph. However, it may be used for any design or posted speed.*
4. *This figure is based on a 200 lb/hp heavy vehicle.*
5. *Figure is from the AASHTO A Policy on Geometric Design of Highways and Streets.*

Figure 2-8
Critical Length of Grade for Design



Crest Vertical Curve



Diagrams are included for illustrative purposes only. Broken back vertical curves are to be avoided where practical.

Sag Vertical Curve

Notes:

1. *For vertical curves where the two tangent grades are in the same direction (both upgrades or both downgrades), 50% of the curve length will be part of the length of grade.*
2. *For vertical curves where the two tangent grades are in opposite directions (one grade up and one grade down), 25% of the curve length will be part of the length of grade.*

Figure 2-9
Measurement for Length of Grade

6. Highway Types – The critical-length-of-grade criteria applies equally to two-lane or multilane highways, and applies equally to urban and rural facilities.

7. Alternative Critical Lengths of Grades – In many design situations, Figure 2-8 may not be directly applicable to the determination of the critical length of grade for one of following reasons:

   - The truck population for a given site may be such that a weight/power ratio is either less than or greater than the 200 lb/hp design vehicle (e.g., coal mining trucks, gravel trucks).
   - The truck speed at the entrance to the grade may differ from the 70 mph assumed in Figure 2-8.
   - The profile may not consist of a constant percent grade.

   For these situations, the designer may want to consider using the software program Truck Speed Profile Model (TSPM) described in NCHRP Report 505 *Review of Truck Characteristics as Factors in Roadway Design* to determine the applicable critical length of grade. This program may be used to generate speed truck profiles for any specified truck weight/power ratio, initial truck speed and sequence of grades.

8. Example Problems – Examples No. 1 and No. 2 illustrate the use of Figure 2-8 to determine the critical length of grade. Example No. 3 illustrates the use of Figures 2-8 and 2-9. In the examples, the use of subscripts 1, 2, etc., indicate the successive gradients and lengths of grade on the highway segment.

Example No. 1

Given: Level Approach
G = +4%
L = 1500 ft (length of grade)
Rural Principal Arterial

Problem: Determine if the critical length of grade is exceeded.

Solution: Figure 2-8 yields a critical length of grade of 1200 ft for a 10-mph speed reduction. The length of grade (L) exceeds this value. Therefore, flatten the grade, if practical, or evaluate the need for a truck-climbing lane.

Example No. 2

Given: Level Approach
G_1 = +4.5%
L_1 = 500 ft
G_2 = +2%
L_2 = 700 ft
Rural Arterial with a significant number of heavy trucks

Problem: Determine if the critical length of grade is exceeded for the combination of grades G_1 and G_2.

Solution: From Figure 2-8, G_1 yields a truck speed reduction of 5 mph. G_2 yields a speed reduction of approximately 3 mph. The total of 8 mph is less than the maximum 10 mph speed reduction. Therefore, the critical length of grade is not exceeded.

Example No. 3

Given: Figure 2-10 illustrates the vertical alignment on a low-volume, two-lane rural collector highway with no large trucks.

Problem: Determine if the critical length of grade is exceeded for G_2 or for the combination upgrade G_3 and G_4.

Solution: Use the following steps:

Step 1: Determine the length of grade using the criteria in Figure 2-9. For this example, the following calculations are used:

$$L_2 = \frac{1000}{4} + 600 + \frac{800}{4} = 825\,\text{ft}$$

$$L_3 = \frac{800}{4} + 700 + \frac{400}{2} = 1100\,\text{ft}$$

$$L_4 = \frac{400}{2} + 300 + \frac{600}{4} = 650\,\text{ft}$$

Step 2:. Determine the critical length of grade in both directions. Use Figure 2-8 to determine the critical length of grade.

- For trucks traveling left to right, enter into Figure 2-8 the value for G_3 (3.5%) and L_3 = 1100 ft. The speed reduction is 7.0 mph. For G_4 (2%) and L_4 = 650 ft, the speed reduction is approximately 3.5 mph. The total speed reduction on the combination upgrade G_3 and G_4 is 10.5 mph. This exceeds the maximum 10 mph speed reduction. However, on low-volume roads, one can assume a 5 mph increase in truck speed for the 3% “momentum” grade (G_2), which precedes G_3. Therefore, a speed reduction may be as high as 15 mph before concluding that the combination grade exceeds the critical length of grade. Assuming the benefits of the momentum grade, this leads to the conclusion that the critical length of grade is not exceeded.

- For trucks traveling in the opposite direction, on Figure 2-8, enter in the value for G_2 (3%) and determine the critical length of grade for the 10 mph speed reduction (i.e., 1700 ft). Because L_2 is less than 1700 ft (i.e., 825 ft), the critical length of grade for this direction is not exceeded.

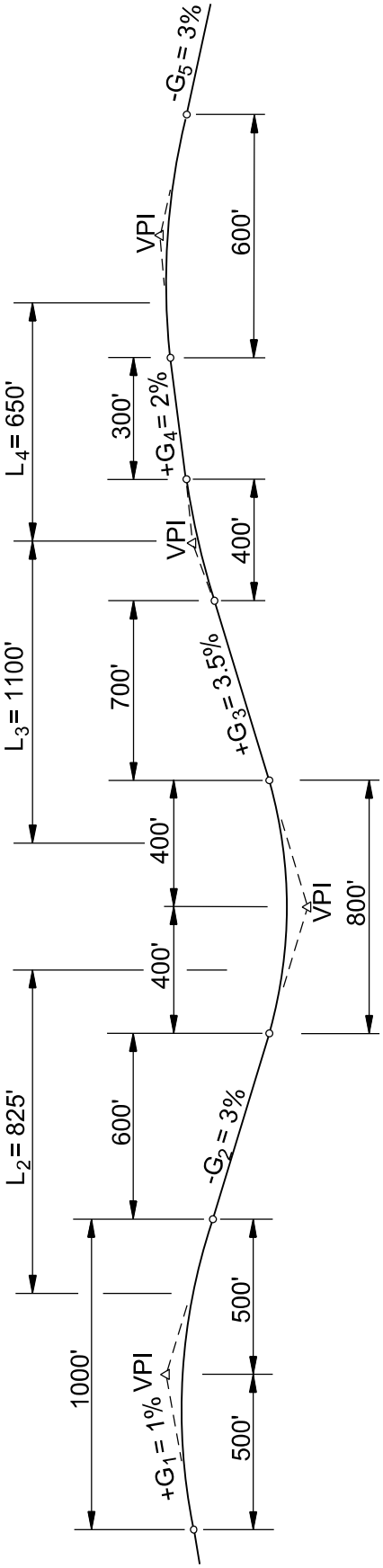


Figure 2-10
Critical Length Of Grade Calculations
(Example No. 3)

2-150.04 DESIGN GUIDELINES

Table 2-1 summarizes the design criteria for a truck-climbing lane. Also, consider the following:

1. Design Speed – For entering speeds equal to or greater than 70 mph, use 70 mph for the truck design speed. For speeds less than 70 mph, use the roadway design speed or the posted speed limit, whichever is less. Under restricted conditions, the designer may want to consider the effect a momentum grade will have on the entering speed. See Comment 3 in Section 2-150.03 for additional information on momentum grades. However, the maximum speed will be 70 mph.

2. Cross Slope – On tangent sections, the truck-climbing lane cross slope will typically be the same as that of the adjacent travel lane.

3. Superelevation – For horizontal curves, superelevate the truck-climbing lane at the same rate as the adjacent travel lane.

4. Performance Curves – Figure 2-11 presents the deceleration and acceleration rates for a 200 lb/hp truck.

5. End of Full-Width Lane – In addition to the criteria in Table 2-1, ensure that there is sufficient sight distance available to the point where the truck, RV or bus will begin to merge back into the through travel lane. At a minimum, this will be stopping sight distance. Desirably, the driver should have decision sight distance available to the roadway surface (i.e., height of object = 0.0 ft) at the end of the taper. See the AASHTO *A Policy on Geometric Design of Highways and Streets* for decision sight distance values.

   The full-lane width should be extended beyond the crest vertical curve and not ended just beyond the crest of the grade. Also, desirably the full-lane width should not end on a horizontal curve.

6. Signing and Pavement Markings – Contact the ITS, Traffic and Standards Section for signing and pavement marking guidance for truck-climbing lanes.

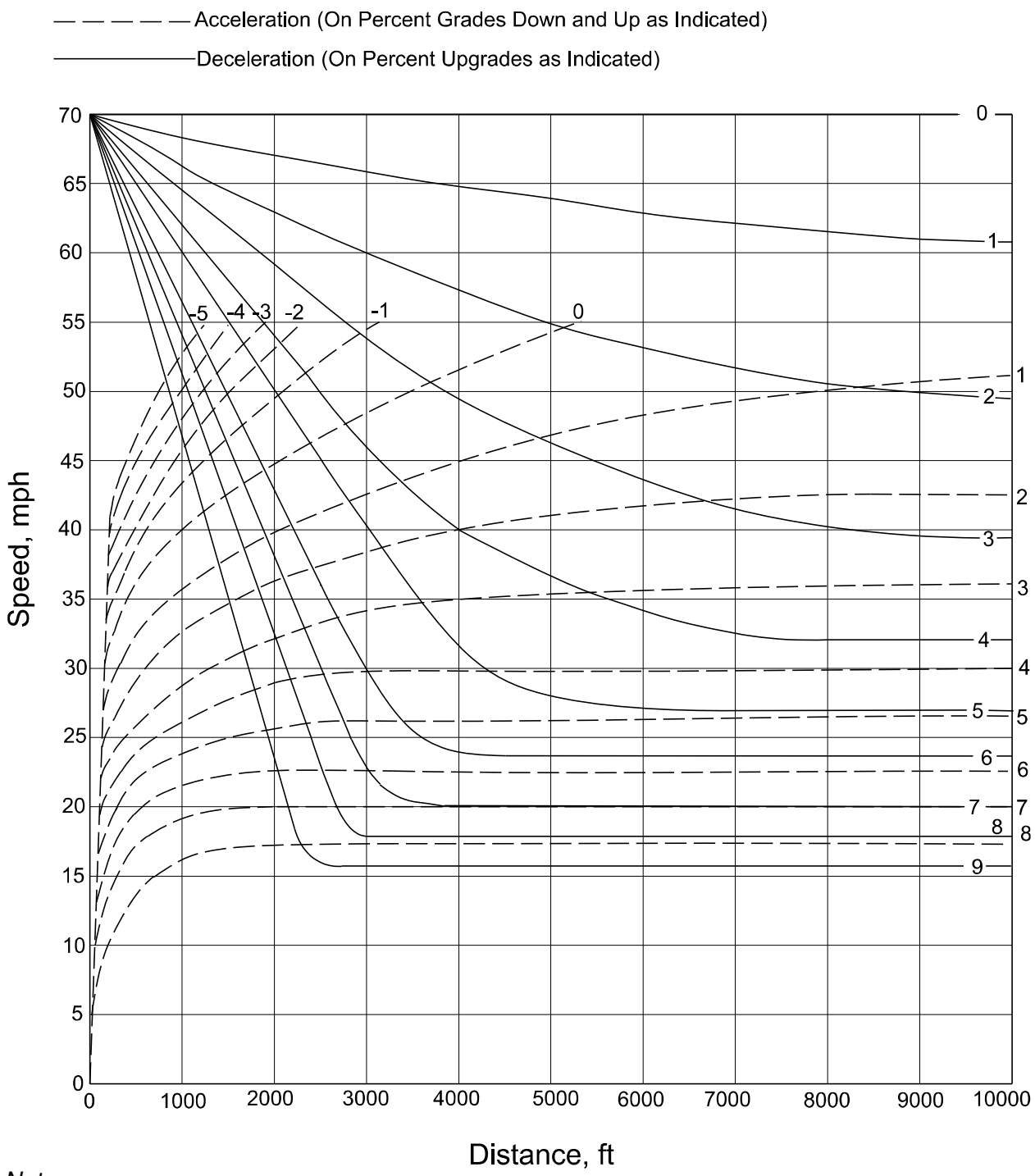
Design Element	Desirable	Minimum
Lane Width	12 ft	Width of adjacent lane
Shoulder Width	Same width as approach shoulder	Interstate: 6 ft Other Highways: 4 ft
Cross Slope on Tangent	0.02 ft/ft	0.02 ft/ft
Beginning of Full-Width Lane (1)	Location where the truck speed has been reduced to 10 mph below the posted speed limit	Location where the truck speed has been reduced to 45 mph
End of Full-Width Lane (2)	Location where truck has reached highway posted speed or 55 mph, whichever is less	Location where truck has reached 10 mph below highway posted speed limit
Entering Taper	25:1	300 ft
Exiting Taper	Interstate: 70:1 Other Highways: 600 ft	50:1
Minimum Full-Width Length	1000 ft or greater	Interstate Only: 1000 ft

Notes:

1. *Use Figure 2-11 to determine truck deceleration rates. In determining the applicable truck speed, the designer may consider the effect of momentum grades.*

2. *Use Figure 2-11 to determine truck acceleration rates. Also, see Comment 5 in Section 2-150.04.*

Table 2-1
Design Criteria for Truck-Climbing Lanes



Notes:

1. *For entering speeds equal to or greater than 70 mph, use an initial speed of 70 mph. For speeds less than 70 mph, use the design speed or posted speed limit as the initial speed.*
2. *Figure is from the AASHTO A Policy on Geometric Design of Highways and Streets*

Figure 2-11
Performance Curves for Trucks
(200 lb/hp)

2-150.05 DOWNGRADES

Truck lanes on downgrades are not typically considered. However, steep downhill grades may also have a detrimental effect on the capacity and safety of facilities with high traffic volumes and numerous heavy trucks. Although specific criteria have not been established for these conditions, trucks descending steep downgrades in low gear may produce nearly as great an effect on operations as an equivalent upgrade. The need for a truck lane for downhill traffic will be considered on a site-by-site basis.

2-150.06 TRUCK SPEED PROFILE

For highways with a single grade, the critical length of grade and deceleration and acceleration rates can be directly determined from Figure 2-11. However, most highways have a continuous series of grades. Often, it is necessary to find the impact of a series of significant grades in succession. If several different grades are present, then a speed profile may need to be developed. The following example illustrates how to construct a truck speed profile and how to use Figure 2-11.

Example No. 4

Given: Level Approach
G_1 = +3% for 800 ft (VPI to VPI)
G_2 = +5% for 3200 ft (VPI to VPI)
G_3 = -2% beyond the composite upgrade (G_1 and G_2)
V = 60 mph design speed with a 55 mph posted speed limit
Rural Principal Arterial

Problem: Using the criteria in Table 2-1 and Figure 2-11, construct a truck speed profile and determine the beginning and ending points of the full-width climbing lane.

Solution: Apply the following steps:

Step 1: Determine the truck speed on G_1 using Figure 2-11 and plot the truck speed at 200 ft increments. See Figure 2-12. Assume an initial truck speed of 55 mph. Move horizontally along the 55 mph line to the 3% deceleration curve. This is approximately 2800 ft along the horizontal axis. This is the starting point for G_1.

Distance From VPI_1 (ft)	Horizontal Distance on Figure 2-11 (ft)	Truck Speed (mph)	Comments
0	2800	55	VPI_1
200	3000	54	
400	3200	53	
600	3400	52	
800	3600	51	VPI_2

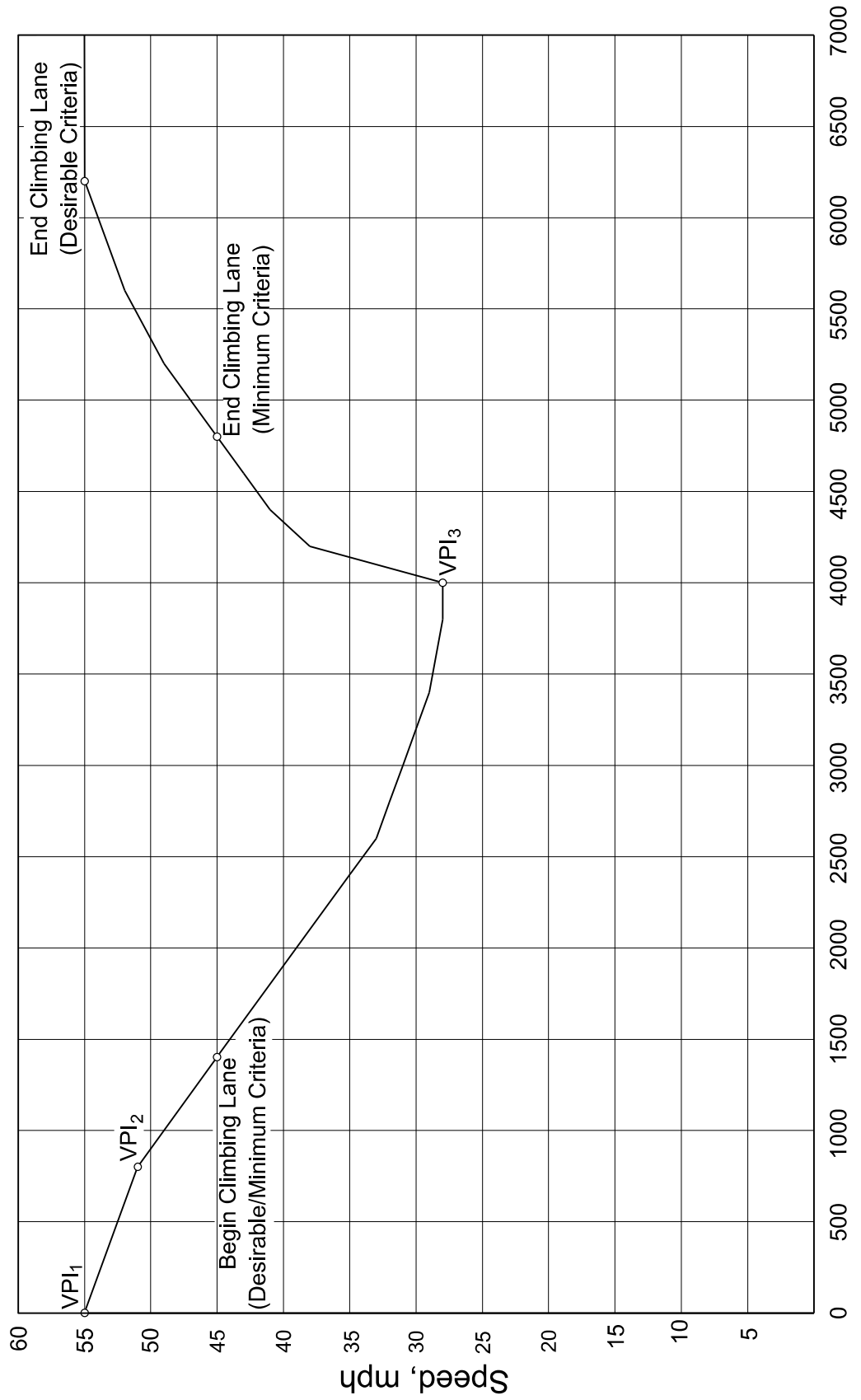


Figure 2-12
Truck Speed Profile
(Example No. 4)

Step 2: Determine the truck speed on G_2 using Figure 2-11 and plot the truck speed at 200 ft increments in Figure 2-12. From Step 1, the initial speed on G_2 is the final speed from G_1 (i.e., 51 mph). Move right horizontally along the 51 mph line to the 5% deceleration curve. This is approximately 1900 ft along the horizontal axis. This is the starting point for G_2.

Figure 2-12 Distance From VPI_1 (ft)	Horizontal Distance on Figure 2-11 (ft)	Truck Speed (mph)	Comments
800	1900	51	VPI_2
1000	2100	49	
1200	2300	47	
1400	2500	45	
1600	2700	43	
1800	2900	41	
2000	3100	39	
2200	3300	37	
2400	3500	35	
2600	3700	33	
2800	3900	32	
3000	4100	31	
3200	4300	30	
3400	4500	29	
3600	4700	29	
3800	4900	28	
4000	5100	28	VPI_3

Step 3: Determine the truck speed on G_3 using Figure 2-11 until the truck has fully accelerated to 55 mph, and plot the truck speed at 200 ft increments in Figure 2-12. The truck will have a speed of 28 mph as it enters the 2% downgrade at VPI_3. Read into Figure 2-11 at the 28 mph point on the vertical axis and move over horizontally to the -2% line. This is approximately 150 ft along the horizontal axis. This is the starting point for G_3.

Figure 2-12 Distance From VPI_1 (ft)	Horizontal Distance on Figure 2-11 (ft)	Truck Speed (mph)	Comments
4000	150	28	VPI_3
4200	350	38	
4400	550	41	
4600	750	43	
4800	950	45	
5000	1150	47	
5200	1350	49	
5400	1550	50	
5600	1750	52	
5800	1950	53	
6000	2150	54	
6200	2350	55	

Step 4: Determine the beginning and end of the full-width climbing lane. From Table 2-1, the desirable and minimum beginning of the full-width lane will be where the truck has reached a speed of 45 mph (10 mph below the posted speed). This point occurs 1400 ft beyond VPI_1.

For ending the full-width climbing lane, the desirable criterion from Table 2-1 is where the truck speed has reached the posted speed limit (55 mph) or 6200 ft beyond the VPI_1. The minimum criterion is where the truck has reached a speed of 45 mph (10 mph below the posted speed). This occurs at 4800 ft beyond VPI_1.

2-155.00 WETLANDS BOUNDARY DESIGNATION

When the Environmental Division marks wetland boundaries in the Ecology Report, the designer will request a survey update to survey in the exact boundaries of the wetland and show the wetland boundaries on the plans.

Wetland boundaries will be shown by the symbol on Standard Drawing RD-L-1.

The wetlands number (WTL-1, etc.) shall be placed inside the boundary.

The plans shall also indicate locations where roadway outfall discharges are modified and locations where the wetland receiving flows are redirected.

The area (in square feet or acres) and volume (in cubic yards) of any wetlands impacted by the project or any right-of-way taken for wetland replacement shall be indicated on the present layout sheet. Impacts or alterations to a wetland may require an Aquatic Resources Alteration Permit (ARAP). See Section 3, Chapter 4 of these Guidelines for additional information on permit sketch requirements.

2-155.02 HAZARDOUS MATERIAL STUDY

The designer shall send an email notification requesting a hazardous materials study for all projects requiring right-of-way acquisition three weeks prior to the Preliminary Field Review (See Activity and Estimated Completion Schedule, A&E) to the Hazardous Materials (HAZMAT) Section of the Environmental Division. A copy of the email shall be placed in the project folder to document the request of a hazardous materials study.

2-155.05 BOX AND SLAB-TYPE CULVERT AND BRIDGE LENGTHS, CHANNEL CHANGES, AND WETLANDS

The following procedures and policies need to be followed in order to achieve an environmentally acceptable project as perceived by the Corps of Engineers, Environmental Protection Agency, United States Fish and Wildlife Service, Tennessee Wildlife Resources Agency, and Tennessee Department of Environment and Conservation:

1. Any project which proposes long expanses of boxes and/or channel changes on blue-line streams and/or wetlands involvement must be studied for alternate solutions: after which, a project coordination meeting between the involved TDOT Divisions must be held.

2. Where box and slab-type culverts and bridges are employed, their length shall be held to a minimum. In the case of interchanges, intermittent boxes, rather than continuous boxes, are preferred.

3. Given the choice between long runs of boxes and channel changes, channel changes are generally preferred.

4. Concrete lined channels and rock lined (rip-rapped) channels are not acceptable for channel changes on blue-line streams.

5. In streams with enough flow to support aquatic life (blue-line streams), a normal flow keyway within a channel change shall be considered if flood plain hydraulics dictate a channel larger than the natural channel is required. The normal flow keyway shall have approximately the same width (X) and height (Y) as the existing normal flow channel, as shown in Figure 2-13.

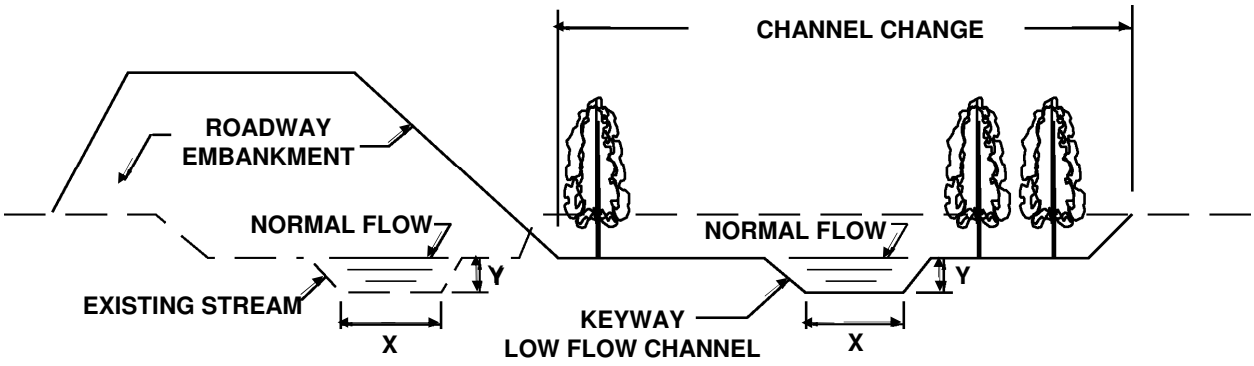


Figure 2-13
Channel Changes

6. Meanders must be included in channel changes on blue-line streams in order to maintain the natural stream length, sinuosity, and slope.

For additional information on channel changes, see Drainage Manual, Chapter 5, Section 5.05 - Guidelines and Criteria for Stream Realignments. For additional information on box and slab-type culvert and bridge lengths, see Drainage Manual, Chapter 6, Section 6.04 - Guidelines and Criteria. For additional information on Natural Stream Design, see Chapter 11 of the Drainage Manual.

2-160.00 EXTENSION OF THROUGH LANES BEYOND INTERSECTIONS AND REQUIREMENTS FOR LANE REDUCTION TRANSITION LENGTHS

Existing two-lane highways are often widened to a multi-lane section at intersections to provide additional capacity (especially at signalized locations). Also, multi-lane highways are often designed to transition down to a two-lane highway downstream from an intersection.

In order to address the resulting lane drop situation, follow the schematic shown in Figure 2-14 which shows the minimum length for the additional through lanes required to adequately sign the lane drop and minimize lane changing within the intersection. An example for computing the required transition lengths is also included with this figure.

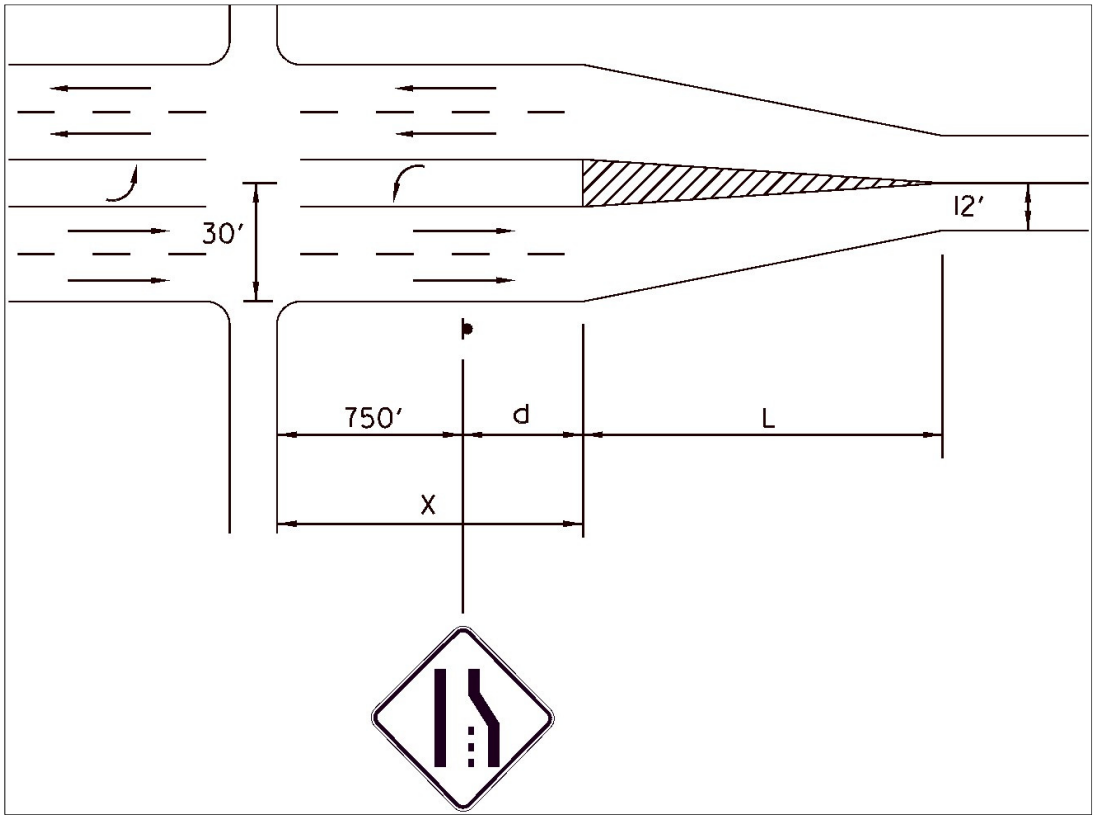


Figure 2-14
Minimum Length (X) for Lane Extensions through an Intersection With Lane Reduction Taper (L)

750 feet- Minimum distance at which sign is not visible to traffic approaching intersection (in order to minimize lane changing within intersection).

d - As required by *M.U.T.C.D.*, Sec. 2C.05, Table 2C-4, Condition A.
L - Transition length, as required by *M.U.T.C.D.*, Sec. 3B.09, Fig. 3B-14.

Note 1- Terminating the outside lane as a right-turn lane at an intersection may be considered subject to the review and approval of the TDOT Signal Section and the Design Manager.

Note 2 - See Section 2C.42 for guidance, options, and standard use of Lane Ends Signs.
To find "d" use the following table:

Posted or 85th- Percentile Speed	Advance Placement Distance[1]								
	Condition A: Speed reduction and lane changing in heavy traffic[2]	Condition B: Deceleration to the listed Advisory Speed (mph) for the Condition							
		0[3]	10[4]	20[4]	30[4]	40[4]	50[4]	60[4]	70[4]
20 mph	225 ft	100 ft[6]	N/A[5]	-	-	-	-	-	-
25 mph	325 ft	100 ft[6]	N/A[5]	N/A[5]	-	-	-	-	-
30 mph	460 ft	100 ft[6]	N/A[5]	N/A[5]	-	-	-	-	-
35 mph	565 ft	100 ft[6]	N/A[5]	N/A[5]	N/A[5]	-	-	-	-
40 mph	670 ft	125 ft	100 ft[6]	100 ft[6]	N/A[5]	-	-	-	-
45 mph	775 ft	175 ft	125 ft	100 ft[6]	100 ft[6]	N/A[5]	-	-	-
50 mph	885 ft	250 ft	200 ft	175 ft	125 ft	100 ft[6]	-	-	-
55 mph	990 ft	325 ft	275 ft	225 ft	200 ft	125 ft	N/A[5]	-	-
60 mph	1,100 ft	400 ft	350 ft	325 ft	275 ft	200 ft	100 ft[6]	-	-
65 mph	1,200 ft	475 ft	450 ft	400 ft	350 ft	275 ft	200 ft	100 ft[6]	-
70 mph	1,250 ft	550 ft	525 ft	500 ft	450 ft	375 ft	275 ft	150 ft	-
75 mph	1,350 ft	650 ft	625 ft	600 ft	550 ft	475 ft	375 ft	250 ft	100 ft[6]

Table 2-2
Guidelines for Advance Placement of Warning Signs Reference: M.U.T.C.D. 2009 Manual (Table 2C-4 of Section 2C.05)

Notes:
[1]The distances are adjusted for a sign legibility distance of 180 ft for Condition A. The distances for Condition B have been adjusted for a sign legibility distance of 250 feet, which is appropriate for an alignment warning symbol sign.
For Conditions A and B, warning signs with less than 6-inch legend or more than four words, a minimum of 100 feet should be added to the advance placement distance to provide adequate legibility of the warning sign.

[2]Typical conditions are locations where the road user must use extra time to adjust speed and change lanes in heavy traffic because of a complex driving situation. Typical signs are Merge and Right Lane Ends. The distances are determined by providing the driver a PRT of 14.0 to 14.5 seconds for vehicle maneuvers (2005 AASHTO Policy, Exhibit 3-3, Decision Sight Distance, Avoidance Maneuver E) minus the legibility distance of 180 feet for the appropriate sign.

[3]Typical condition is the warning of a potential stop situation. Typical signs are Stop Ahead, Yield Ahead, Signal Ahead, and Intersection Warning signs. The distances are based on the 2005 AASHTO Policy, Exhibit 3-1, Stopping Sight Distance, providing a PRT of 2.5 seconds, a deceleration rate of 11.2 feet/second^2, minus the sign legibility distance of 180 feet.

[4]Typical conditions are locations where the road user must decrease speed to maneuver through the warned condition. Typical signs are Turn, Curve, Reverse Turn, or Reverse Curve. The distance is determined by providing a 2.5 second PRT, a vehicle deceleration rate of 10 feet/second^2, minus the sign legibility distance of 250 ft.

[5]No suggested distances are provided for these speeds, as the placement location is dependent on site conditions and other signing. An alignment warning sign may be placed anywhere from the point of curvature up to 100 feet in advance of the curve. However, the alignment warning sign should be installed in advance of the curve and at least 100 feet from any other signs.

[6]The minimum advance placement distance is listed as 100 feet to provide adequate spacing between signs.

EXAMPLE:

Posted speed = 55 mph

X = 750 feet + d = 750 feet + 700 feet = 1,450 feet

L = S x W (for speed 45 mph or more) = 55 x 18 = 990 feet

2-165.00 TWO-LANE ENTRANCE RAMPS ON FREEWAYS AND EXPRESSWAYS

Designers shall use the parallel design when introducing two-lane entrance ramps to freeways and expressways.

The parallel design is preferable for two reasons: (1) Past experience with the tapered design has been undesirable from an operational and safety standpoint; (2) Uniformity of design due to the fact that most two-lane entrance ramps statewide are the parallel type.

For examples of the parallel design for two-lane entrance ramps, refer to *A Policy on Geometric Design of Highways and Streets*, AASHTO, 2001, Pages 816 and 858 (Exhibits 10-52, A2 and 10-69, B).

2-170.00 GUIDELINES FOR DESIGN OF TURNING LANES

These guidelines are intended to assist the designer in designing left and right-turn lanes at intersections.

These guidelines provide information on material included in the AASHTO's *A Policy on Geometric Design of Highways and Streets*, 2001 and are an attempt to consolidate that information regarding the design of turn lanes.

The benefits of turn lanes at intersections are obvious in improved capacity and safety.

These guidelines are applicable to right and left-turn lanes, and give procedures for desirable design. Design may be limited by geometric or other constraints, but these guidelines shall be followed as closely as possible.

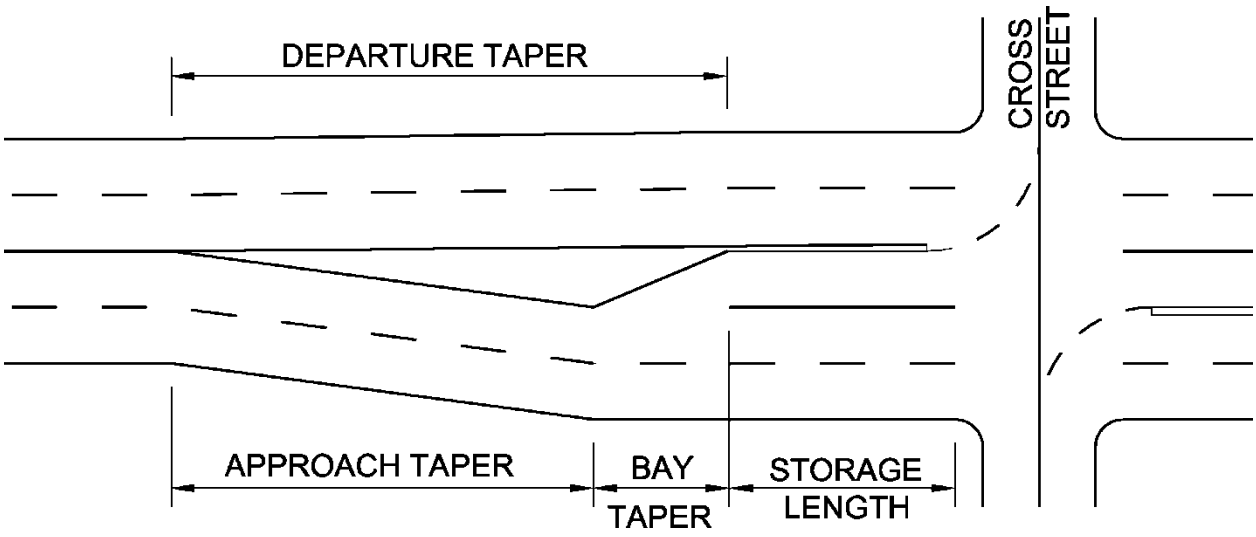


Figure 2-15
Turning Lane Terminology

1) APPROACH TAPER

a) $L = W \times S$, Speed $\geq$ 45 mph

b) $L = \frac{WS^2}{60}$, Speed < 45 mph

Where L = Length of Taper in feet

W = Width of Offset in feet

S = Design Speed in miles per hour

2) BAY TAPER

$L = \frac{WS}{3}$ L, W, S as defined for approach taper above.

3) STORAGE LENGTHS

a) Unsignalized Intersections

To determine a warrant for and a required storage length, use the attached charts (Figures 2-17 through 2-20f) by M. D. Harmelink. (See also *A Policy of Geometric Design of Highways and Streets 2001*, Exhibit 9-75, page 685. This table is a condensed version of the Harmelink charts for two-lane highways.)

The first chart applies to four-lane highways, all speeds.

The remaining charts are a function of speed and the percentage of lefts in the approaching traffic, and are applicable only to two-lane highways.

Select the appropriate chart for design speed and percentage of left turns. Use the total advancing volume for the approach (left, through, and right) on the bottom axis of the chart, and the total opposing volume on the left axis of the chart.

b) Signalized Intersections

Storage lengths at signalized intersections are a function of signal timings, volumes, and saturation flow rates. Assistance in determining storage lengths can be provided by the Design Traffic Engineering Section, Signal and Lighting Office.

4) DEPARTURE TAPER

The departure taper begins at the end of the storage lane and ends at the beginning of the approach taper.

SOME SPECIAL NOTES:

i) When the left-turn volume exceeds 300 vph, a double left-turn lane shall be considered. A capacity analysis will help determine the benefit of an additional lane. If a double left is proposed, use 60% of the turn volume to determine the storage length for each lane.

ii) It is suggested in *A Policy of Geometric Design of Highways and Streets*, Chapter 9, that it is desirable to provide the appropriate deceleration distance for vehicles entering a left or right-turn lane. This distance can be considered to be the sum of the bay taper and the storage length for minimum design. From page 714, these lengths are:

Design Speed (mph)	Deceleration Length to Stop Condition for Less Than 3% Grade (ft)
30	170
40	275
45	340
50	410
55	485

Table 2-3
Approximate Total Lengths Needed for Deceleration to a Stop from Design Speed
Reference: AASHTO, A Policy on Geometric Design of Highways and Streets (2001)

Adjustments to deceleration length for grades are found on page 848, Exhibit 10-71.

Providing deceleration lengths is not normally feasible on urban facilities.

When the deceleration length is to be provided, and this length exceeds the bay taper plus storage length, the additional length shall be provided as storage and the bay taper kept constant.

iii) As suggested in the *2000 Highway Capacity Manual (HCM2000),* page 10-18, exclusive right-turn lanes shall be considered when the right-turn volume exceeds 300 vph and the adjacent thru-lane volume also exceeds 300 vphpl. A capacity analysis will also provide a measure of the benefits of a right-turn lane to the overall intersection operation.

iv) It shall be noted that at some intersections, lengths of turn lanes may be more a function of queue lengths in through lanes that might block access to turn lanes, thus reducing turn lane efficiency.

5) LOCATION OF LEFT-TURN LANES IN MEDIANS

As discussed in *A Policy of Geometric Design of Highways and Streets*, Chapter 9, it is desirable to align left-turn lanes in medians. The advantages of this placement are:

i) Better visibility of opposing through traffic as left turners look for gaps.

ii) Decreased conflict between opposing left-turn vehicle paths.

iii) Increased numbers of left-turn vehicles served in a given period of time. The farther left the turn lane, the shorter the crossing distance for left-turn vehicles, allowing drivers to choose shorter gaps in opposing traffic and clear the intersection. There is also an increase in capacity at signalized intersections, due to more flexibility in left-turn phasing and shorter clearance intervals.

The following guidelines apply to four-lane divided highways with a maximum median width of 48 feet. For median widths greater than 48 feet or six-lane divided highways, left-turn lanes shall be designed as usual, constructed immediately to the left of the through lanes.

The centerline of left-turn lanes shall be placed along the centerline of the median, so that opposing left-turn lanes are directly opposite each other. Excess pavement area between the turn lane and adjacent through lane shall be marked with channelization striping (see Figure 2-14).

The attached ADT criteria can be used to estimate if a traffic signal will be warranted within five years of project opening (see Table 2-4).

If the current major street ADT and minor street ADT both meet the criteria for Warrant 1 or Warrant 2, future signalization is probable and the intersection design shall provide aligned left-turn lanes.

Currently signalized intersections or those to be signalized under the project shall be designed this way.

The number of approach lanes on the major street includes only through lanes. The same is true for the minor street, except in the case of "T"-intersections. For "T"-intersections, the number of approach lanes shall include left and right-turn lanes (if present) for the stem of the "T" as the minor street.

If the major street ADT differs on each side of the intersection, an average shall be used. For the minor street, use the higher ADT on the higher volume approach.

Be aware that there may be special conditions affecting signalization or geometric design. For those unusual conditions, the Design ITS, Traffic, and Standards Office can provide assistance.

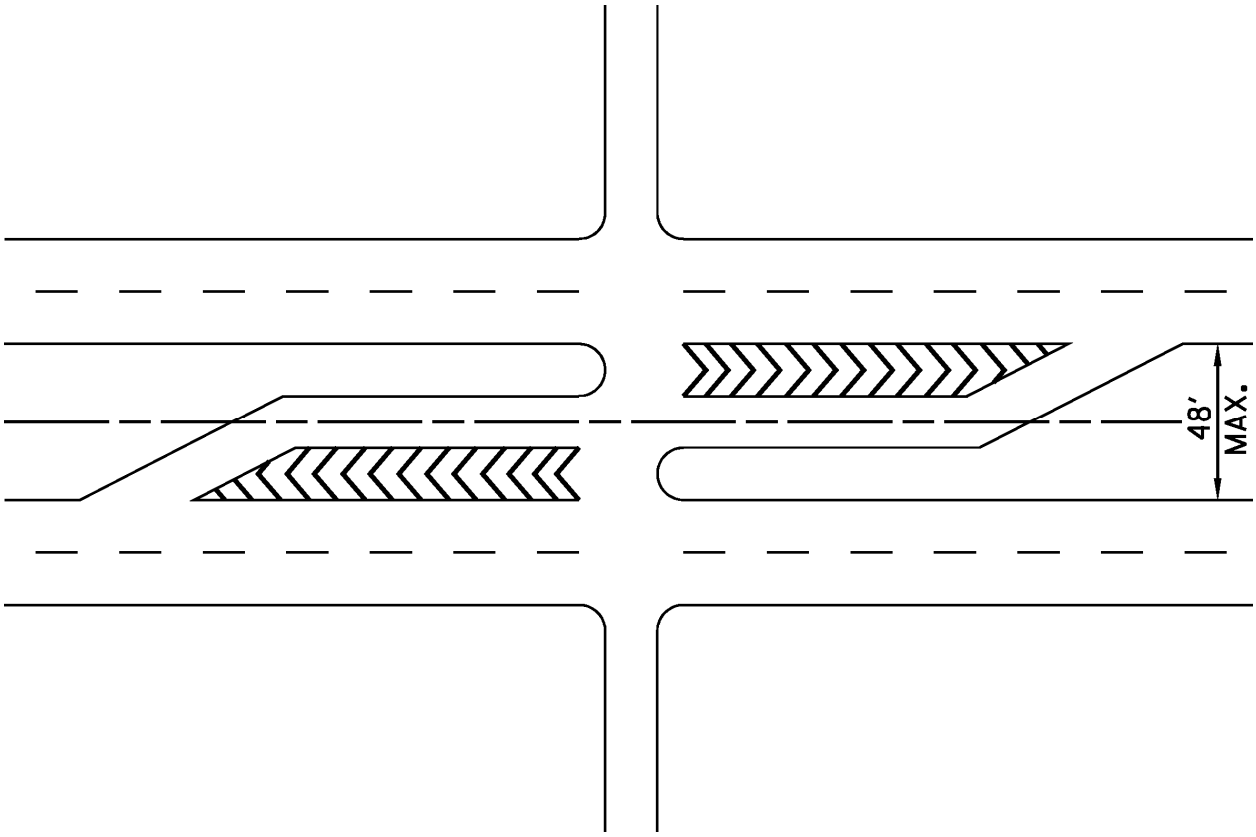


Figure 2-16
Left-Turn Lane Alignment

NUMBER OF APPROACH LANES		WARRANT 1		WARRANT 2	
Major	Minor	Major ADT	Minor ADT	Major ADT	Minor ADT
1	1	5000	3000	7500	1500
2 or more	1	6000	3000	9000	1500
2 or more	2 or more	6000	4000	9000	2000
1	2 or more	5000	4000	7500	2000

Table 2-4
Future Traffic Signal Warrants

VOLUME WARRANTS FOR LEFT - TURN STORAGE LANES
AT UNSIGNALIZED GRADE INTERSECTIONS

CHART VALUE	% T_L = % TRUCKS IN V_L					
	0%	10%	20%	30%	40%	50%
75’	0	25’	25’	25’	50’	50’
100’	0	25’	25’	50’	50’	50’
125’	0	25’	25’	50’	50’	75’
150’	0	25’	50’	50’	75’	75’
175’	0	25’	50’	75’	75’	100’
200’	0	25’	50’	75’	100’	100’
250’	0	25’	50’	75’	100’	125’
300’	0	50’	75’	100’	125’	150’
350’	0	50’	75’	125’	150’	175’
400’	0	50’	100’	125’	175’	200’
450’	0	50’	100’	150’	200’	225’
500’	0	50’	100’	150’	200’	250’

Table 2-5
Storage Length to be Added to Chart Values of
Left-Turn Lane Storage Lengths

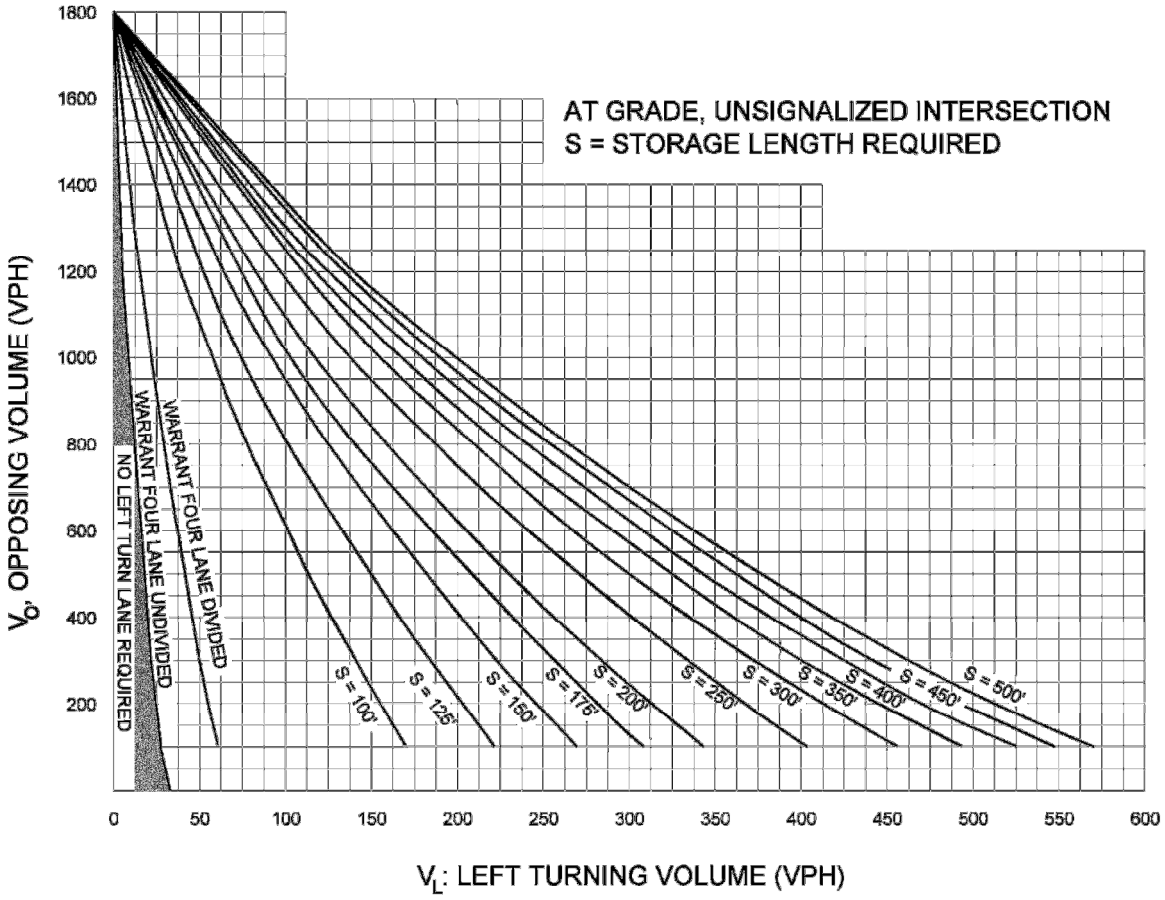


Figure 2-17
Warrant for Left-Turn Storage Lanes on Four-Lane Highways

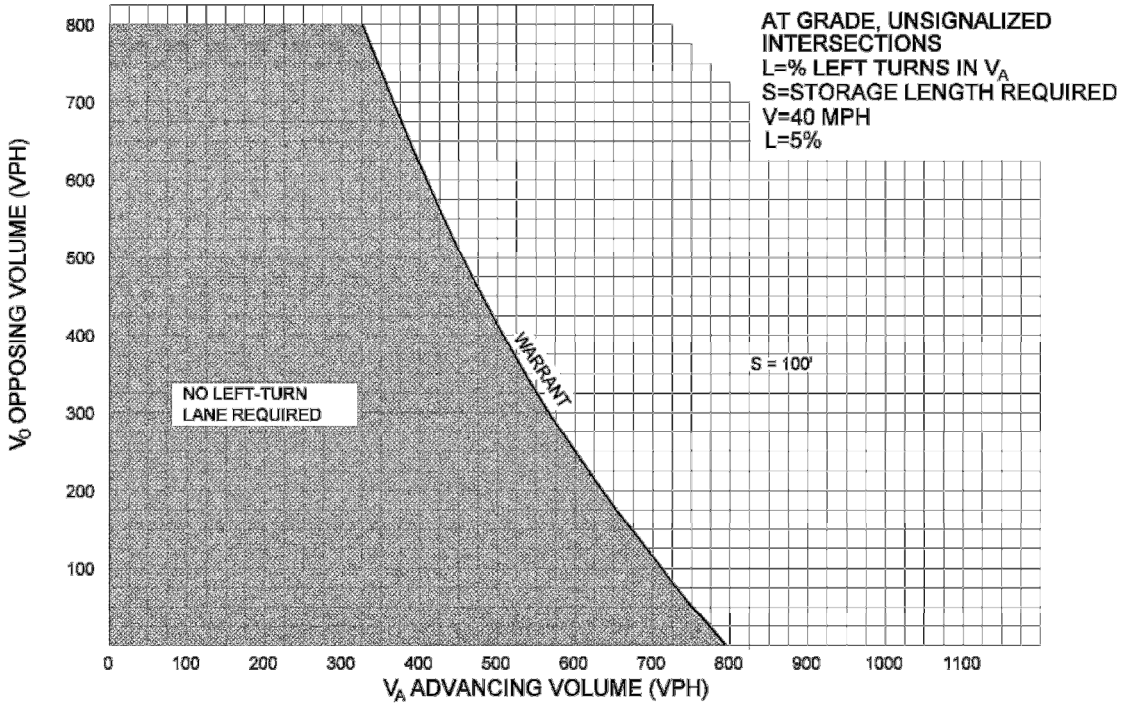


Figure 2-18a
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 40 mph and L = 5%)

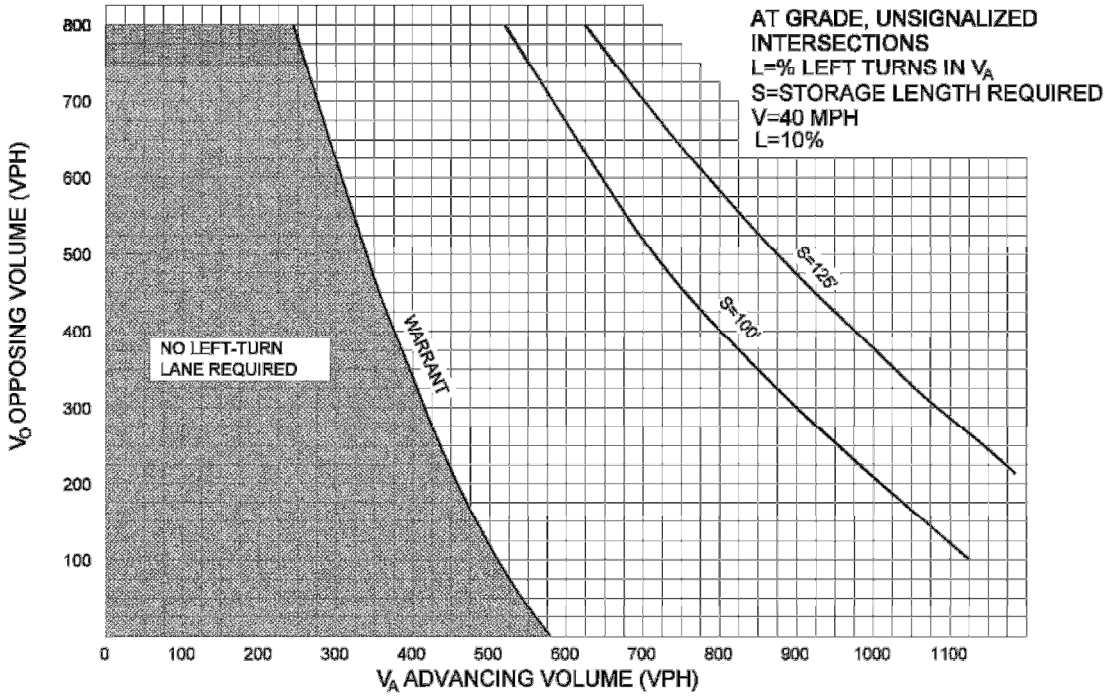


Figure 2-18b
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 40 mph and L = 10%)

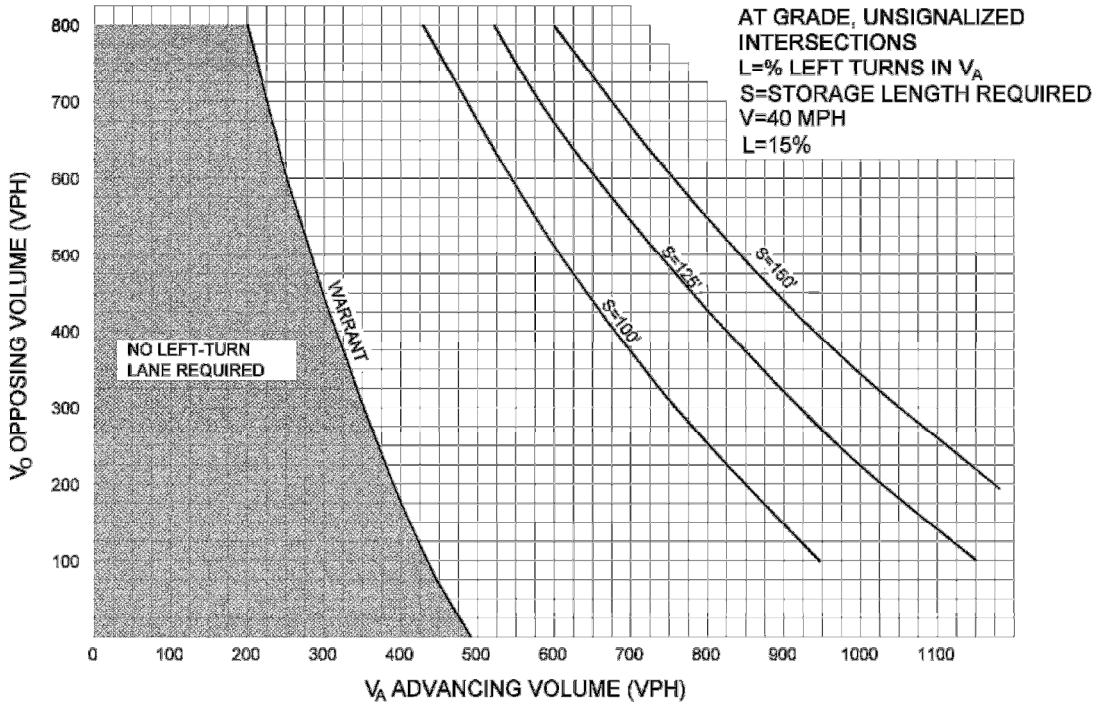


Figure 2-18c
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 40 mph and L = 15%)

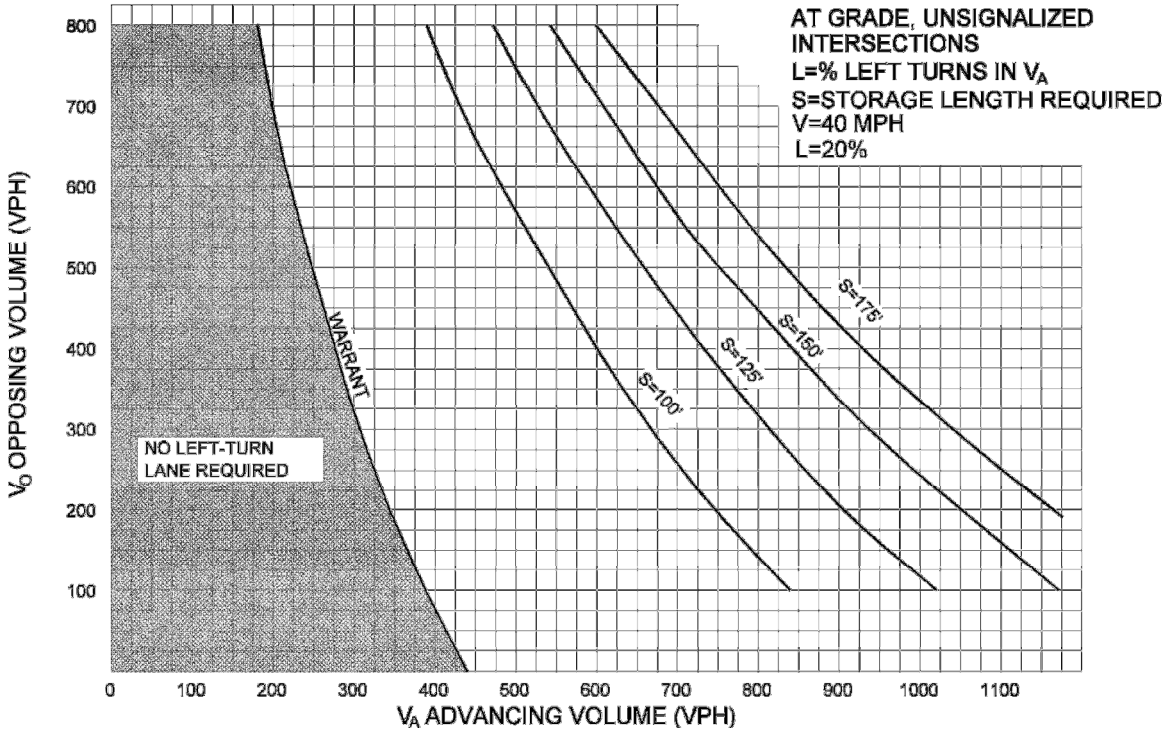


Figure 2-18d
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 40 mph and L = 20%)

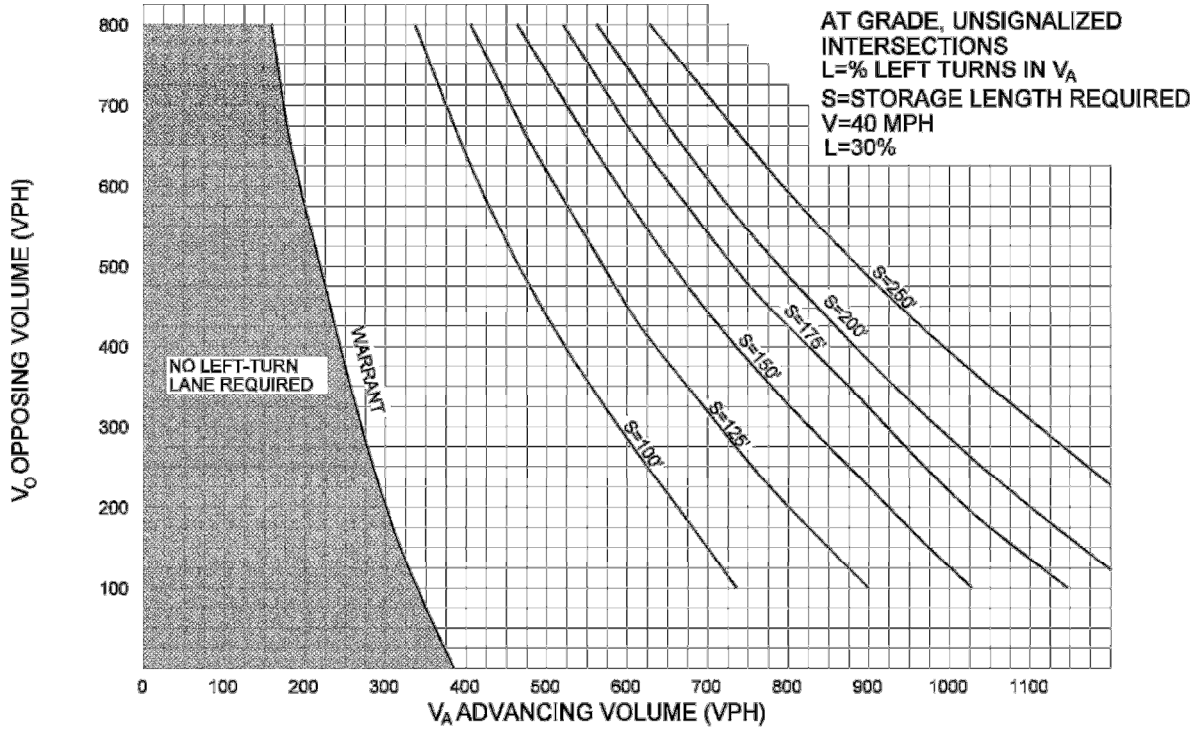


Figure 2-18e
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 40 mph and L = 30%)

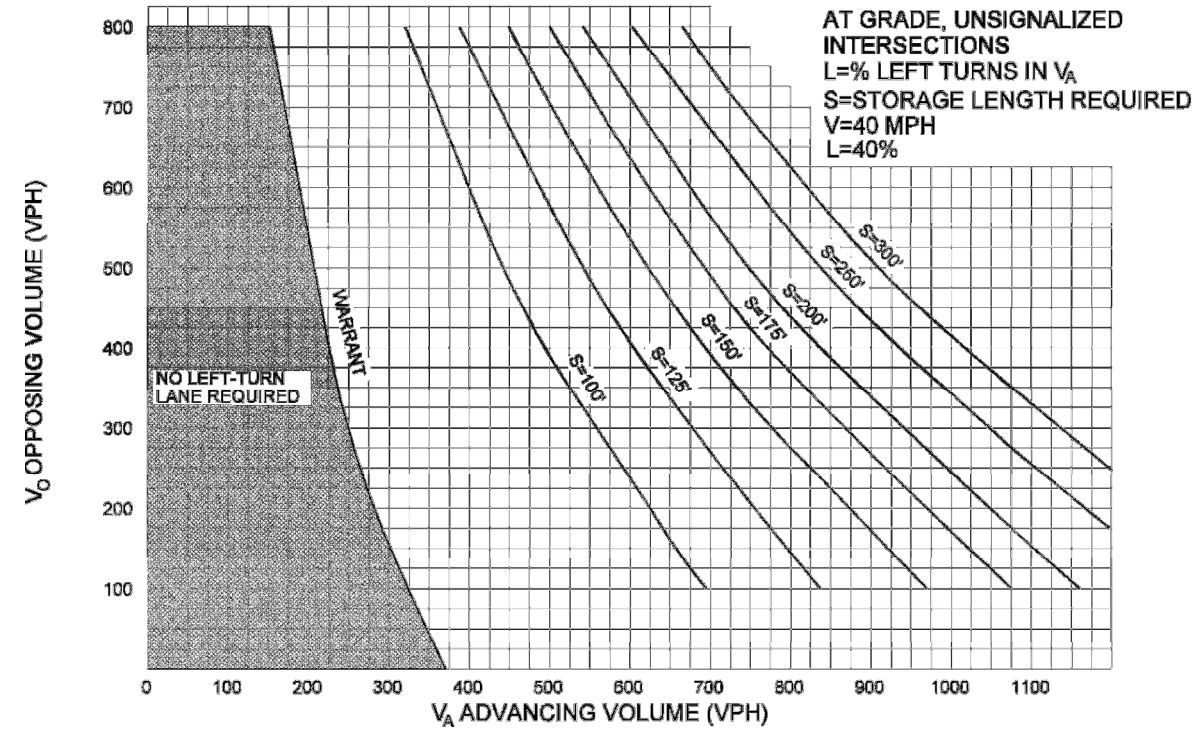


Figure 2-18f
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 40 mph and L = 40%)

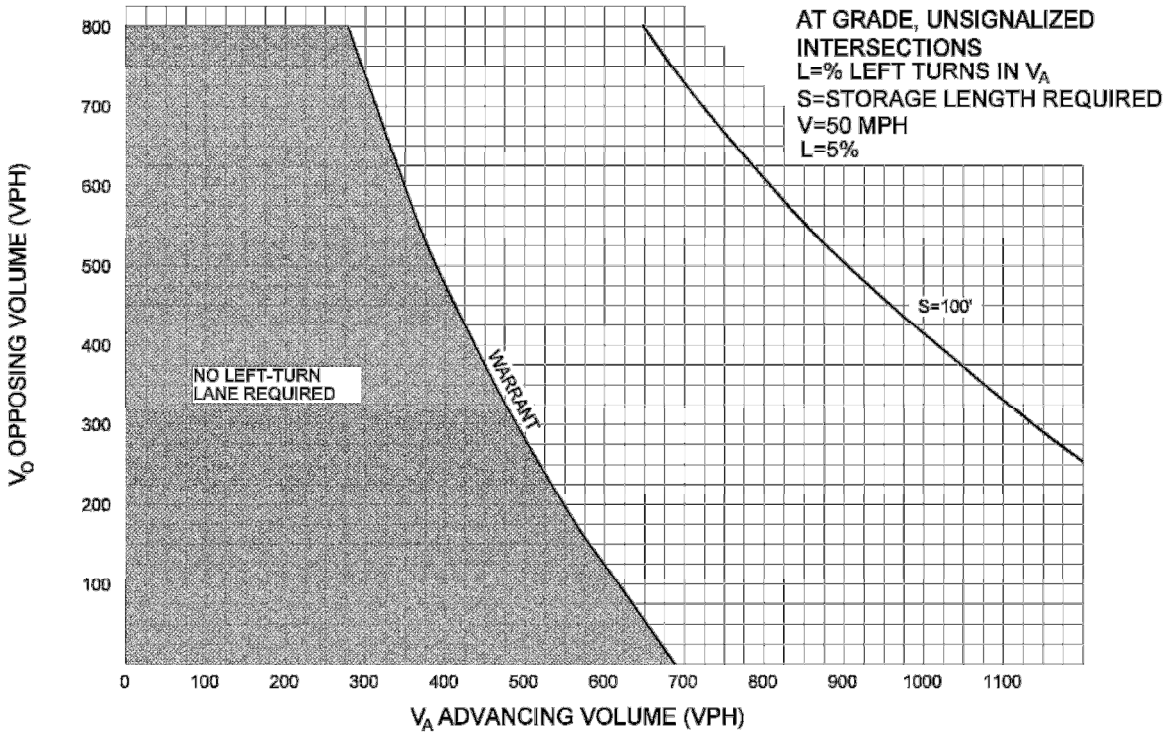


Figure 2-19a
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 50 mph and L = 5%)

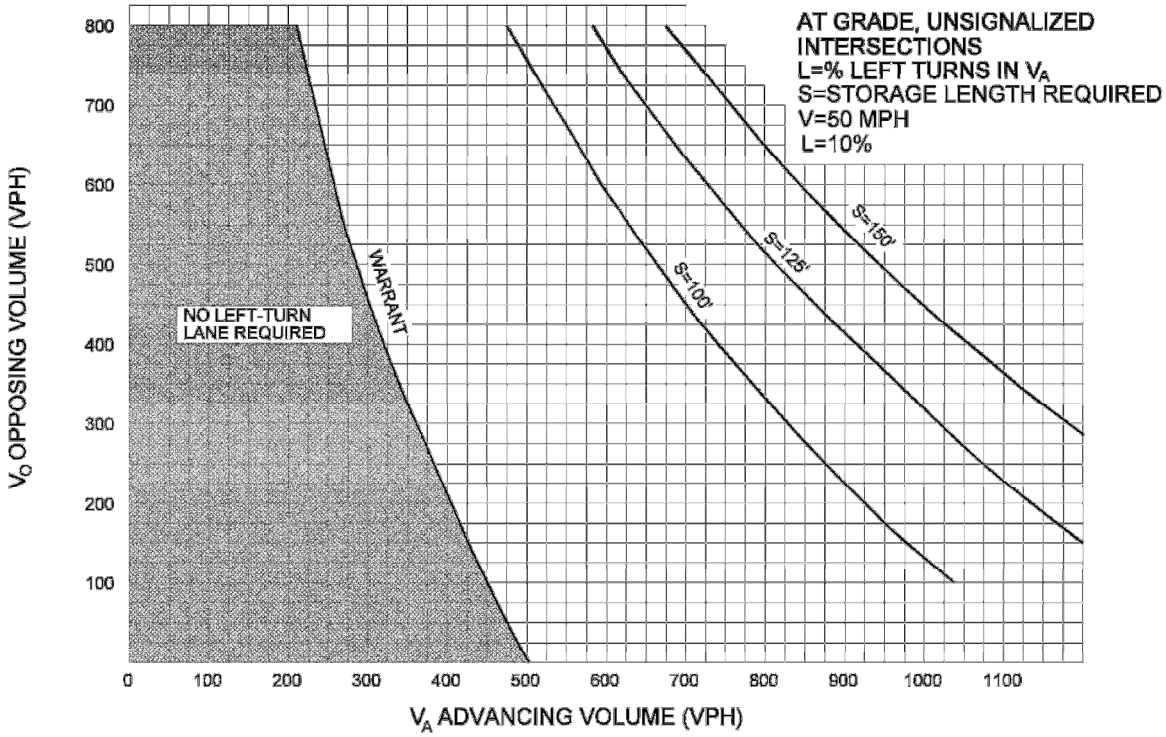


Figure 2-19b
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 50 mph and L = 10%)

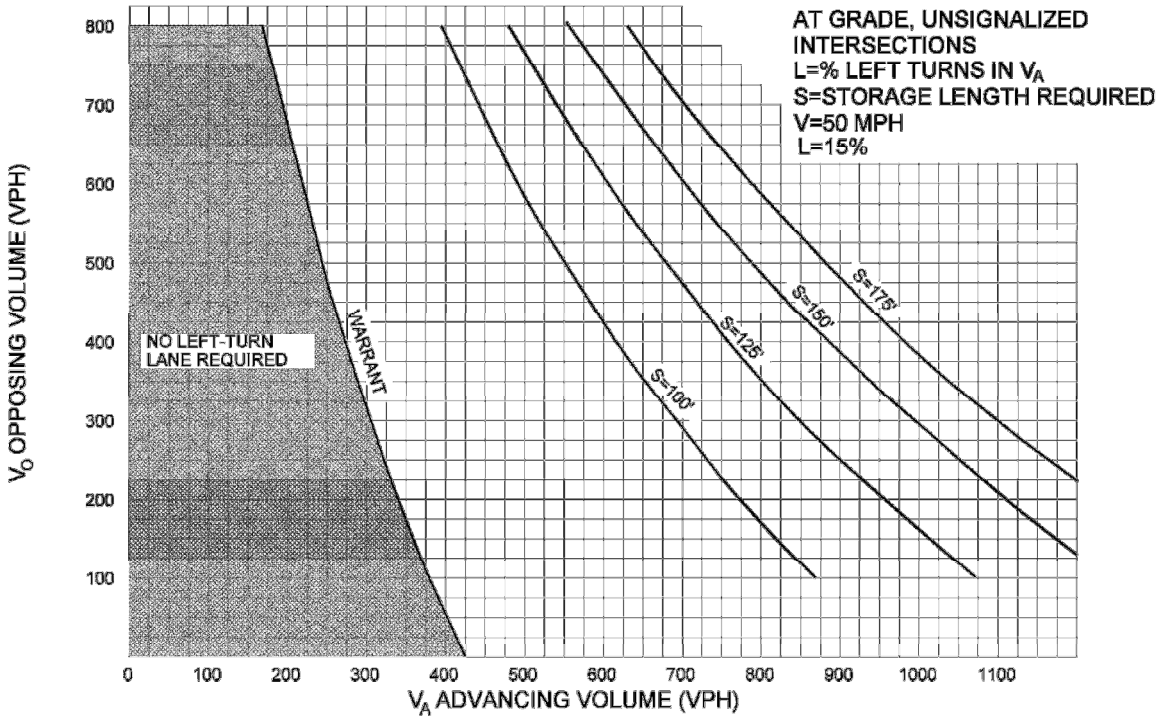


Figure 2-19c
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 50 mph and L = 15%)

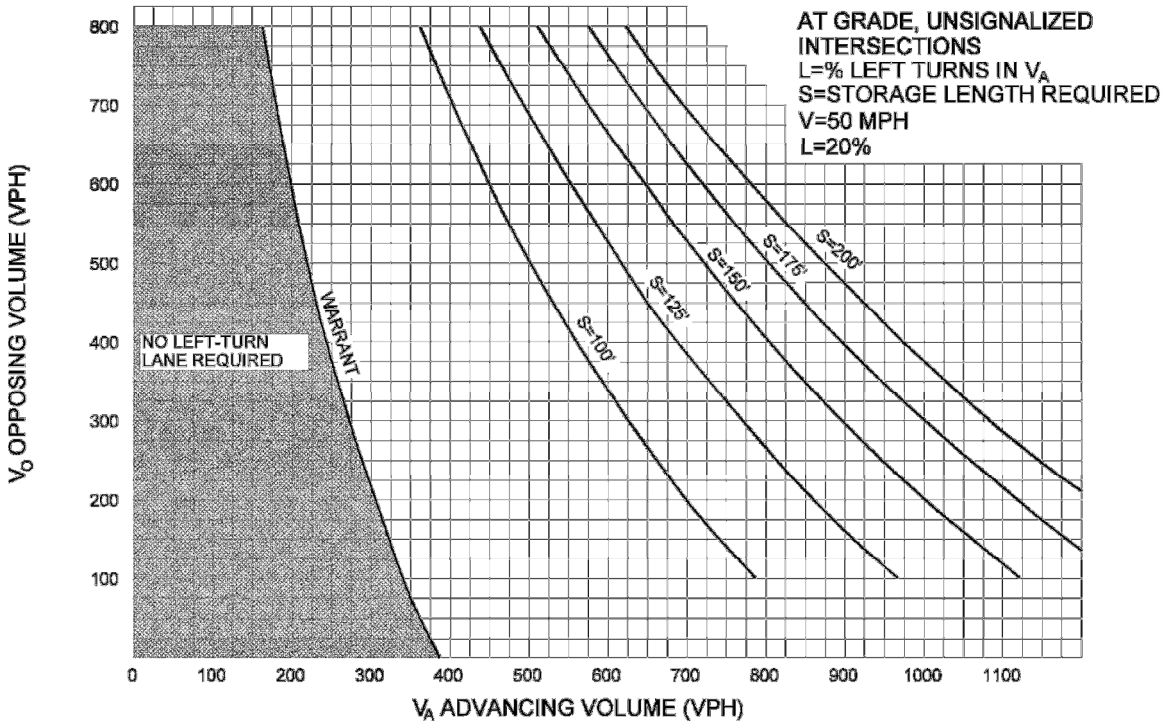


Figure 2-19d
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 50 mph and L = 20%)

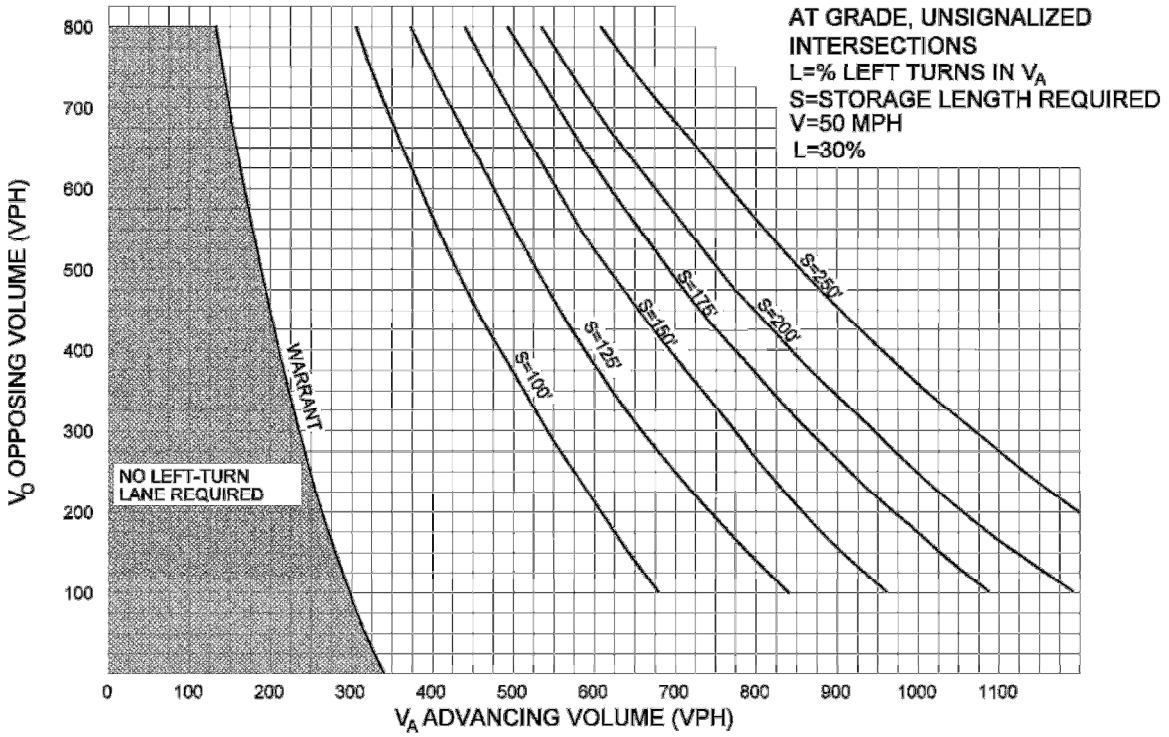


Figure 2-19e
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 50 mph and L = 30%)

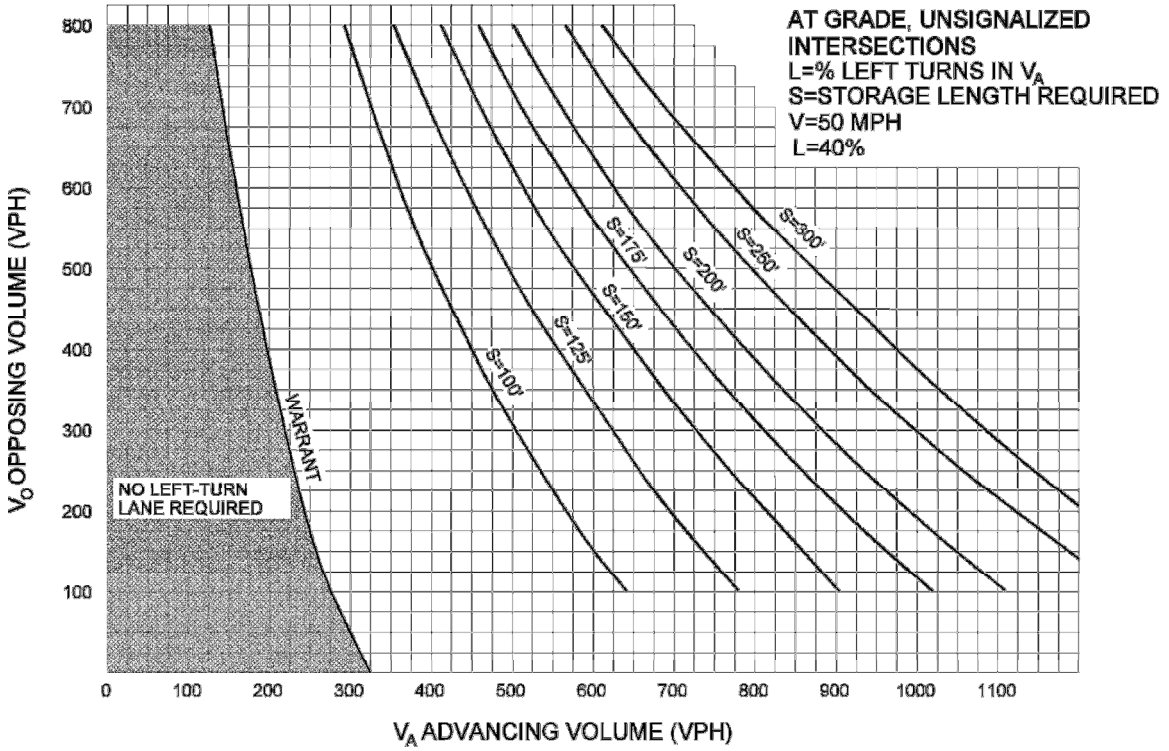


Figure 2-19f
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 50 mph and L = 40%)

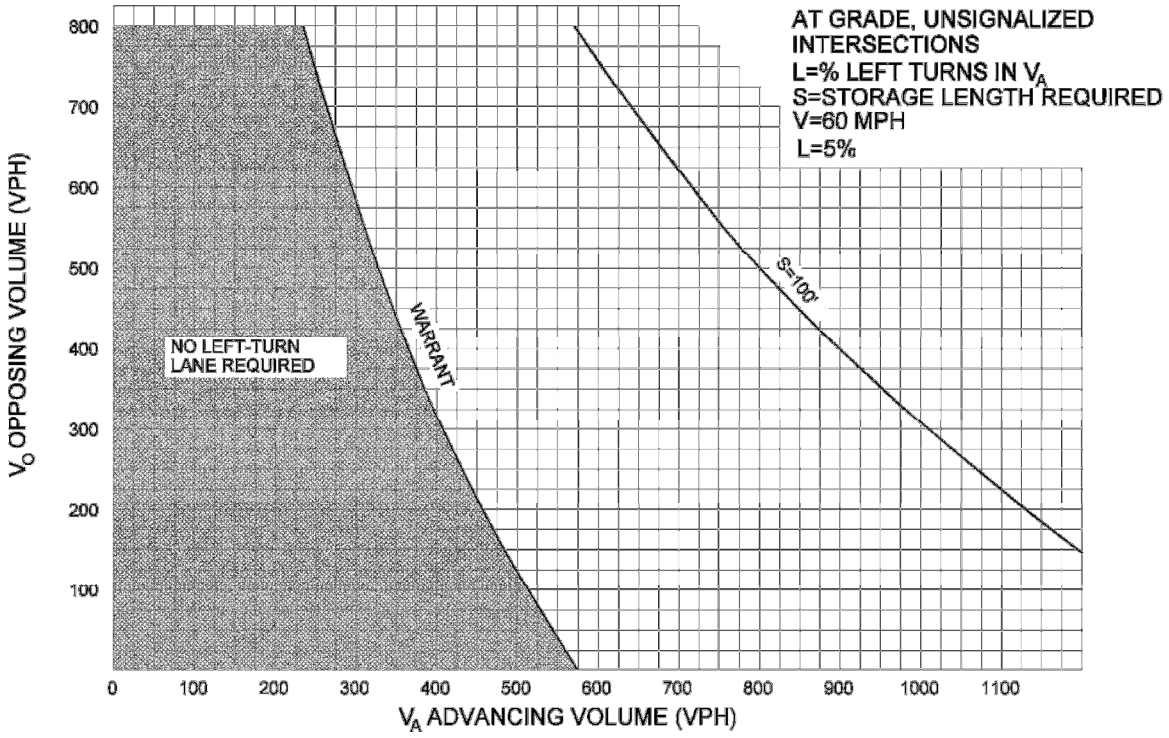


Figure 2-20a
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 60 mph and L = 5%)

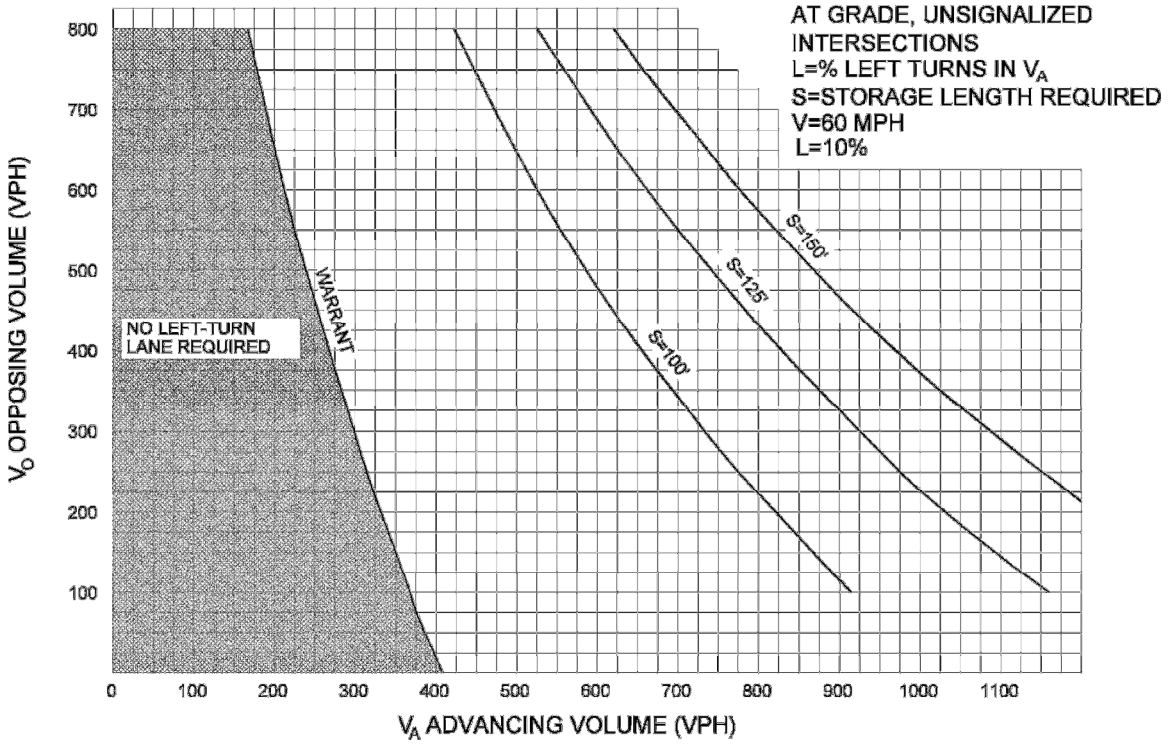


Figure 2-20b
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 60 mph and L = 10%)

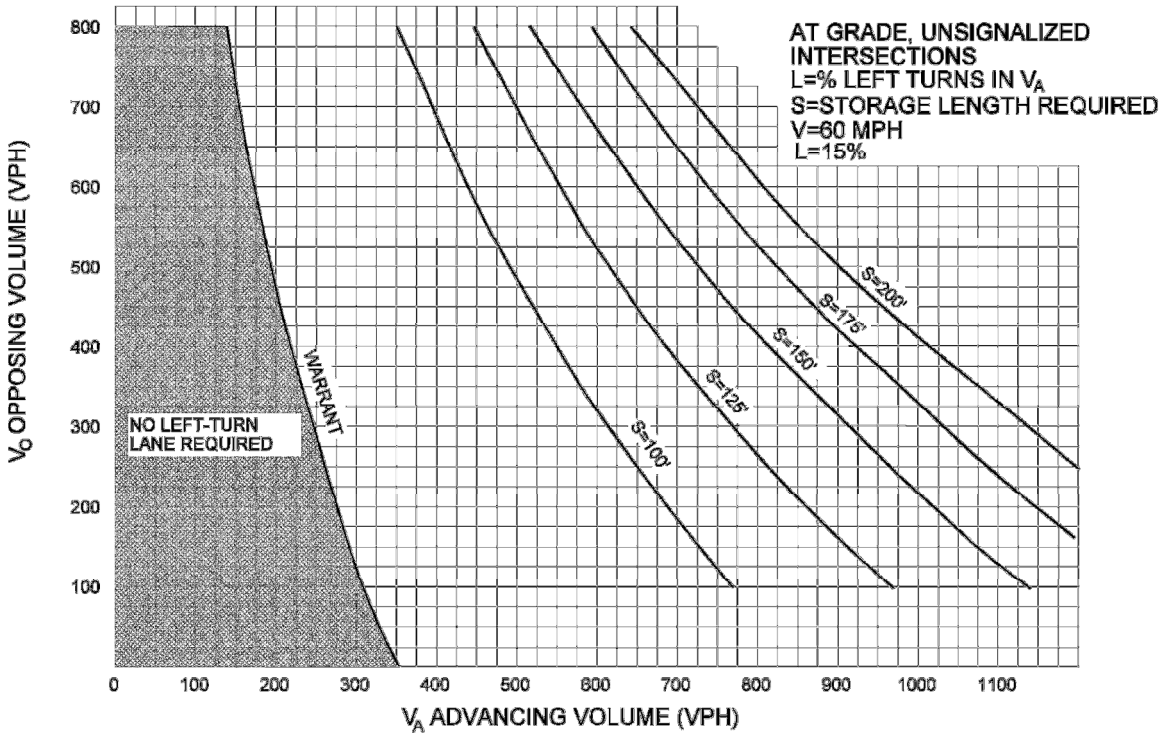


Figure 2-20c
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 60 mph and L = 15%)

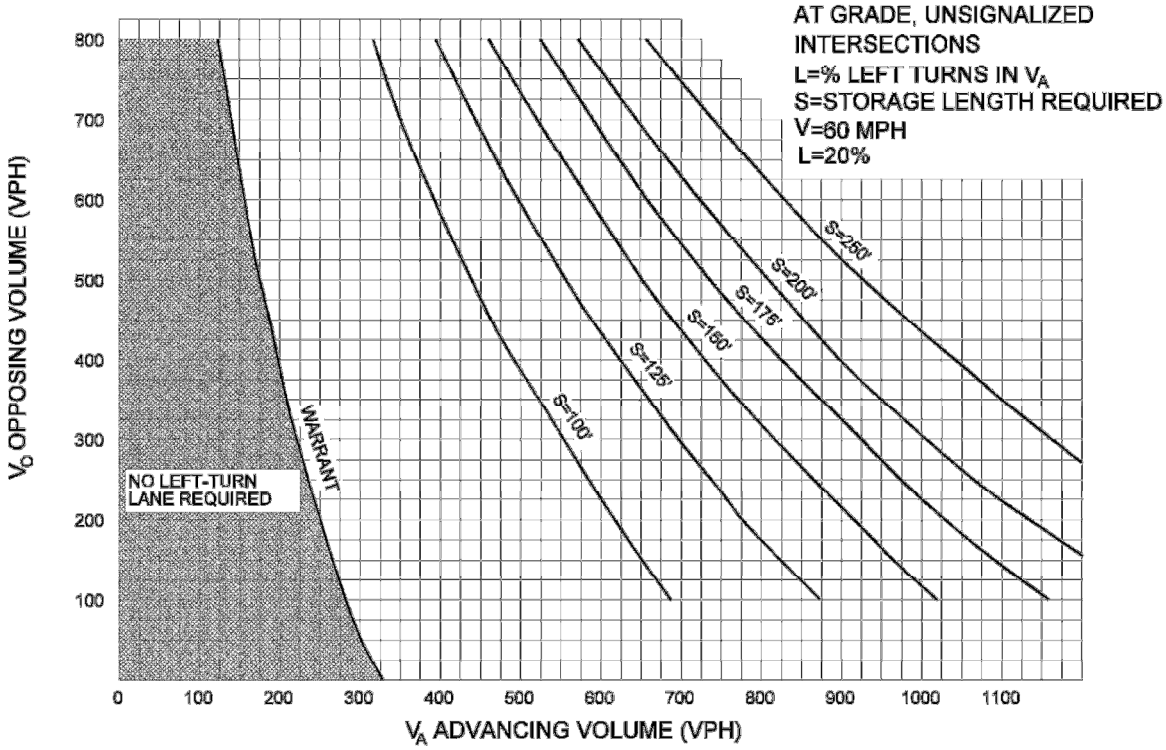


Figure 2-20d
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 60 mph and L = 20%)

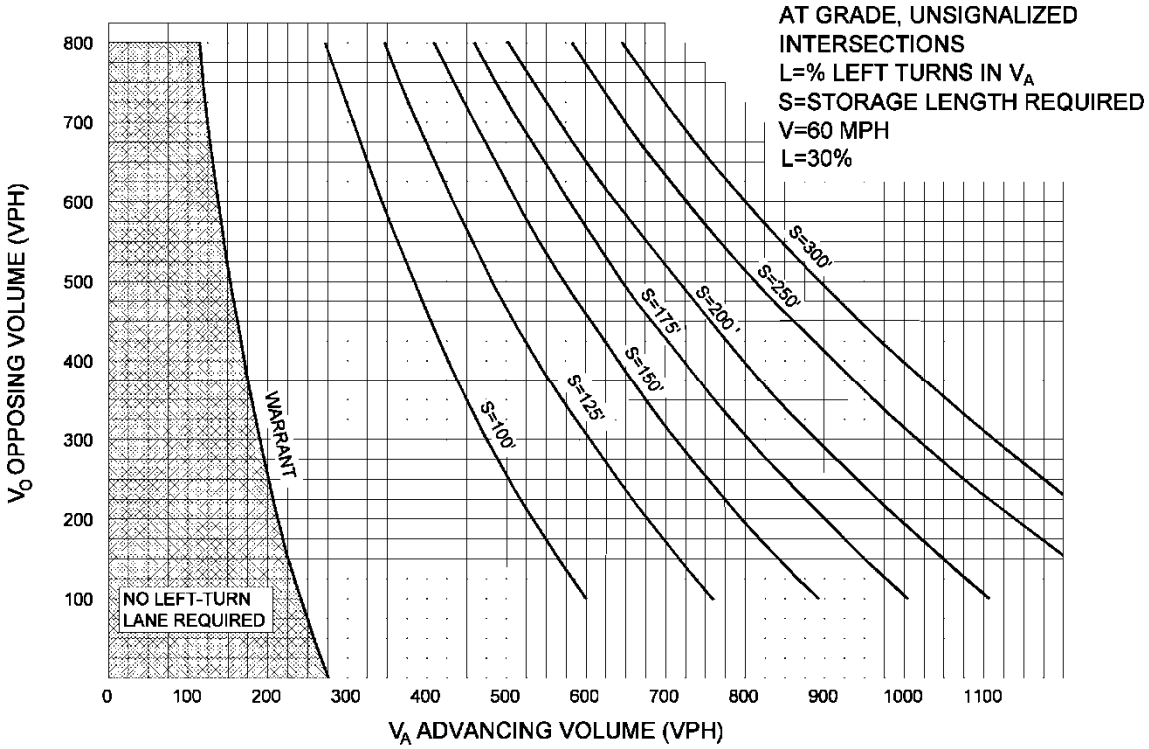


Figure 2-20e
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 60 mph and L = 30%)

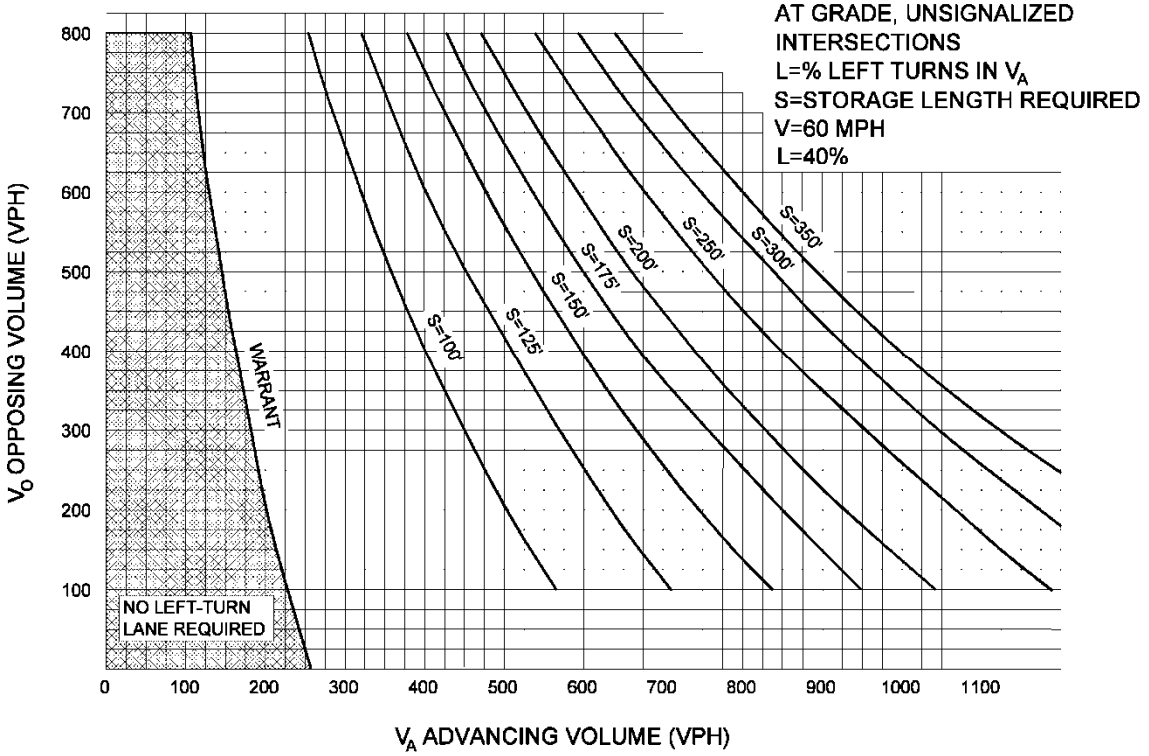


Figure 2-20f
Warrant for Left-Turn Storage Lanes on Two-Lane Highways (V = 60 mph and L = 40%)

2-175.00 GUIDELINES FOR DETERMINING AND PROPOSING RETAINING WALLS

For all design projects that contain retaining walls or that could potentially contain retaining walls, the responsibilities of the Design Division in relation to proposing a retaining wall design shall be as follows:

1. During the development of many roadway design projects, proposing a retaining wall is necessary due to right-of-way limitations, environmental impacts, drainage issues, or the need to reduce damage to adjacent properties. In most cases, a cost evaluation may be needed to justify a retaining wall. For those cases, the Designer should prepare a conceptual drawing in accordance with the Earth Retaining Structures Manual, Chapter 1, Section 3.0 - Conceptual Drawing Preparation. Right-of-way needs, including construction requirements, are to be clearly defined and shaded on the conceptual drawing and the roadway plans. The conceptual drawing and plans should be emailed to the Structures Division and Right-of-Way Division for cost estimates evaluating the economics of the proposed retaining wall.

   After receiving the estimates, the Design Manager and the Designer determine if the retaining wall will be cost effective. If the retaining wall is cost effective or is required for other reasons or compelling factors such as environmental considerations, continue to prepare roadway plans with the retaining wall and complete step 2, below. When environmental factors are involved it may also be necessary to coordinate with the Environmental Division.

2. The roadway plans and the conceptual drawing should be emailed to the Structures Division, Hydraulic Section (if water is involved), and the Materials and Tests Division as appropriate. The submittal package should include the standard Letter of Transmittal provided in Appendix C of the Earth Retaining Structures Manual.

The flow chart in Figure 2-21 depicts the Design Division's responsibilities with regard to determining and proposing a retaining wall.

For all proposed retaining wall submittals, a proposed retaining wall request packet shall be emailed to the appropriate Divisions. Each person listed in the CC section of the letter of transmittal should be copied on the email along with the Design Manager. A copy of the email and retaining wall packet shall be placed in the project folder to document the submittal of the retaining wall request. The proposed retaining wall packet shall consist of a single .pdf file that contains the letter of transmittal (shown in Appendix C of the Earth Retaining Structures Manual), the conceptual drawing and a set of plans, as appropriate.

The naming convention for the proposed retaining wall request packet will include the PIN and the Region #, XXXXXX-XX-RetainingWallRequest-RegX.pdf. If there are modifications, including submitting additional information, then the naming convention will be XXXXXX-XX-RetainingWallRequest-RegX-Rev-00-00-00.pdf. Revised proposed retaining wall request will contain the packet in its entirety – i.e. letter, conceptual drawing, and plans.

Example: 123456-00-RetainingWallRequest-Reg1.pdf

When assembling the pdf file, select small file size of default file size in Adobe Acrobat Standard in order to keep the proposed retaining wall request packet under the 15MB email

limit. If the file exceeds 15MB, the designer should split the packet into multiple emails and add Part 1, Part 2, etc. to the naming convention.

Example: 123456-00-RetainingWallRequest-Reg1-Part1.pdf

For the Roadway Plans prepared by consultants, the proposed retaining wall request packet should be prepared as described above and emailed to the Roadway Design Manager for review. Upon acceptance, the Design Manager will forward the package to the appropriate divisions.

The proposed retaining wall packet should be resubmitted whenever major design revisions are made that could affect other aspects of the design as determined by the Design Manager.

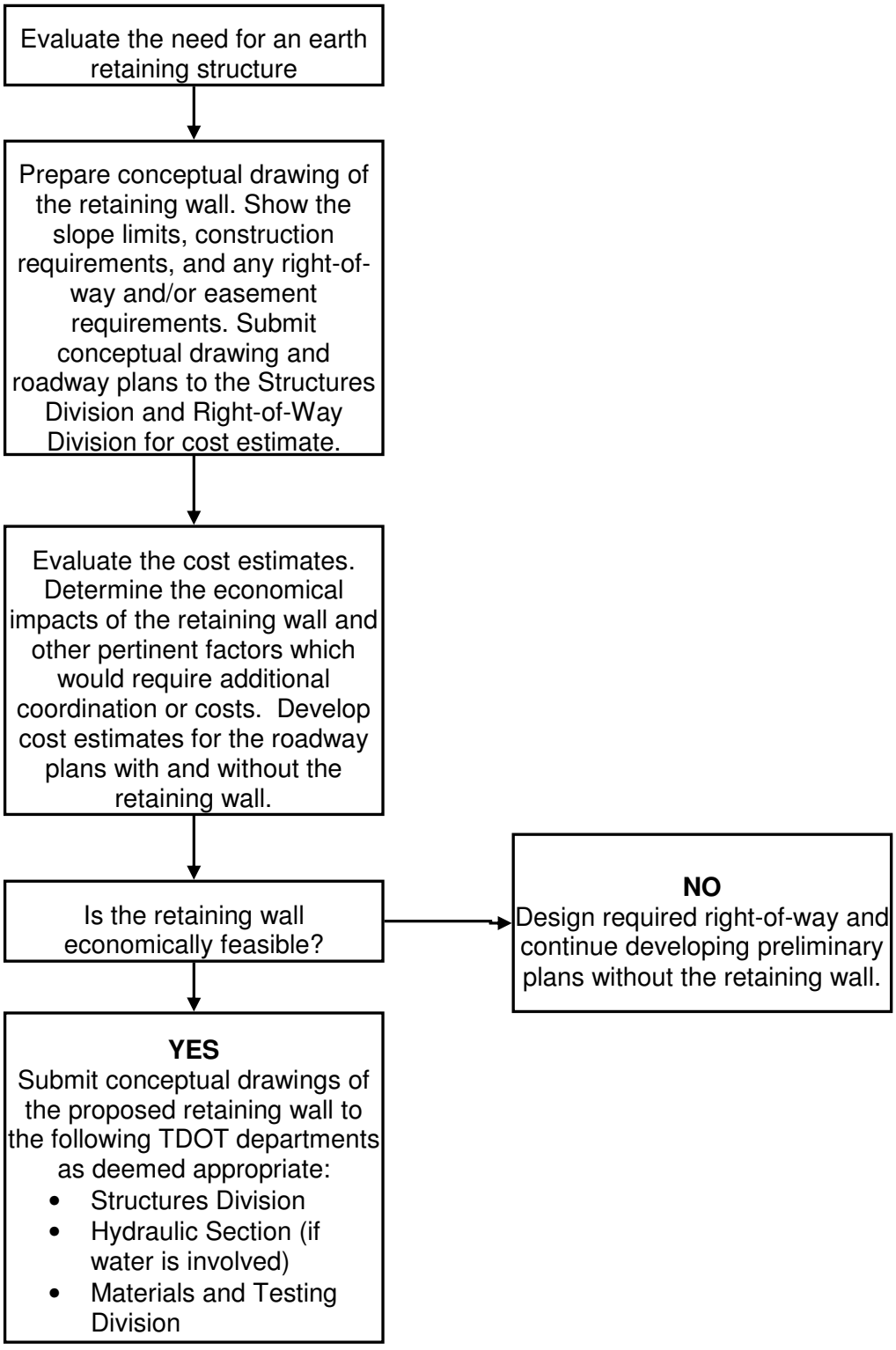


Figure 2-21
Flow Chart for Determining and Proposing a Retaining Wall

2-180.00 LOCATION OF AUTOMATIC TRAFFIC RECORDERS (ATR) AND ROADWAY WEATHER INFORMATION SYSTEMS (RWIS) ON PROJECTS

To avoid damage to Automatic Traffic Recorder (ATR) and RWIS Weather Station (RWIS) equipment that might be located within the limits of TDOT projects, the Design Division has been requested to identify equipment for ATR's or RWIS's located within the project limits during development of project plans. On projects developed in-house, it will be the responsibility of the designer to make this determination. On projects developed by consultants, it will be the responsibility of the TDOT Design Manager.

To determine whether an ATR is located within a project, check TRIMS using the standard query "ATR Locations" (statewide) or "ATR Locations by Region". The county, route and log mile location for each respective ATR is listed. Please note that if you use the "ATR Locations by Region" query you must enter the correct region number under Value in the criteria window at the bottom. The query will also provide RWIS Weather Station information if a RWIS is also located at the ATR location.

If an ATR is found within a project, notify Director of Project Planning Division with a description of the proposed work in the vicinity of the ATR location. If the work on the project is likely to affect the operation of the ATR equipment, the roadway designer will be given a list of item numbers and descriptions for inclusion in the construction plans quantity block.

To determine whether a RWIS Weather Station is located within a project, check TRIMS using the standard query "RWIS Locations". The county, route and log mile for each RWIS location is listed statewide. The query will list stand alone RWIS sites and RWIS sites located at ATR locations.

If a RWIS is found within a project, notify the Manager of Asset Management Section of the Maintenance Division. He will determine if the equipment will be affected by the work and arrange for the equipment to be replaced or advise the designer of appropriate items to include the plans to replace the affected equipment.

If inclusion of construction items is required and the project includes any traffic signal work, notify the Manager of Design ITS, Traffic, and Standards Office in order to avoid possible duplication of construction items.

CHAPTER 2 – DRAINAGE

2-200.00 DRAINAGE MANUAL

In order to assist the designer performing drainage and hydrologic design, the Design Division has developed a Drainage Manual to provide a collection of applicable drainage criteria, policies and examples. The Manual discusses Tennessee Department of Transportation policies, practices and procedures for performing drainage design and hydraulic analyses on projects that are the responsibility of TDOT.

Designers shall use Chapters 1-11 of the Design Division's Drainage Manual for all projects designed or constructed by TDOT. These chapters include:

Chapter 1	Introduction
Chapter 2	General Drainage Policies and Practices
Chapter 3	Drainage Plan Requirements
Chapter 4	Hydrology
Chapter 5	Roadside Ditches and Streams
Chapter 6	Culverts
Chapter 7	Storm Drainage Systems
Chapter 8	Stormwater Storage Facilities
Chapter 9	Energy Dissipators
Chapter 10	Erosion Prevention and Sediment Control
Chapter 11	Natural Stream Design

Limited copies of the Manual will be distributed for internal use only. Consultants and other interested persons may download the Manual from the TDOT Internet site. The Manual can be found at:

http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/DrainManChap%201-11.htm

2-200.01 COMPUTATION OF DRAINAGE

See Chapter 4 of the Drainage Manual.

2-200.05 DRAINAGE TABLES AND CHARTS

See Chapter 4 of the Drainage Manual.

2-200.10 EXAMPLE DRAINAGE PROBLEMS

See Chapter 4 of the Drainage Manual.

CHAPTER 3 - RIGHT-OF-WAY

2-300.00 R.O.W. NOTES FOR ALL R.O.W. PROJECTS (See 3-305.00 and 6-140.00)

All the notes below, which apply, will be put on the first property map sheet or first present layout sheet of the Right-of-Way Plans.

1. It is intended that all buildings and/or portions of buildings that are within the proposed right-of-way and/or easement lines for the project, be removed in the process of right-of-way acquisition. If any such buildings or improvements are not removed in the course of right-of-way acquisition, the Design Manager, Design Division (and Design Manager, Regional Design Office, if plans are being developed in the Regional Office) is/are to be notified in sufficient time to permit having such removals designated as a part of the construction contract.

2. All ramps must conform to the Department's "Policy on Financing Construction on Public Road Intersections and Driveways on Highway Resurfacing, Reconstruction and Construction Projects on New Locations", *The Manual on Rules and Regulations for Constructing Driveways on State Highway Right-of-Way, Standard Drawing RP-R-1*, and other accepted design and safety standards.

2-300.05 R.O.W. NOTES ON PLANS REGARDING DRIVEWAYS (See 3-305.05, 3-310.00, and 6-140.00)

See Figures 2-22 through 2-24 for examples of how to show driveways on plans.

All ramp profiles (private drives, field entrances, business entrances, private and public side roads) shall be shown on the private drives and/or side road profile sheets.

All the notes below, which apply, will be put on the first property map sheet or the first present layout sheet of the Right-of-Way Plans.

1. New or Reconstruction Projects - with partial access control -

   A. Existing paved driveway per tract remainder will be replaced in-kind to a touchdown point.

   B. Where the existing driveway is unpaved and the proposed driveway exceeds 7 percent in grade, each driveway will be paved to a touchdown point or until the grade is less than 7 percent.

   C. Where the existing driveway is unpaved and the proposed driveway is less than 7 percent in grade, each driveway will be paved a shoulder width from the edge of pavement and the remainder of that driveway replaced in-kind to a touchdown point.

   D. Any necessary paving of driveways will be done during paving operations on the main roadway.

E. Tract remainders not having an existing driveway will be provided a 50-foot opening in the access control fence, and a driveway will be constructed unless access is provided from an intersecting road or based on physical conditions and/or conflicts with other design considerations which prevent an access opening. Paving of these new driveways will be in accordance with the 7 percent criteria previously mentioned for existing driveways.

2. New or Reconstruction Projects - with no access control -

A. Existing paved driveway per tract remainder will be replaced in-kind to a touchdown point.

B. Where the existing driveway is unpaved and the proposed driveway exceeds 7 percent in grade, each driveway will be paved to a touchdown point or until the grade is less than 7 percent.

C. Where the existing driveway is unpaved and the proposed driveway is less than 7 percent in grade, each driveway will be paved a shoulder width from the edge of pavement and the remainder of that driveway replaced in-kind to a touchdown point.

D. New driveways provided in the plans will be paved based on the 7 percent criteria. Those 7 percent or steeper in grade will be paved and those flatter than 7 percent will be covered with base stone.

E. Any necessary paving of driveways will be done during paving operations on the main roadway.

F. Additional driveways and field entrances other than those provided in the plans shall require a permit on a state route.

(1) On projects without curb and gutter, it will be the responsibility of the owner to secure a permit and to construct additional desired driveways.

(2) On projects with curb and gutter, it will be the responsibility of the owner to secure a permit. After the permit has been granted, the Department will construct the driveway or field entrance through the curb and sidewalk, provided the curb and sidewalk have not been constructed. It will be the responsibility of the property owner to construct the driveway from back of sidewalk to the touchdown point.

G. On non-state routes additional driveways and field entrances other than those provided in the plans shall require a permit only if the local agency specifies the need for that permit.

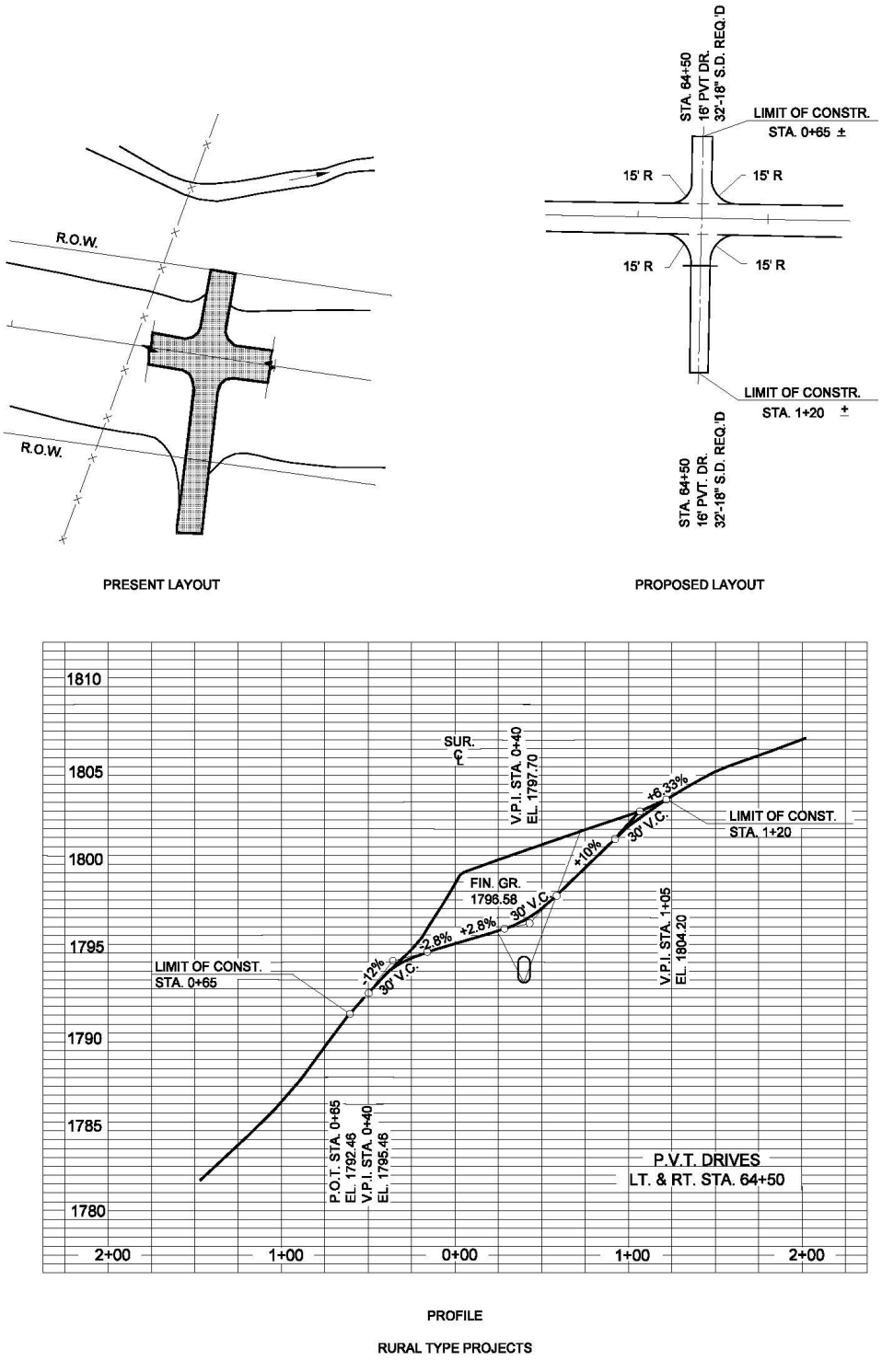


Figure 2-22
Rural Type Projects Typical Driveway Notation

Note: This figure is for layout procedure purposes only. Please refer to Manuals and Standards for design information.

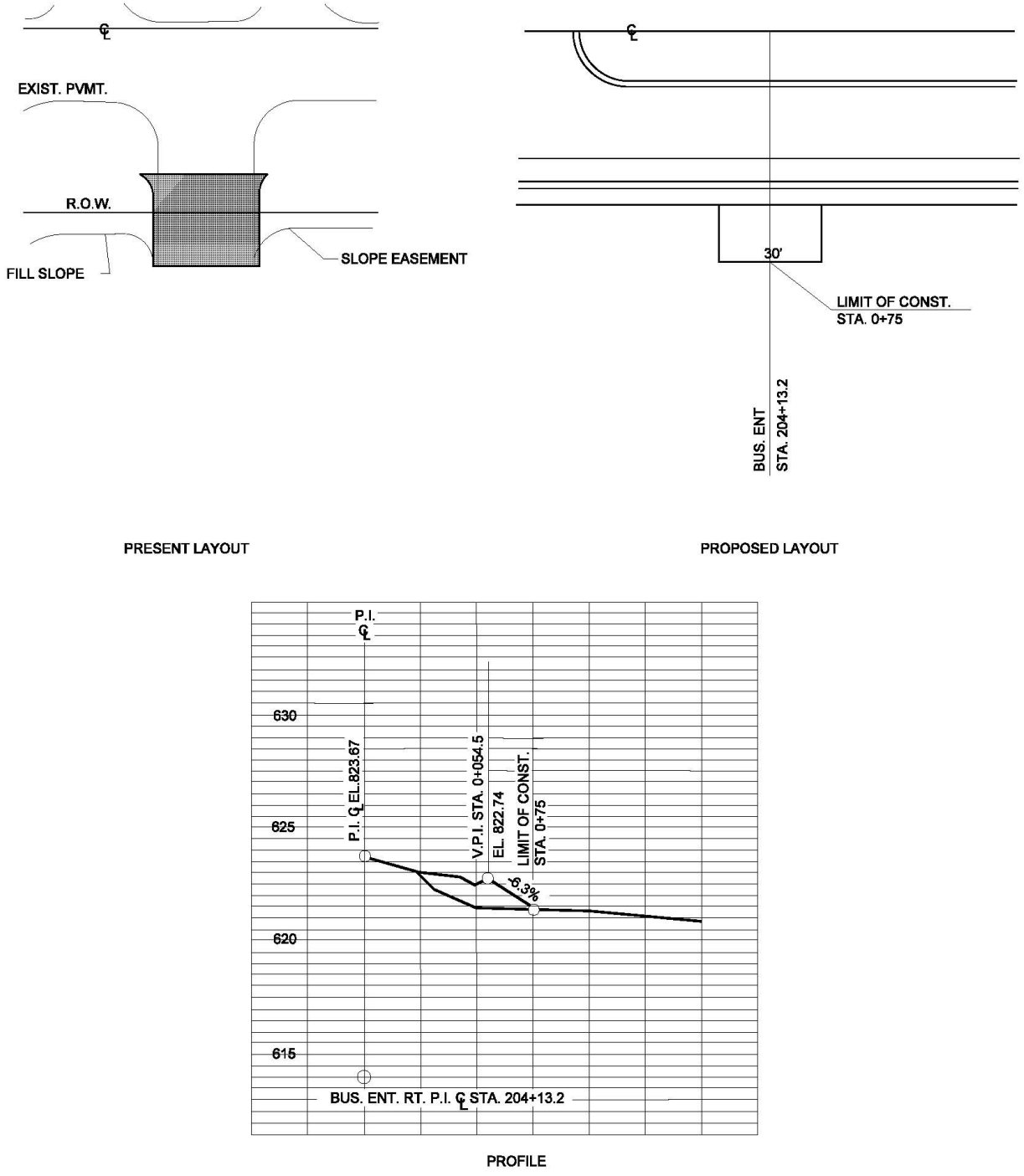


Figure 2-23
Urban Type Projects Typical Driveway Notation

Note: This figure is for layout procedure purposes only. Please refer to Manuals and Standards for design information.

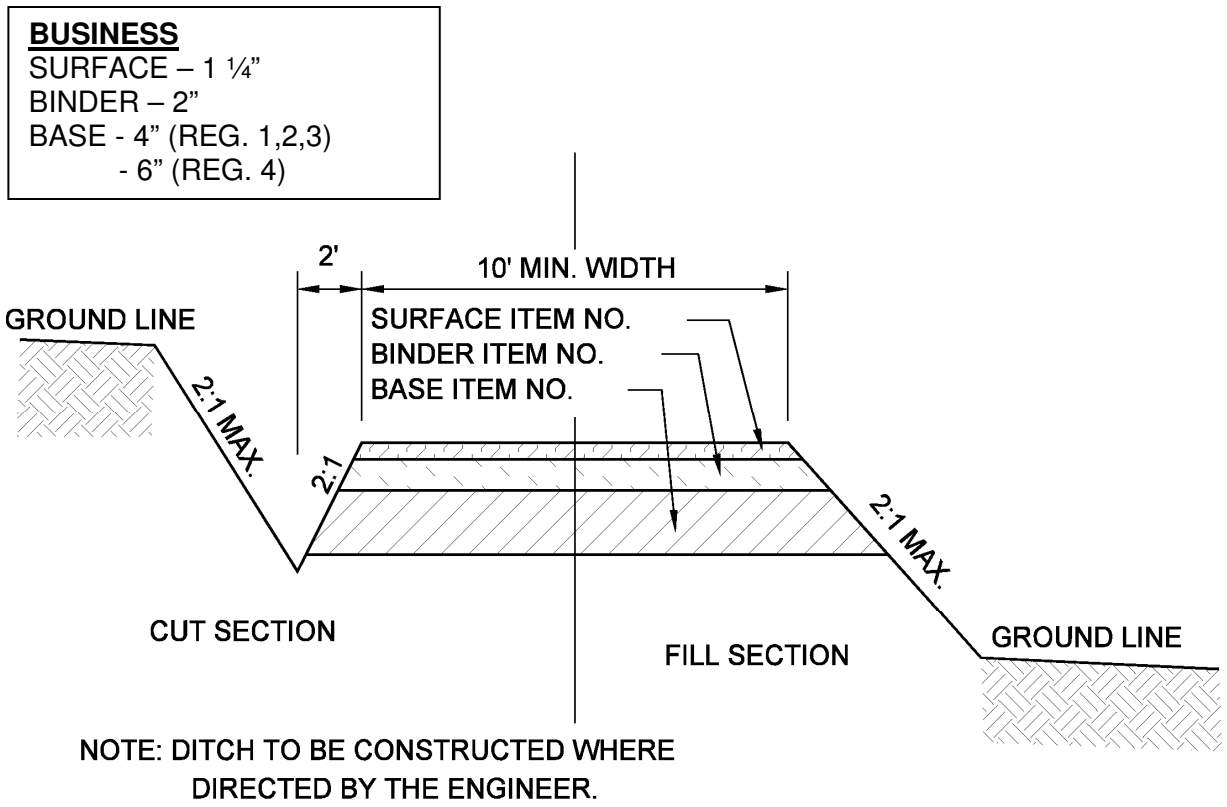


Figure 2-24
Typical Section Private Drive to Business, Field, or Residential Property

NOTES TO DESIGNERS:

1. Driveway design shall be in accordance with the State of Tennessee *Rules and Regulations for Construction of Driveways on State Highway Right-of-Way.*

2. Where surface of existing drive is concrete, substitute 6 inches of concrete for base and surface.

3. For curb and gutter sections, this typical section is to begin at the back edge of the proposed or future sidewalk. See Standard Drawings RP-D-15 and RP-D-16 for design of drives from curb line to back of sidewalk.

4. If an existing drive is greater than 10 feet, the width of the proposed drive shall be equal to the existing width; but not greater than the maximum allowable width as specified in the rules and regulations.

5. If existing drive is gravel, surfacing will be for one shoulder width. The remainder of the drive will be replaced with gravel to the touchdown point.

2-300.10 GUIDELINES FOR CONSTRUCTION AND RESURFACING OF PUBLIC ROAD INTERSECTIONS AND DRIVEWAYS ON HIGHWAY PROJECTS

I. GENERAL

This is a general guide for designers and departmental staff to use in developing project plans. Driveway installations on highway rights-of-way by individuals, firms, and corporations for each property are governed by TCA §54-5-301 through 54-5-303 and *Rules and Regulations for Construction of Driveways on State Highway Right-of-Way* (Rev. Jan. 1, 1967). Locations of driveways on new construction are also guided by the above Rules. In an effort to provide statewide uniformity, all future resurfacing, reconstruction and projects on new location shall include public road intersection and driveway construction in accordance with the provisions of this Guideline.

II. DEFINITION OF TERMS

Paved Shoulder Width - The width of the shoulder paved as part of the project.

Paver Width - The width of asphalt paving machine used on mainline paving with maximum width not to exceed 12 feet or to extend beyond right-of-way limit.

Normal Right-of-Way - An imaginary line which, when projected through a public road intersection, would enclose the normal slopes of the highway.

III. RESURFACING

A. Where directed by the TDOT Engineer, the Contractor shall be required to shape public side roads, business entrances, and private drives, as well as clean existing drains before placing materials. All costs are to be included in the price bid for other items of construction.

B. Resurfacing projects on roadways with shoulders and ditches (no curb or gutter):

1. All public side roads shall be paved one paver width through the intersection as a minimum. A satisfactory transition from the new pavement to the existing grade of the intersecting public road or business entrance shall be provided. Should the pavement of the intersecting public road be distressed, the resurfacing width may be increased to the normal right-of-way line.

2. Private driveways, field entrances, and business entrances will be resurfaced a paver width (lane width) as a minimum. A pavement taper to transition the new pavement shall be required, it shall be based on an additional 1 foot of width per inch depth of pavement. If the shoulder is narrow enough that the sum of the shoulder and the transition are less than a paver width (lane width), the transition shall occur within the paver width. If the sum of the shoulder and the transition is greater than a paver width (lane width), the transition shall occur outside of the paver width.

C. Resurfacing projects on roadway with urban curb and gutters

1. Public road intersections shall be resurfaced to the end of the radius. A satisfactory transition from the new pavement to the existing grade of the intersecting public road shall be provided.

2. Residential driveways and business entrances shall have a minimum width of material not less than one foot used in the transition to feather the pavement edge.

D. In all cases, the length of the pavement transition, the thickness and width of the resurfacing and any additional pavement materials shall be as directed by the TDOT Engineer.

IV. NEW OR RECONSTRUCTION

A. Facilities with Full Access Control

1. Full access control will be maintained for the entire designated project limits.

B. Facilities with Limited Access Control

1. Access will be allowed at public roads and streets only. No driveways will be permitted access to the mainline project.

C. Facilities with Partial Access Control - driveways permitted:

1. Fence Opening:

One 50-foot opening in the control access fence will be provided per tract remainder, unless access is provided from an intersecting road or based on physical conditions and/or conflicts with other design considerations, which prevent an access opening.

2. Existing Driveways:

Existing paved driveway per tract remainder will be replaced in-kind to a touchdown point.

Where the existing driveway is unpaved and the proposed driveway exceeds 7 percent in grade, each proposed driveway will be paved to a touchdown point or until the grade is less than 7 percent.

Where the existing driveway is unpaved and the proposed driveway is less than 7 percent in grade, each proposed driveway will be paved a shoulder width from the edge of pavement and the remainder of that driveway replaced in-kind to a touchdown point.

3. Requirements for field entrances and/or other driveways:

New driveways provided in the plans will be paved based on the 7 percent criteria. Those 7 percent or steeper in grade will be paved and those flatter than 7 percent will be covered with base stone.

Field entrances provided in the plans will be covered with base stone.

Normally, one field entrance or driveway, whichever is appropriate, per tract remainder will be provided except in the following circumstances:

a. In the project's preconstruction condition, there is a barrier to access such as a substantial cut, fill, ditch or curb.

b. A non-gated fence where the existing frontage is totally fenced.

c. In the project's post-construction condition, there is a substantial cut, fill, or ditch.

Also, small remainders and damage considerations are to be reviewed by the Design Division and the Right-of-Way Office to determine if a proposed driveway or field entrance is justified. The location, design and method of surfacing of the field entrance or driveway must be in accordance with the previously mentioned Rules. If the landowner does not desire a driveway, then it will not be included in the project.

4. All public roads will be paved to a touchdown point.

D. Non-Access Control Facilities

1. Existing paved driveways will be replaced in-kind to a touchdown point.

2. Where the existing driveway is unpaved and the proposed driveway exceeds 7 percent in grade, each proposed driveway will be paved to a touchdown point or until the grade is less than 7 percent.

3. Where the existing driveway is unpaved and the proposed driveway is less than 7 percent in grade, each proposed driveway will be paved a shoulder width from the edge of pavement and the remainder of that driveway replaced in-kind to a touchdown point.

4. Requirements for field entrances and/or other driveways:

   New driveways provided in the plans will be paved based on the 7 percent criteria. Those 7 percent or steeper in grade will be paved and those flatter than 7 percent will be covered with base stone.

   Field entrances provided in the plans will be covered with base stone.

   Normally, one field entrance or driveway, whichever is appropriate, per tract remainder will be provided except in the following circumstances:

   a. In the project's preconstruction condition, there is a barrier to access such as a substantial cut, fill, ditch or curb.

   b. A non-gated fence where the existing frontage is totally fenced.

   c. In the project's post construction condition, there is a substantial cut, fill, or ditch.

   Also, small remainders and damage considerations are to be reviewed by the Design Division and Right-of-Way Office to determine if a proposed driveway or field entrance is justified. The location, design and method of surfacing of the field entrance or driveway must be in accordance with the previously mentioned Rules. Variances may be permitted due to the proximity of existing drives to property lines. No drives will be allowed in radii. If the landowner does not desire a driveway, then it will not be included in the project.

5. All public roads will be paved to a touchdown point.

To assist local governments with compliance with the Americans with Disabilities Act, it is the Department’s intent to repair or install curb ramps which meet the Americans with Disabilities Act Accessibility Guidelines whenever possible as encountered through resurfacing.

While according to TCA §54-5-202, the Department is responsible, when resurfacing or performing any maintenance work on a roadway, for work from “curb to curb”, due to the limited resources of some localities, the Department will attempt to install or repair curb ramps whenever possible and funds are available.

The local government is responsible for maintaining sidewalks, curb ramps, etc.

2-310.00 ACCESS CONTROL - CROSSROADS AT INTERCHANGES

The extent of the access control for rural highways will be 300 feet from the ramp terminal, treating each side of the crossroad independently. Thus, where the interchange ramp terminals at the crossroad are not opposite each other, the limits of access control will not be opposite; each being 300 feet from the ramp terminal which governs. For urban highways, the extent of access control shall be 100 feet.

2-315.00 TRAFFIC SIGNAL AND LIGHTING DESIGNS FOR ROADWAY PROJECTS

(See 3-140.00, 3-400.05, 3-400.15, 4-145.00, 4-714.00 and 4-730.10)

The following steps are to be followed in order to assist the ITS, Traffic, and Standards Office in providing signalization and lighting designs in a timely manner as well as to allow the ITS, Traffic, and Standards Office to schedule its work efficiently.

A. When the Transportation Planning Report (TPR) indicates that signalization and/or lighting is required on a project, or if signalization and/or lighting is not included in the TPR, but there is suspicion that signals and/or lighting may be involved in a project, the ITS, Traffic, and Standards Office shall be notified by email of preliminary field review. Designers are reminded that all available design traffic data (including ADT's, DHV's, Design Speed, and traffic turning movements at all intersections) shall be included in the preliminary plans. The ITS, Traffic, and Standards Office will respond to the designer indicating where signalization is warranted, or if no signalization will be involved, give any comments pertaining to geometric improvements that will provide better operations characteristics.

B. For Right-of-Way, the designer shall notify the ITS, Traffic and Signal Design Section by email of the Right-of-Way Field Review.

   The ITS, Traffic, and Standards Office, will provide support pole and lighting pole locations and related information for the Right-of-Way Plans.

C. For Construction Plans the designer shall notify the ITS, Traffic and Standards Office by email of Construction Field Review to ensure that the latest changes will be reflected on the signal and/or lighting layout.

   The ITS, Traffic, and Standards Office, will then complete and submit final signal and/or lighting design, quantities, standard drawings, and applicable notes for Construction Plans assembly.

2-315.05 ROADWAY LIGHTING INFORMATION FOR RIGHT-OF-WAY / UTILITIES

(See 3-140.00, 3-400.05, 3-400.15, 4-145.00 and 4-714.00)

When the Transportation Planning Report (TPR) indicates that lighting is required on a project, the designer shall furnish the ITS, Traffic, and Standards Office, with a set of prints and request a pole location layout. These prints shall be furnished by the designer at the "preliminary plans" stage of project development to ensure that the utility requirements will be shown on the plans for the Right-of-Way Field Review.

If there is no right-of-way acquisition required on the plans, but lighting is required, the designer shall furnish the ITS, Traffic, and Standards Office with a set of prints of the plans as

soon as the present and proposed layout sheets are drawn and request the light pole locations. This is to ensure that the utility requirements will be shown on the plans for Right-of-Way plans submittal.

2-320.00 EASEMENTS - GENERAL (See 3-300.05)

The Right-of-Way Acquisition Table shall have three columns for easements. The first column shall be for Permanent Drainage Easements, the second column shall be for Slope Easements, and the third column shall be for Construction Easements.

Figure 2-25 is a model R.O.W. Acquisition Table.

Figure 2-26 demonstrates how to show various easements on the plans.

2-320.05 PERMANENT DRAINAGE EASEMENT ON PLANS (See 2-200.00)

Slope and Construction Easements shall not overlap Permanent Drainage Easements. The Permanent Drainage Easement shall extend from the Right-of-Way and have precedence over other easements.

Permanent drainage easements may be appropriate for channel changes and realignments or ditches where no ditch existed before the proposed project.

Permanent drainage easements will be required for ponding occurring outside the right-of-way, as discussed elsewhere in this document.

On urban curb and gutter roadway sections, when catch basins must be located outside the right-of-way line to eliminate ponding or when a cross drain pipe and headwalls are installed outside the right-of-way line, permanent drainage easements shall be set up for these structures. Good engineering judgment must be exercised regarding the amount of drainage easement taken.

Riprap, for the protection of proposed structures that are outside of the right-of-way, shall be located within a permanent drainage easement.

There may be isolated instances where permanent drainage easements may be required for other reasons. In these instances, the Right-of-Way Division's concurrence shall be required.

R.O.W. ACQUISITION TABLE

TRACT NO.	PROPERTY OWNERS	COUNTY RECORDS				TOTAL AREA (ACRES)			AREA TO BE ACQUIRED (ACRES)			AREA REMAINING (ACRES)		EASEMENT (SQUARE FEET)		
		TAX MAP NO.	PARCEL NO.	DEED BK.	PAGE	LEFT	RIGHT	TOTAL	LEFT	RIGHT	TOTAL	LEFT	RIGHT	PERM. DRAIN.	SLOPE	CONST.
1	BERT C. NICHOLSON	42	8	16	142											①0.138 AC
2	GINGER BURCHETT	42	9	24	216											②807 ③97
3	GLENN LADD	42	10	30	123	42.006		42.006	3.279		3.279	38.727				
4	IRENE S. MONK	42	11	77	289		52.098	52.098		2099 S.F.	2099 S.F.		52.052			
5	ROBERT L. BRYANT	42	12	63	352	36.699	58.965	95.664	10.146	9.244	19.39	26.553	49.721			

① FOR CONSTRUCTION OF DETOUR

② FOR CONSTRUCTION OF DRAINAGE DITCH

③ FOR CONSTRUCTION OF RETAINING WALL

NOTE: EASEMENT AREAS SHOULD BE SHOWN IN ACRES AND NOTED AS SUCH WHEN GREATER THAN 0.1 ACRES
SQUARE FEET. AREAS ACQUIRED AND REMAINING SHOULD BE SHOWN IN SQUARE FEET AND NOTED AS SUCH WHEN
LESS THAN 0.1 ACRES. IN URBAN PROJECTS THE PREDOMINANT UNITS FOR AREA ACQUIRED AND REMAINING
SHOULD BE SHOWN IN SQUARE FEET.

Figure 2-25
Typical R.O.W. Acquisition Table

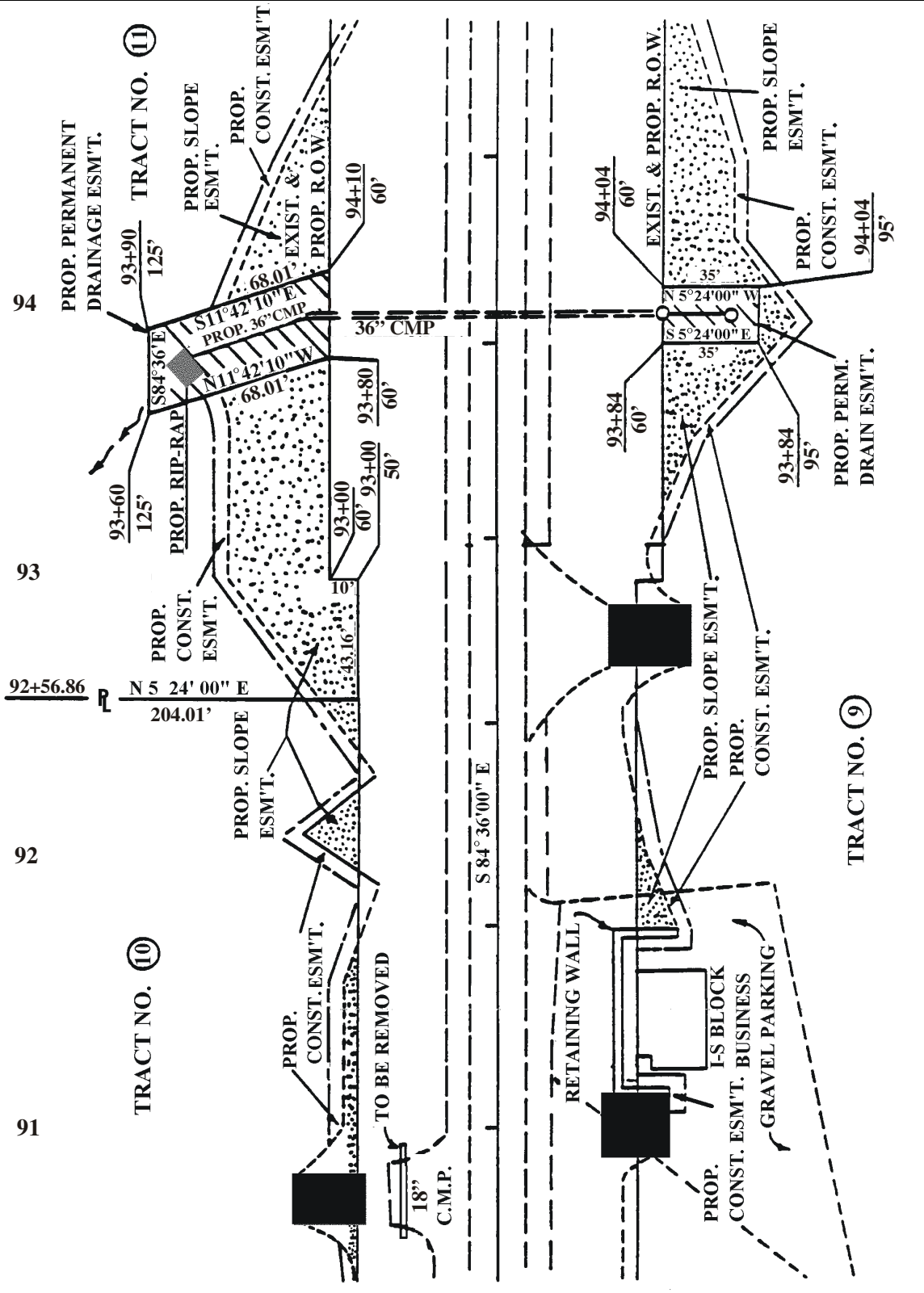


Figure 2-26
Guide for Showing Various Easements in Plans

2-320.10 SLOPE EASEMENTS

The Slope Easement column shall contain only that area outside the right-of-way, required for slopes.

2-320.15 CONSTRUCTION EASEMENTS

All easement areas that do not go in the Drainage Easement or Slope Easement columns, such as detours, some drainage ditches and channel improvements (such as widening or bank stabilization with riprap), locations where a ditch or channel already exists, sediment basins and other erosion prevention and sediment control areas, working room for retaining walls and permanent easement on railroad right-of-way, shall be placed in the construction easement column and footnoted as appropriate.

A 10-foot construction easement, for working outside slope easements, is to be shown on the plans sheet. This construction easement may be reduced or eliminated as necessary to avoid trees, buildings, etc. It may be necessary to increase the easement size to allow for pollution control structures and high fills.

2-320.20 PRELIMINARY RIGHT-OF-WAY ESTIMATE FROM PRELIMINARY FIELD REVIEW PLANS

Design will provide preliminary acquisition areas and slope easement areas to the Right-of-Way Division so that a preliminary right-of-way estimate can be developed. Design managers will be responsible for furnishing a copy of the R.O.W. Acquisition Excel File with acquisition areas and slope easement areas prior to scheduling the preliminary field review.

Designers shall calculate preliminary areas using the following procedure:

1. Calculate acquisition areas and slope easements with MicroStation's Measure Area tool using the Points or Flood methods. It is not necessary to store areas in the GEOPAK GPK file nor should time be spent defining shape elements in MicroStation for area calculations.

2. In the **R.O.W. Acquisition Excel File** provided by Survey and includes owner and tract information; enter the calculated square foot areas on the "DES IN" worksheet.

3. Make a copy of the Excel file and rename it using the State Route Number, County and Pin Number followed by the extension .xls. **Example: SR1Knox405132.00.xls**

4. Consultants shall provide the Excel file to the Design Manager. For projects developed in-house, the designer should submit the excel file to the email address listed below with a copy of the email being sent to the Design Manager.

5. Submit the Excel file via email as an attachment to Preliminary.acquistiontable@tn.gov. Subject line for email should be Preliminary Areas-State Route #, County, PIN. **Example: Preliminary Areas, SR 1, Knox County, PIN 405132.00.** A copy of the email shall be placed in the project folder to document the submittal of preliminary acquisition and slope easement areas.

2-325.00 **RAILROADS** (See 1-210.00, 1-210.05 and 1-210.10)

2-330.00 **FIELD REVIEW PROCEDURES** (See 1-120.00)

CHAPTER 4 - GUIDELINES FOR DESIGN OF ROUNDABOUTS

2-400.00 GENERAL ROUNDABOUT DESIGN PRINCIPLES

TDOT roundabout designs should consist of either a single lane or multi-lane facility for both urban and rural settings. The design of a roundabout requires balancing the needs of the existing and proposed traffic in a given location with providing intersection control that is efficient and user friendly for the traveling public. The design should provide for reduced and consistent speeds throughout the intersection. This will enhance both safety and operational performance at the intersection.

At a minimum, all TDOT roundabouts should follow these basic design principles:

- Provide a yield at all entry points
- Yield right-of-way to circulating vehicles
- Counterclockwise vehicular traffic passes to the right of the center island
- Splitter islands at all approaches providing channelized approaches
- Entry deflection required to control speed
- Maintain consistent speeds throughout
- Limit pedestrian traffic to designated locations at the approach legs
- Parking and private driveways prohibited within the circulatory roadway
- Provide proper sight distance, marking, signing, and visibility

Roundabout designs are site specific to each individual intersection and should not be considered as a template to be used at other locations. The designer should be aware that there is not an absolute design for any given site. Each proposed location will require new information and analysis and may contain site specific design issues to overcome during the project development process.

The basis for these roundabout Design Guidelines is the Federal Highway Administration's (FHWA) Report No. FHWA-RD-00-067, *Roundabouts: An Informational Guide*, dated June 2000. Available on-line, this document is widely considered the most comprehensive guide for planning and designing roundabouts; however, the designer should not consider this document as the rule book for proper design. Other supplemental information and standards of practice have been adopted for these Design Guidelines.

2-405.00 GENERAL ROUNDABOUT DESIGN CONSIDERATIONS

2-405.05 DESIGN SPEED AND DESIGN VEHICLE SELECTION FOR ROUNDABOUTS

A roundabout operates most effectively when the final design results in a desired speed reduction and a consistent speed is maintained throughout the intersection. Design speed is fundamental to attaining desired operational performance at the intersection. The design speed of a roundabout is determined from the fastest vehicle path allowed by the geometry. Geometric and other design features should be properly selected and checked to ensure speeds are appropriately reduced at the approach, entry, circulating lanes, and exit of the intersection. A combination of all design elements working together is ultimately how the final design speed will be dictated. Table 2-6 provides the recommended design speed based on the type of roundabout.

Roundabout Type	Recommended Entry Design Speed R1 (mph)
Urban Single Lane	20
Urban Multi-Lane	25
Rural Single Lane	25
Rural Multi-Lane	30

Table 2-6
Recommended Entry Design Speed (R1) for Roundabouts
Reference: FHWA, *Roundabouts: An Informational Guide, 2000*

The choice of design vehicle should be based on the type of roadway, volume and type of vehicles expected, and the intersection location. For the purpose of most TDOT designs, the AASHTO WB-62 vehicle should be used for designing roundabouts, especially those located on the state highway system, freeway or other controlled access facility ramp terminals, or industrial areas where a high percentage of truck traffic is expected. The circulatory roadway width should readily accommodate a WB-50 design vehicle without the need to track onto the truck apron; however, larger vehicles (WB-62, etc…) are expected to track onto the truck apron.

In cases where a roundabout is being located in an area with minimal truck traffic, or where the roundabout is being located on an urban collector, local road, or where community sensitive design parameters are being used for design, the WB-50 design vehicle may be used for the entire design, including the turning movements check at the truck apron. Where over-sized trucks are expected, the designer may want to consider designing the roundabout for a legal vehicle larger than the WB-62.

The design vehicle should be accommodated while maintaining a minimum 2-foot separation between the truck and the curb face. Additionally, the designer should be aware that for multi-lane roundabouts, large trucks rarely track within the circulatory lanes marked on the pavement and may utilize both lanes, or possibly both lanes *and* the truck apron, while attempting to navigate through the intersection.

2-405.10 HORIZONTAL ALIGNMENT CONSIDERATIONS FOR ROUNDABOUTS

All approaching roadway centerlines should pass near the center of the proposed circle, as close to a 90 degree angle as possible when projected across the intersection. This configuration should allow for necessary entry deflection without creating severe horizontal curvature or reduced stopping sight distance. The designer should attempt to achieve this configuration on most projects. Where this is not possible at an approach, the designer may offset an approach centerline to the left of the circle's center. It is not recommended that any approach leg to a roundabout be offset to the right of the circle's center. A right-of-center layout will result in the alignment entering at a greater tangential angle and may lead to higher entry speeds, greater potential for vehicle roll-over, and increased pedestrian conflicts.

Where feasible, the designer should attempt to equally space entries into the circulatory roadway. For new facilities, adjustments to the approaches in advance of the roundabout may be required. For urban roundabouts, the ability to provide equally spaced entries may not always be possible, especially when existing intersecting roadways are skewed from the mainline. When considering adjustment to approaches the proposed right-of-way cost should be

factored into the final design decision. Where estimated right-of-way and construction costs are excessive, the roundabout design may be eliminated.

2-405.15 LONGITUDINAL GRADE CONSIDERATIONS FOR ROUNDABOUTS

An important factor when determining the optimum location of a roundabout is the longitudinal (profile) grade passing through the intersection. A relatively flat area with minor grade changes for drainage is preferred. The longitudinal grade through a roundabout should be limited to a maximum of 4 percent. Flatter longitudinal grades are preferred. Longitudinal grades in excess of 4 percent are not recommended due to the increased potential for load shifting within semi-trailers traversing the intersection, especially on the down-slope side of the central island, which can result in overturning of the vehicle.

Where a longitudinal grade cannot be designed less than 4 percent, the designer should consider benching the roundabout into a localized flat area and steepening the roadway approaches to the intersection. The design should accommodate for the steeper approach grades by providing adequate braking distance.

Large differences in grades through and around a roundabout can create sight distance problems; refer to the sight distance design criteria in Section 1-225.20 for more information. Roundabout sight triangles should be approximated during the preliminary design stage since they are different than for a normal intersection. Having proper sight triangles is essential to roundabout operation and performance.

2-405.20 RIGHT-OF-WAY REQUIREMENTS FOR ROUNDABOUTS

The purchase of right-of-way may be a determining factor when locating a roundabout. As compared to a traffic signal or a stop-controlled intersection, roundabouts usually require more right-of-way closer to the intersection and less right-of-way further away. Roundabouts designed in tight urban areas where building corners and/or right-of-way corners are close to the intersection may require additional right-of-way so that required sight distances are achieved. Additional right-of-way may also be required to alleviate skewed entries, accommodate multi-lane roundabouts, provide for right-turn bypass lanes, or maintain required intersection sight distances.

If there is a possibility for future expansion of a roundabout from a single lane to a multi-lane facility, the designer should consider designing the roundabout to a multi-lane standard with provisions for expanding the initial roundabout included in the design. The intersection may be opened as a single lane roundabout and then enlarged toward the central island and splitter islands at a later date. Expansion should normally be inward, so the designer should provide an adequately sized inscribed circle diameter and splitter islands if future expansion is expected.

2-405.25 CONSIDERATIONS FOR HIGH SPEED APPROACHES AND RURAL LOCATIONS FOR ROUNDABOUTS

High speed approaches and rural roundabout locations require additional attention because of the need for speed reduction of the approaching vehicles. Any approach to a roundabout with a posted speed of 45 mph or greater should be considered a high speed approach, even if the project site is located in an urban or urbanizing area. At these locations, drivers may not be anticipating a roundabout or any other type of speed interruption. Drivers should be able to discern the impending intersection configuration and react to changing

operational needs. Providing sufficient entry deflection is one of the most important design parameters for roundabouts with high speed approaches.

At high speed approaches or rural locations the designer may consider additional speed reducing design elements including:

- Providing visibility of the roundabout from a greater distance.
- Adding reverse curvature at the high speed approach leg. The reverse curves should have a broad radius at the first curve, moderate at the second, and a sharp radius at the last curve before the yield line. See Section 6.5 in FHWA *Roundabouts: An Informational Guide*, for a graphical representation.
- Alignment and cross-sectional cues to alert drivers of the pending change in geometry such as longer splitter islands for additional deceleration length (see AASHTO recommendations for required braking distance), adding curb or curb and gutter to both sides of the approach, and a transition section where the shoulders narrow for the curbed section.
- Additional signs and pavement markings to supplement geometric features, landscaping features to produce a “tunneling” effect, and roadway lighting.

Standard AASHTO guidelines for island design should be followed for the splitter island designs. This includes using larger nose radii at approach corners to maximize island visibility and offsetting curb lines at the approach ends to create a funneling effect. The funneling treatment also aids in reducing speeds as vehicles approach the roundabout.

For rural locations where a roadway shoulder is being used for a bike route or for urban areas designated as a bike lane, the shoulder should not continue through the roundabout. The roadway shoulder should end approximately 100 feet prior to the yield line and a bicycle ramp should be provided to allow cyclists the option of exiting the roadway to a multi-use path around the roundabout or remaining on the roadway. Riders choosing to continue through the roundabout will be required to merge with the vehicular traffic in both position and speed. The additional lane width of the circulatory roadway should be adequate to accommodate cyclists choosing to pass through the circle. The designer should not specifically mark a shoulder or bike lane within the circulatory roadway.

2-405.30 GRADING AND DRAINAGE CONSIDERATIONS FOR ROUNDABOUTS

The optimum grading scheme for a roundabout is to slope the circulatory roadway away from the central island (i.e. the center of the central island is the highest point in the intersection). This will aid in achieving the desired visibility of the central island to the approaching motorist. The designer should accept the adverse superelevation for left turning and through vehicles in the travel lanes of the circulatory roadway.

While each location will be unique, grading a roundabout to slope away from the central island should follow these general guidelines:

- The ground slope of the central island should not exceed 6H:1V (per AASHTO *Roadside Design Guide*).
- The central island earthen area should always be raised, not depressed.
- The slope of the truck apron should not exceed 4 percent and should normally be between 2 and 3 percent, away from the central island. When the entire intersection is placed on a constant longitudinal grade, special attention should be given to ensure

that the slope of the truck apron on the down-grade side of the center circle does not exceed 4 percent. Apron cross-slopes above 4 percent may lead to roll-over or load shifting within trucks.

- Roadway cross slope of the circulatory roadway should be a maximum of 2 percent sloping away from the center circle. Superelevation sloping toward the central island will normally result in increased vehicle speeds and will additionally result in the need to place stormwater inlets along the truck apron.
- The maximum grade in any direction of travel along the circulatory roadway should be 4 percent.

The designer should note that by sloping the entire intersection away from the central island, visibility is improved since the center of the circle becomes the highest point in the intersection. Sloping the roadway inward is not preferred, unless the design is for a multi-lane roundabout in which one-third of the lane width can slope inwards and two thirds can slope outwards from the central island.

Stormwater runoff should be controlled to minimize sheet flow across the roundabout. The designer should consider the vehicle wheel path traveling through the roundabout when considering placement of catch basins and inlets. The most desirable location of stormwater inlets is between the entrance and exits of the roundabout. Additional inlets in the roundabout may be required and installed above the splitter islands. Concentrated storm drainage that is directed towards a roundabout should be intercepted where practical prior to entering the circulatory roadway. The designer should not place inlets or low points within crosswalks.

Drainage for the circulatory roadway should typically be toward the exterior of the intersection; away from the central island. Inlets should be placed in the outer curb line of the roundabout, away from, and up-slope, of crosswalks. When the roundabout is placed on a roadway with a constant grade that passes completely through the intersection, the designer may be required to place an inlet adjacent to the central island. In rare cases where the central island is large enough and/or contains complex landscaping plans, the designer may consider placing an area drain within the central island to minimize runoff to the roadway.

2-410.00 GEOMETRIC DESIGN ELEMENTS FOR ROUNDABOUTS

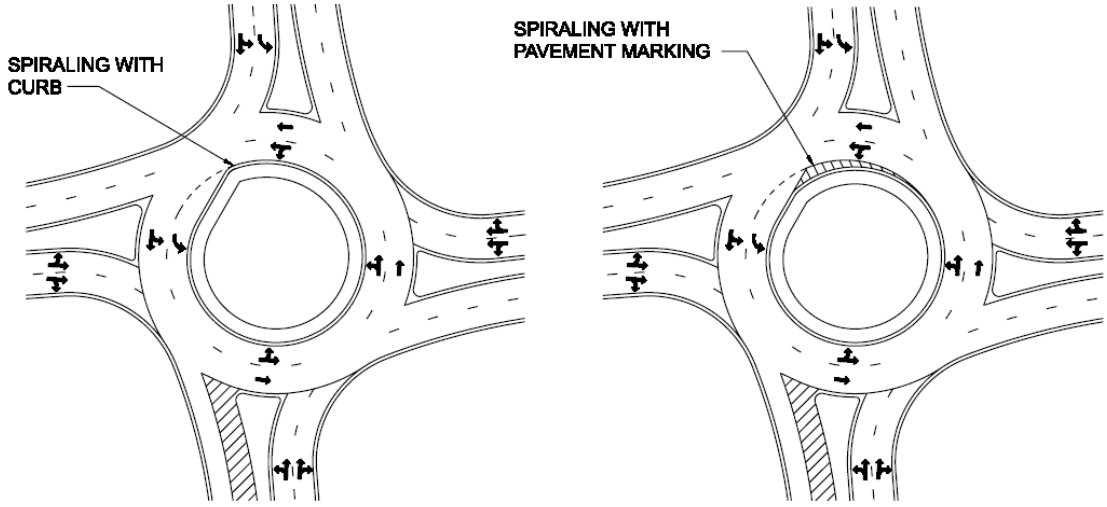
A roundabout intersection incorporates a different group of geometric elements than a traditional signal or stop controlled intersection. Roundabout design ranges should not be considered absolute. Some locations may require the designer to deviate slightly from the given design ranges on an as-needed basis. The following list of geometric features is generally considered the most basic of design elements for a simple roundabout intersection.

1. **Inscribed Circle Diameter (ICD)** is the basic diameter of the roundabout circle. The ICD is measured from curb face to curb face across the largest part of the circle. The ICD size can vary at different parts of the circle due to spirals on the inside lanes (see Figure 2-27). Larger ICDs may help to reduce circulating speeds but may also result in the need for additional right-of-way. Determining the optimal ICD size is typically an iterative process. The designer may consider making minor changes in the size of the ICD, but should also be cautioned from deviating too much from the original requirements of the roundabout traffic model. See the RD-series Standard Drawings for ICD size.

The use of a smaller ICD may not adequately allow for the WB-62 to make a left or u-turn. Ultimately, the design vehicle selected will have a direct influence on the ICD, especially for single lane roundabouts where the ICD is most influenced by the vehicle selected. While a truck apron is required at all roundabouts, the width of the truck apron may be larger when the ICD is small.

2. **Circulatory Roadway Width** is the travelled way width of the roadway for vehicles circulating around the central island. This width is typically measured from the curb face at the central island to the edge of the gutter of the ICD. The width of the circulatory roadway is directly dependent on the entry width into the roundabout, and is typically designed to be 1.0 to 1.2 times as wide as the width of the largest entry. The circulatory roadway width does not include the mountable truck apron.

   Spirals are used to lead vehicles into their proper lane within the circulating roadway and are effective in keeping vehicles in the proper lane as they traverse the roundabout. A spiral is either a hard raised surface or painted line that develops at the central island and continues "spiraling out" until it ties into a circulating lane. Spirals should be considered for use when multiple left-turning lanes are present so that turning movements and through movements do not overlap. Figure 2-27 depicts two options for providing spirals when used in a design at a multi-lane roundabout.



Spiral with Extended Central Island (Preferred)

Spiral with Pavement Marking (Acceptable)

Figure 2-27
Spirals for Multilane Roundabouts

3. **Entry Deflection** is the curvature (deflection) of the roadway as the roadway enters the roundabout. Deflection is used as a passive speed control measure for entering vehicles and should be applied prior to the yield line. Proper and adequate entry deflection promotes reduced entry speed and speed consistency. Deflection also positions the entering vehicle so that the driver can see the circulating vehicles already in the roundabout. Entry deflection has a direct correlation with fastest path speeds, phi angle, truck turning movements, and path overlap, and will ultimately

affect all aspects of a roundabout. Deflection is also critical for preventing wrong way movements at the entries.

If the computed speed at the entry (the speed corresponding to the R1 critical path radius – see Figure 2-30) is high, the designer should consider increasing the entry deflection. To gain additional area for entry deflection, the designer can offset the roadway alignment of the approach leg to the left of the circle center. When used, a left-of-center offset is particularly beneficial to achieving desired deflection at roundabouts with small ICD's.

Entry Width is the width of the entering travelled way as it approaches the roundabout after the flare length has ended (flare length is the distance from approach width to entry width). Entry width is the largest determinant of a roundabout's capacity and has a direct correlation to the fastest path measurement and truck turning movements. The most accurate location for measuring entry width is typically at the end of the splitter island, beginning at the intersection of the yield line and the left edge of the travel way, measured to the right edge of travel way. This measurement should be taken perpendicular to the right (exterior) gutter. Design ranges for entry width are provided on the Standard Drawings.

4. **Entry Radius** is the radius of the curve that leads vehicles into the roundabout. The entry radius is measured at the face of the outer curb line. The designer should use a radius that is small enough to reduce vehicle speeds, but not so small that vehicle turning movements are compromised. Acceptable ranges for entry radius can be found on the Standard Drawings.

5. **Exit Width** is the width at the exit roadway from a roundabout measured from curb face to curb face. The exit width should correlate with the upstream entries and circulating roadway width to ensure that it is wide enough. The designer should ensure that the exit width provided is not too narrow for vehicles as they attempt to leave the roundabout, resulting in possible delays. In general, the exit width should be no less than the entry width and it should transition to the full width cross-section of the receiving roadway.

6. **Exit Radius** is the radius of the curve that leads a vehicle out of the roundabout. The radius is measured along the face of the outer curb line. Exit radii are generally larger than entry radii to allow for smoother exits and minimize the potential for delays; however, to ensure low speeds at the downstream crosswalk, the exit path radius should not be significantly greater than the circulatory path radius either. Ideally, the exit curve should be tangential to the circulatory roadway. Design ranges for exit radius can be found on the Standard Drawings.

7. **Approach Width:** The approach width is the width of the approach leg prior to the flare length. The approach width, or half width, is measured from edge of travel way to edge of travel way.

8. **Right-Turn Bypass Lanes (Slip Lanes):** An exclusive lane used to accommodate a high right-turn volume; whereby, allowing right-turning traffic to bypass the roundabout. See Figure 2-28 for a schematic of a typical right turn bypass lane. In areas that have a high volume of pedestrian traffic, additional attention should be given to the design of the right turn bypass lane to allow for pedestrians to have the

right-of-way. The designer should consider other options for accommodating anticipated right-turn volumes prior to using a bypass lane in an urban environment due to the potential for high pedestrian volumes. However, in some cases, the need for a multilane roundabout may be eliminated by providing a right-turn bypass lane.

For rural roundabouts, right-turn bypass lanes may be considered when their need is warranted. When used, the designer should accommodate for greater vehicle speeds in the bypass lane and an increased risk to pedestrians crossing the quadrant of the intersection where the bypass lane is to be located. The project designer should examine the present and projected pedestrian and bicycle demand at the rural location under consideration, and properly design pedestrian crossings, signalization, and signing at the bypass lane.

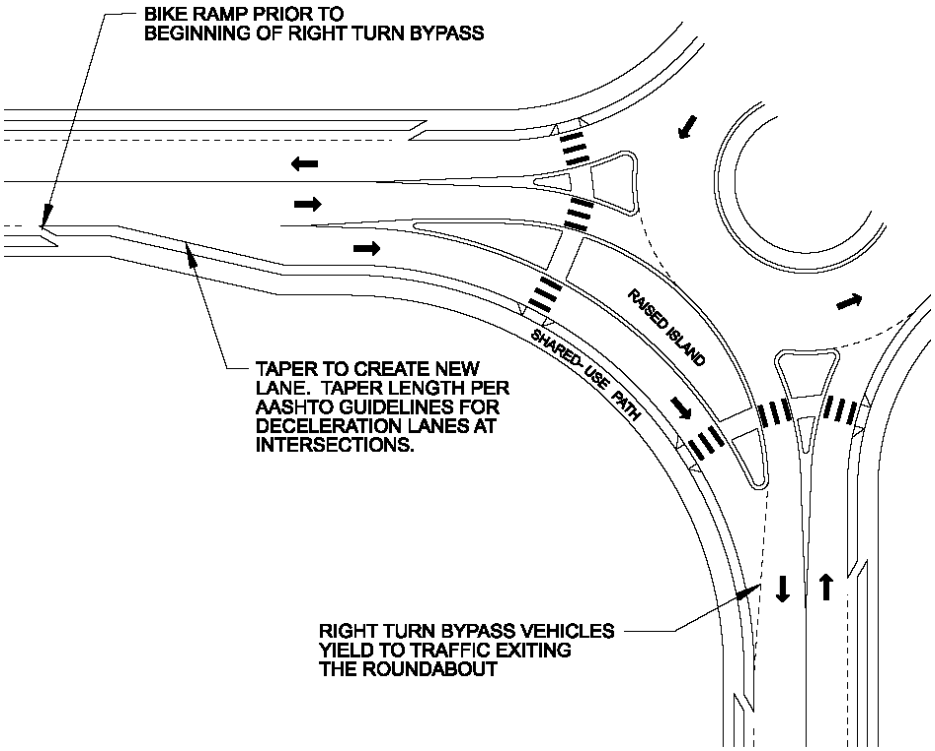


Figure 2-28
Typical Right-Turn Bypass Lane

Where a bypass lane is used, the following design criteria should be considered:

- Run a fastest path check through the bypass lane so that the bypass lane does not produce excessive speeds. Vehicle speeds in the bypass lane should be similar to those in the roundabout.
- Once a vehicle is committed to using the bypass lane, the design should not allow for access back into the circulating roadway.

- Minimizing the radius of the bypass lane may provide greater safety for crossing pedestrians; however, the design vehicle should be checked on all aspects of the bypass lane geometry.
- Traffic exiting the roundabout should be given the right-of-way over traffic exiting any bypass lanes. Providing a yield-controlled entrance onto the adjacent exit roadway from the bypass lane is required.
- In rural locations where right-of-way is available, an acceleration lane with appropriate taper rates based on AASHTO guidelines is the preferred merging method at the end of the bypass lane.
- Pedestrian crossing points should be designed per ADA guidelines in addition to the other requirements found in these roundabout guidelines.
- Proper lighting should be provided, where applicable.

Bypass lanes can potentially add a significant amount of required right-of-way area to the intersection design. The final decision to use a bypass lane should take into account pedestrian and right-of-way constraints. Proper analysis should ensure all right-turn bypass lanes have been justified prior to proceeding with a detailed design.

9. **Truck Apron:** A mountable circular concrete pad along the outer edge of the central island used to accommodate turning movements of larger vehicles. The truck apron is designed to allow the rear tires of large vehicles to traverse the apron as they are making through and left turn movements. The width of the truck apron should be in the range of 6 to 10 feet. Final truck apron design (width) should be based on truck turning analysis (design vehicle tracking) plus a recommended buffer of 2-feet in width for driver irregularity. Truck aprons should not be less than 6 feet wide.

   The truck apron shall not be flush with the traffic lanes nor merely painted on the roadway surface. Truck aprons are not intended for passenger vehicles or small trucks; therefore, a mountable curb that provides enough vertical grade difference should be used so as to appear unappealing to the driver of a smaller vehicle.

   It is preferable that the design of the truck apron provide a color or surface texture contrast from the circulatory roadway. This should normally be accomplished with an asphalt roadway and a concrete truck apron. Where the roadway surface is to be concrete, the designer may consider the use of stamped or colored concrete or brick pavers to achieve this contrast. The use of asphalt on the truck apron should be avoided.

2-420.00 ROUNDABOUT DESIGN CHECKS AND MEASUREMENTS

Roundabouts are generally considered a passive form of intersection control. Roundabouts create a situation in which drivers are expected to slow down as they enter the intersection through the use of visual cues and roadway geometry. Since a roundabout does not require a vehicle to completely stop, the design should ensure that vehicle speeds are reduced as the vehicle enters the roundabout. Vehicles entering at a slow, consistent, and controlled pace are essential to roundabout design, safety, and operation.

Design checks are measurements that are taken on various geometric elements of a roundabout to verify that the design will have sufficient entry angles, proper deflection and speed reduction, adequate area for turning movements, and adequate sight distance. Design checks are also necessary to show that the desired capacity and speed will be maintained for the types of vehicles that are expected to use the intersection. The design check process is essential to a roundabout design. Verifying the design through the use of design checks can be a tedious process, but is necessary for proper roundabout design.

The following design checks should be performed for proper roundabout design:

1. Fastest Path – The measure of a single vehicle's shortest (smoothest) path through a roundabout given the absence of any other traffic and given that the driver ignores all lane markings, traverses the entry, and travels around the central island and through the exit. In order for the designer to determine the maximum expected vehicle speeds at, and through the roundabout, fastest path measurements should be calculated. The fastest path should be measured at all approaches to a roundabout and should include path analysis for all left-turn, right-turn, and through movements at the intersection (i.e. a total of 12 measurements for a 4-leg intersection). Under certain circumstances, the critical path may be the right-turn movement; however, in most cases it will likely be the through movement. The longest of the fastest paths is typically the left-turn movement at the intersection.

   Fastest path measurements are typically taken by constructing a b-spline (polyline) curve in a CADD program. The b-spline curve (See Figure 2-29) should represent the centerline of the vehicle that is attempting to traverse the roundabout at the highest rate of speed possible while ignoring other vehicles, pedestrians, pavement markings, and signing. Three b-spline curves should be constructed for each approach into a roundabout.

   When laying out a b-spline curve, the designer should use an assumed width for a vehicle of 6 feet and to maintain a minimum of 2-feet of clearance from the roadway centerline or any curb face. When constructing b-spline curves for the centerline of the vehicle path, maintain the following minimum offset distances:

   - 5 ft. from face of a concrete curb (2' clearance + 3 ft to center of vehicle),
   - 5 ft. from a roadway centerline, and
   - 3 ft. from a painted edge line (if no curb is present).

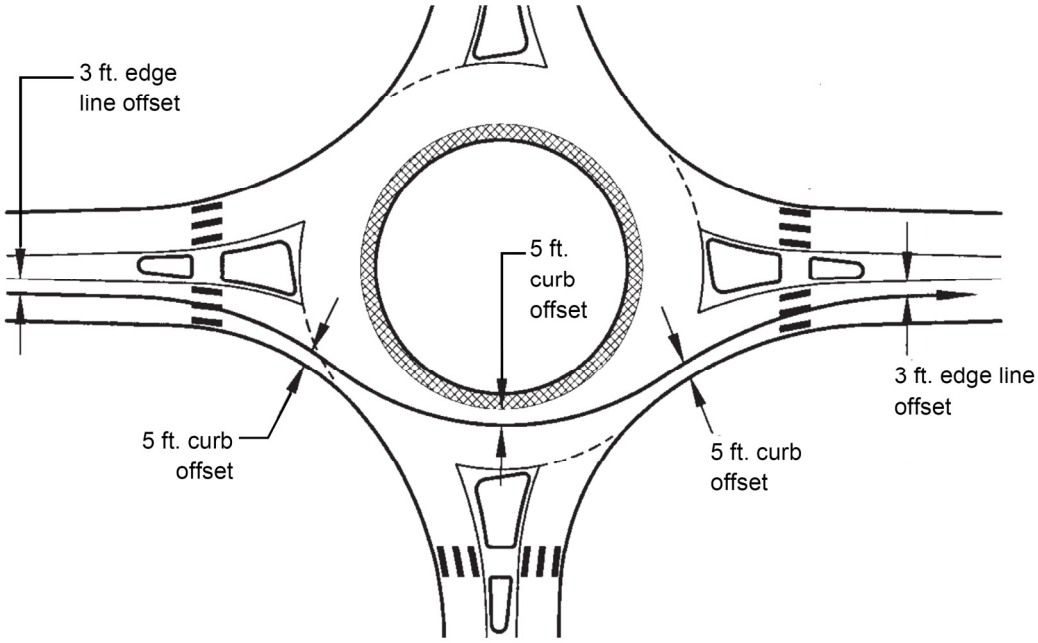


Figure 2-29
Fastest Path for Through Movement at Single Lane Roundabout
Adapted From: FHWA, *Roundabouts: An Informational Guide*

The through movement b-spline curve (as shown above in Figure 2-29) will be constructed to represent a vehicle entering a roundabout, passing to the right of the central island, and exiting the roundabout on the opposite side of the circle. The left-turn movement b-spline curve will be constructed to represent a vehicle entering a roundabout and making a left turn-around the central island. The right-turn movement b-spline curve will be constructed to represent a vehicle entering a roundabout and then making an immediate right-turn out of the roundabout. These movements are depicted in Figure 2-30.

Once the designer has constructed b-spline curves for the through, left-turn, and right-turn movements for each approach to the roundabout, corresponding speeds can be computed from each critical (minimum) path radius measured along the b-spline curve. The five critical path radii in a roundabout are:

- R1 - The minimum radius on the through movement b-spline curve, typically measured prior to the yield line, but not more than 165' prior to yield line.
- R2 - The minimum radius on the through movement b-spline curve measured in the circulatory lanes around the central island.
- R3 - The minimum radius on the through movement b-spline curve measured at the exit to the roundabout.
- R4 - The minimum radius on the left-turn b-spline curve measured in the circulatory roadway around the central island.
- R5 - The minimum radius on the right-turn b-spline curve. Measured at the tightest point.

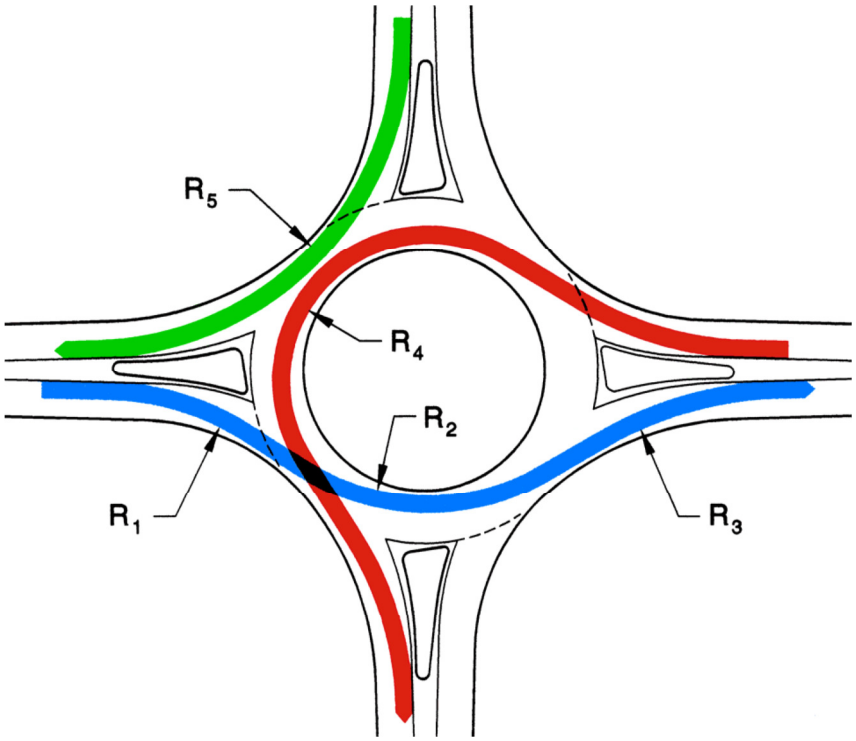


Figure 2-30
Critical Path Radii at a Roundabout
Reference: FHWA, *Roundabouts: An Informational Guide*

It should be noted that critical path radius does NOT equal curb radius. Each critical path radius should be measured in a CADD program; generally the designer can draw a new curve on top of the b-spline curve in order to measure the critical radii. Speeds should be recorded for all critical radii. Once the critical path radii are measured the designer can determine the corresponding speed associated with each critical path radius using methodology in AASHTO's *A Policy on Geometric Design of Highways and Streets*. Figure 2-31 correlates the measured radius to a computed speed using the AASHTO methodology.

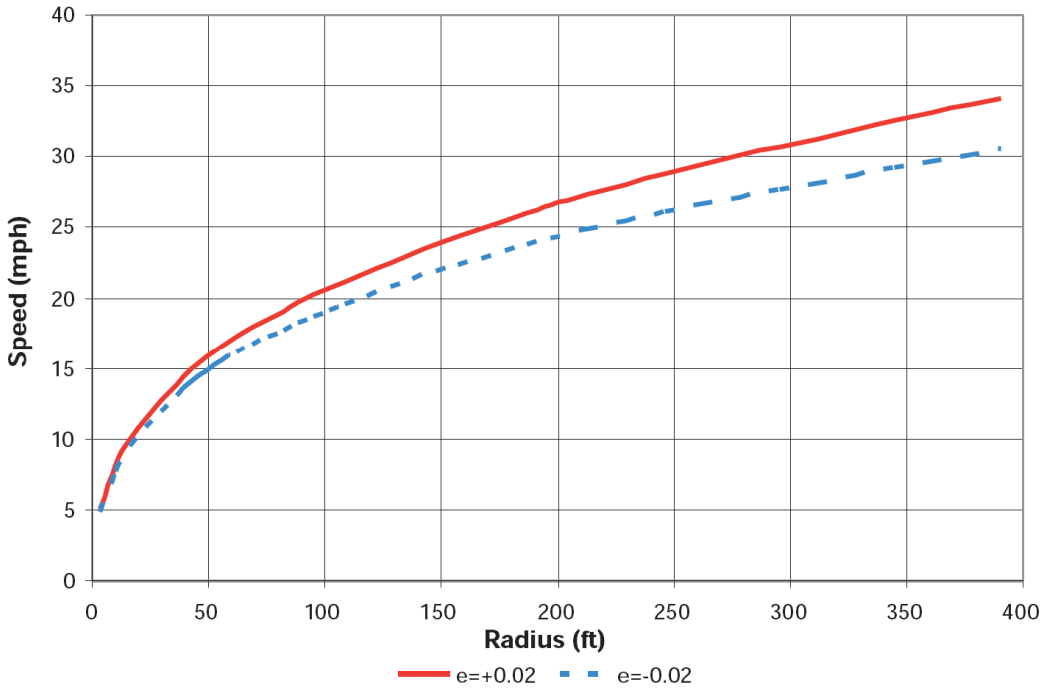


Figure 2-31
Speed-Radius Relationship
Reference: FHWA, *Roundabouts: An Informational Guide*

Figure 2-31 gives the designer an estimate of the maximum speeds through the roundabout at various locations: entrance, circulatory roadway, and exit. Use the +0.02 curve for measurements at the entry and exit (R1, R3, and R5) and use the -0.02 curve for those around the central island (R2 and R4).

Speed consistency is critical and should be checked between all fastest path measurements. The designer should attempt to minimize variations in vehicular speeds. If one path has a speed differential significantly higher than the other paths, that movement will tend to control the roundabout and the lower speed movements will be affected with longer queues. A speed differential of no more than 6 mph is preferred between all paths. Since this may not always be possible, a speed differential of 12 mph shall be considered the maximum allowable. It is preferable for R3 to be greater than R2, and R2 to be greater than R1 (i.e. the entrance has the lowest speed).

When the initial design will not produce adequate speed consistency, the designer has several options for consideration to remedy the situation. The following is a list of options that the designer may consider to correct a speed control problem:

- Adjust the size of the inscribed circle diameter a few feet, either making it smaller or larger as needed.
- Adjust the entry radius by a few feet by either making it smaller or larger.

- Re-design the entry or exit so that the entry angle changes, thus creating more or less deflection as needed.
- Move the entire circle in one direction to increase or decrease the entry deflection.
- Re-evaluate the modeling to determine if a different lane configuration will be acceptable.

Designers should be aware that any change to a geometric element will affect the previously computed roundabout design checks and all checks will need to be re-evaluated after geometric changes are made.

2. Phi Angle – The angle measured between the entering and exiting roadways or in the case of a three legged roundabout, it is the angle measured between the entering and circulatory roadway. When the angle is measured between the entering and exiting roadways, the actual phi angle is half the angle measured. In the case of an angle being measured between entering and circulatory roadways the phi angle is the angle measured.

   Phi angle is typically measured as a design check to verify that the entering roadway, in relation to the nearest exiting roadway, allows a driver to see oncoming traffic within the circle, without the driver having to turn their head in an uncomfortable position. When a driver approaches the yield line, the roundabout geometry should allow for the driver to see oncoming vehicles within the circle without having to look over their left shoulder excessively; whereby producing driver discomfort. Acceptable values for the phi angle typically range from 16 to 40 degrees.

3. Path Overlap – A critical design issue for multi-lane roundabouts occurs when the natural paths of entering and exiting vehicles in adjacent lanes overlap or cross each other. This occurs when a vehicle enters a roundabout and is directed into an adjacent lane once inside the circulatory roadway as shown in Figure 2-32. The existence of path overlap should be checked at both the entrance and exits.

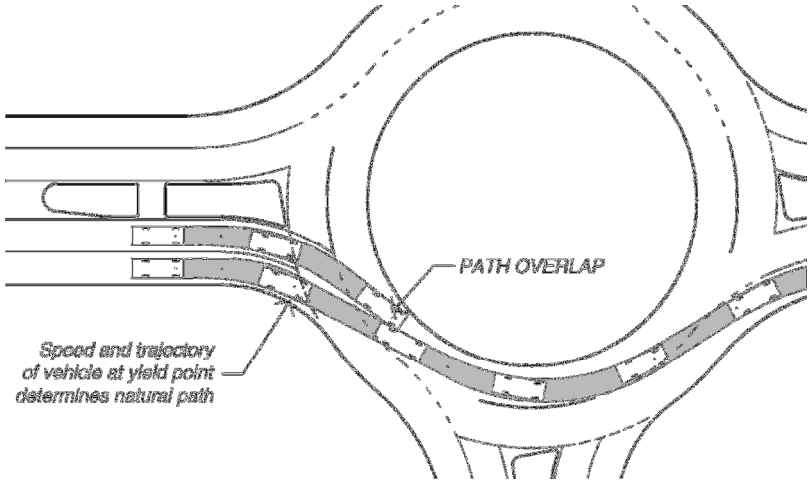


Figure 2-32
Example of Vehicle Path Overlap
Reference: KDOT, *Kansas Roundabout Guide*

Larger exit radii and/or tangential exits will aid in reducing the potential for exit path overlap. The designer can minimize the potential for entry path overlap by providing adequate entry deflection and ensuring multi-lane vehicle entry paths are properly aligned with the circulatory lanes ahead at the yield line. To accomplish this, the designer should locate the entry curve so that the projection of the inside entry lane at the yield line connects tangentially, or nearly tangentially, to the curb line ahead at the central island, as see in Figure 2-33.

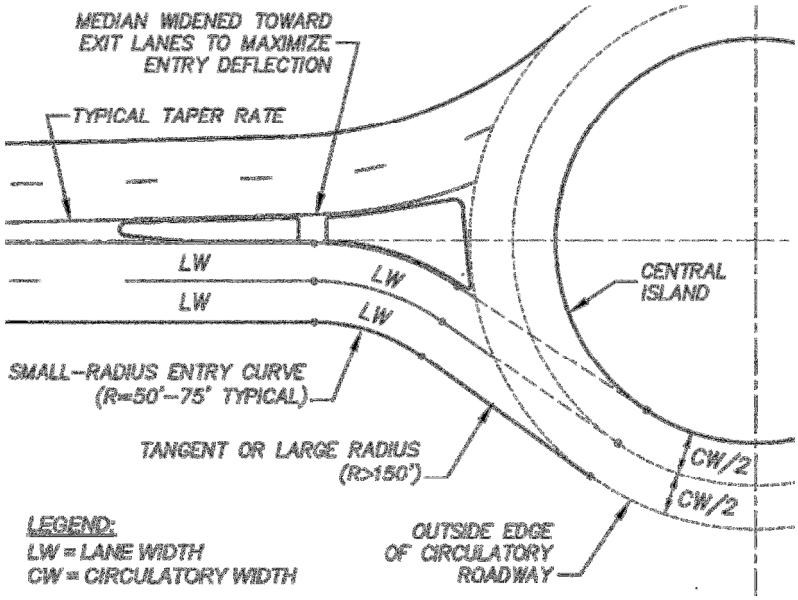


Figure 2-33
Good Path Alignment into Multi-Lane Roundabout
Reference: FHWA, *Roundabouts Technical Summary (FHWA-SA-10-006)*

Multi-lane roundabouts should be designed to minimize the potential for entry and exit path overlap which results in reduced operational performance due to unbalanced lane utilization on the approach. The designer should be particularly aware of path overlap, since it can lead to a higher rate of side-swipe collisions and may be adverse to the desired capacity of the roundabout. FHWA's *Roundabouts: An Informational Guide, 2000*; provides additional suggestions for eliminating path overlap at a multi-lane roundabout.

4. Truck Turning Movements – Truck movements should be reviewed for all roundabout designs to verify that the design vehicle can properly navigate all required turns. The right-turn movement tends to be the most challenging movement for a truck. The roundabout should be designed so that the truck tires do not track over the exterior concrete curbing or combined curb and gutter for the right-turn movement, nor over the splitter island curbing at the entry and exits. Trucks that are continuing through the roundabout or making a left turn can use the truck apron within the central island.

   TDOT roundabouts should be designed to accommodate a WB-50 vehicle within the traffic lanes, with the WB-62 design vehicle (or larger) expected to have to track over the truck apron. The truck apron at the central island will allow larger vehicles to track around the central island.

5. Stopping Sight Distance/Intersection Sight Distance – Key elements to safety and operating speed of a roundabout. There are three critical types of stopping sight distance that should be measured at roundabout intersections. Approach stopping sight distance, stopping sight distance on the circulatory roadway, and stopping sight distance to a crosswalk. These distances are normally measured to verify that there are no obstructions within the sight lines (triangles). Refer to FHWA's *Roundabouts: An Informational Guide* or the Standard Drawings for diagrams on the proper method for measuring stopping sight distance.

   When measuring intersection sight distance there are two conflicting approaches for a vehicle entering the roundabout. Intersection sight distance with the conflicting upstream entry and intersection sight distance within the circulatory roadway should be determined. Each should be checked independently and each should be measures along the expected vehicular path on the roadway, not as a straight line. While studies have shown that providing the minimum intersection sight distance may actually aid in speed reduction at some locations; for TDOT projects, speed should be controlled with geometric and other design elements, not by means of limiting sight distance. See Section 1-225.10 for additional speed reduction design elements.

   Stopping sight distance to crosswalks should be verified for both the entry and exit of the roundabout; especially at the exit crosswalk. NCHRP (Report 572, 2007) studies have shown that a higher percentage of drivers do not yield to pedestrians at the exit when compared to the entry. The proper design of the exit is essential to ensure adequate sight lines are provided between the driver and the pedestrian and that speeds are held to the desired amount. The designer should consider additional design features that will provide improved safety to pedestrians at crosswalks.

The roundabout design process should be considered an iterative process throughout the design. There may be several acceptable designs for a given location that will meet the desired performance objectives; however, this is rarely achieved on the first design iteration. Because of this, it is advisable that the designer prepare the preliminary layout drawings to a "sketch" level of detail. Design components are interrelated, and changing one affects others, so it is important that the designer evaluate the performance of the entire intersection design as changes are made to ensure that the individual components are compatible. If a change is made to one component of a roundabout design such as the ICD size, angle of approaches, or lane width, the designer should verify that other components of the roundabout will still meet the design criteria.

The flow chart in Figure 2-34 provides the general procedure and steps for designing a typical roundabout.

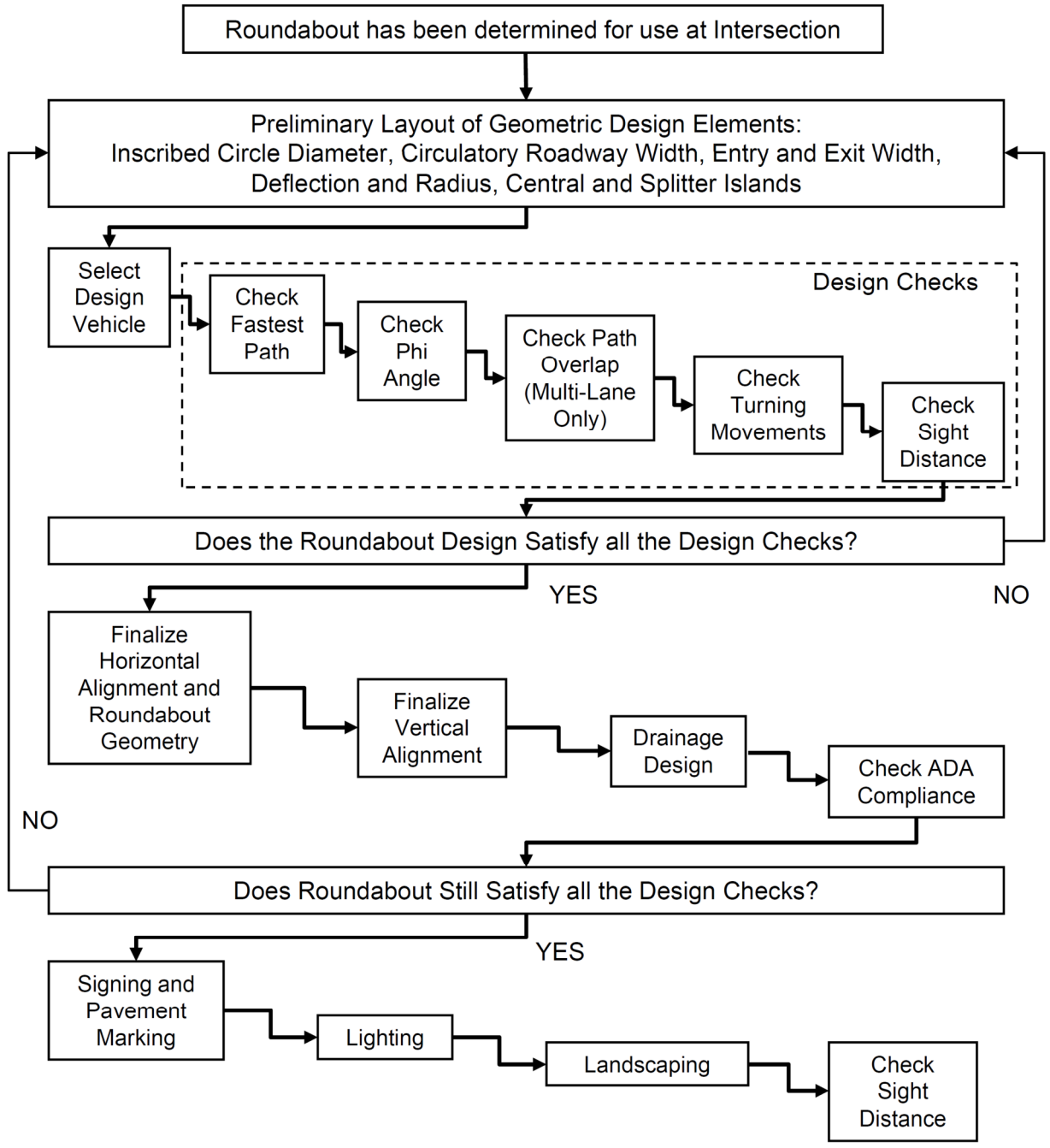


Figure 2-34
Typical Roundabout Design Procedure

2-430.00 ROADWAY DESIGN CONSIDERATIONS FOR ROUNDABOUTS

2-430.05 DETERMINING ROUNDABOUT LOCATION

For projects utilizing a roundabout for intersection control, optimum location, project goals, and system considerations should be reviewed before formal design begins. These additional design considerations should take into account existing and proposed grades, availability and cost of right-of-way, proximity to other intersections (especially signalized intersections), railroad crossings, intersecting roadway skew angles, and private driveway locations.

2-430.10 ROUNDABOUT PROXIMITY TO OTHER INTERSECTIONS

Roundabout proximity to other types of intersection control should be considered when determining a location for a roundabout. The typical spacing between intersections where one or more of the intersections is a roundabout, will generally be shorter than a series of signalized or stop controlled intersections. There is no absolute minimum distance between a roundabout and another intersection. In order to determine a satisfactory distance, a queue length evaluation should be completed prior to commencing with design. This queue length evaluation should include all queue lengths associated with the roundabout and any adjacent signalized or stop controlled intersections.

2-430.15 ACCESS MANAGEMENT AND PRIVATE DRIVEWAYS AT ROUNDABOUTS

Parking will not be allowed within the circulatory roadway of roundabouts designed by the Department. The designer should attempt to minimize or avoid locating on-street parking areas within the splitter island area or within the transition to the splitter island. For new designs, parking should be terminated a minimum of 75 feet from the yield point, which is at the entrance to the circulatory roadway.

Where driveways are present, the designer should consider methods for locating private driveways outside of the roundabout, so that a vehicle cannot take direct access to the circulatory roadway from the private property. Additionally, the designer should avoid providing private driveways anywhere within the vicinity of the splitter island. Where this is unavoidable, the driveway connection should be designed with a small raised island restricting traffic to a right-in/right-out movement, and the designer should check for proper sight distance to the left of the driveway for vehicles entering or exiting the roundabout. For most TDOT projects, driveway access between the crosswalk and yield line at the entrance (or exit) to the roundabout will not be permitted except under extraordinary circumstances.

Bus stops should be located as far away as possible from the entries and exits and should not be placed within the circulatory roadway or within the area of the splitter islands. Pedestrian crossing areas at the splitter islands should not be used for bus stop locations.

2-430.20 RAILROAD CROSSINGS AT ROUNDABOUTS

Roundabouts should not be designed at a location where the existing railroad line will pass through the center circle (or any portion) of the roundabout. The exception to this will be where an existing intersection is being reconstructed, and an existing rail line currently passes through the intersection. Even in this case, the designer should explore all options for re-locating the roundabout to a location that the rail line crosses only one leg in proximity to the

roundabout. In all cases involving a project in close proximity to a railroad track, the designer should acquire a queue length evaluation to ensure that vehicles will not queue onto the active rail line. Other options to minimize the possibility of a vehicle being on the railroad track is to pre-empt the roundabout with gates or flashing beacons at all the entrances and the exit feeding to the railroad track.

2-430.25 SERIES OF ROUNDABOUTS

Roundabouts should be evaluated for installation along a corridor, because they have advantages and disadvantages over traditional signalized corridors and may provide for design flexibility in urban and developing areas. Traffic and planning studies should be evaluated before considering a corridor containing a series of roundabouts. Each roundabout in a corridor or ramp interchange should be designed as a completely new intersection, just as a designer would treat a series of signalized intersections.

Roundabouts typically tend to have a higher capacity and lower delays than a traditional signalized intersection. This leads to shorter travel times through roundabout corridors than through signalized corridors.

2-430.30 ROUNDABOUTS USED AT INTERCHANGES

Roundabouts may be considered as an acceptable design option for intersection control at interchange ramp locations. Unlike a typical stop or signal controlled interchange, roundabouts generally require less space between ramps. This may save on right-of-way costs when considering a new interchange, especially when right-of-way is constrained or when the interchange is located near a narrow structure such as an underpass or overpass. Additionally, when designing a roundabout in close proximity to an interstate or other controlled access route approved for large trucks, the WB-62 design vehicle should be used for analysis.

Sight distance should be a significant design parameter when designing tightly spaced roundabouts at interchanges. The designer should verify that bridge abutments, piers, and/or bridge railings do not interfere with sight distance requirements. A full traffic analysis should be performed before a roundabout is considered at an interchange since roundabouts will be closely spaced. Additionally, an analysis should be performed to verify that required and appropriate signing can be adequately provided and visible to motorists at both new and retrofitted interchange locations.

2-440.00 PEDESTRIAN, BICYCLE, AND ADA CONSIDERATIONS FOR ROUNDABOUTS

The number of pedestrian/vehicle conflict points is reduced when a roundabout is used for intersection control. Since a roundabout may not have pedestrian signal phases or pedestrian push-buttons, and does not require vehicles to make a complete stop, other measures should be designed to ensure drivers and pedestrians are clearly able to see each other. Proper design should produce conditions needed to allow vehicles to yield to the pedestrians and at a reduced speed.

Since a goal of any roundabout is to reduce speeds without actually stopping the vehicles, a properly designed roundabout will reduce the risk of pedestrian/vehicle collisions due to the slow speeds expected. There are design elements that may be beneficial to pedestrian

safety when designing the crosswalks at a roundabout. The following general design criteria should be considered for crosswalks at roundabouts:

- Minimized crossing distance to reduce pedestrian exposure to traffic.
- Where possible, crosswalks should be designed to provide pedestrians a straight walking path across the traffic lanes (90 degrees to traffic flow preferred), including any right-turn bypass lanes. This may not apply to small single lane approaches where a straight crossing route can be provided regardless of splitter island or roadway deflection.
- To minimize out-of-direction travel for pedestrians, crosswalks should be located as close as possible to the intersection while still maintaining required queue space for vehicles. A mid-block pedestrian crossing near a roundabout is not recommended.
- At single lane roundabouts, crosswalks should typically be located one vehicle length (approximately 20 feet minimum) behind the yield line; this gives the driver at the yield line the ability to concentrate on entering the roundabout.
- For multi-lane roundabouts crosswalks may be located one vehicle length behind the yield line. A designer may need to "bend" crosswalk alignments at the splitter island, where necessary to provide 90 degree crossings at the entrance/exit lanes where possible.
- Splitter islands should be a minimum width of 6 feet at the narrow end of the island – 9.5 feet preferred. The refuge area (gap) within the splitter island should be 10' long. Therefore the minimum dimensions for the refuge area should be 6' x 10'. See the Standard Drawings.
- The finished grade of the pedestrian crossing (refuge) areas within the splitter islands should be at or slightly above the elevation of the adjacent pavement. The designer should avoid elevating the refuge area except the minimal amount needed for proper drainage.

Additional details for crosswalks can be found on the Standard Drawings. The Standard Drawings for handicap ramps provide details for ramps at the exterior curb cuts for crosswalks. The splitter island refuge area should be wide enough to accommodate multiple modes of pedestrian traffic including side-by-side wheelchairs, bicycles with trailers, pedestrians, and pedestrians with baby strollers.

Accommodating designs for visually impaired and disabled pedestrians should be a priority at roundabouts since those pedestrians tend to rely on audio signals more than other pedestrians. Roundabouts generally do not require audio devices for pedestrian crossings, but in special cases they may be needed at a roundabout. In addition, detectable warning surfaces should be provided at all paths, including the splitter island refuge area, leading to any traffic lane. The Design Division's handicap ramp Standard Drawings and roundabout Standard Drawings provide detectable warning surface details. All pedestrian facilities should be designed to comply with the latest version of the Americans with Disabilities Act.

The TDOT bicycle and pedestrian policy requires consideration be given to providing provisions for bicycles to be integrated into new construction and reconstruction of roadway projects through design features appropriate for the context and function of the transportation facility.

Bicyclists should be given a choice when approaching a roundabout of either going through the roundabout and mixing with the vehicles in the circulatory stream, or exiting the roadway prior to entering the roundabout and continuing around the roundabout on a shared-

use path (sidewalk) with pedestrians. To optimize safety and the most efficient operation of the roundabout, bicyclists should be provided with shared-use paths around the perimeter of the roundabout. For the purposes of most TDOT design projects, the designer should provide bike ramps for exiting the roadway to the shared use path, and then ramps for re-entering the roadway, bicycle lane, or roadway shoulder on the opposite side of the roundabout.

The bicycle exit ramp (the ramp the bicyclist uses to exit the roadway prior to the roundabout) should be provided prior to the pedestrian crossing or at least 100' prior to the yield line, whichever of the two is greater. At the exits, a bicycle entrance ramp should be provided after a pedestrian crosswalk or 100' from the exit, whichever is greater.

Bicycle ramps should be a minimum 6' wide between the roadway and the shared-use path. This width will be large enough to accommodate a bicycle pulling a child cart, but small enough to prevent a vehicle from using it. The bicycle exit and entrance ramp should typically be placed at a 20 to 45 degree departure angle from the roadway. A perpendicular bicycle ramp is not recommended since it would require a bicyclist to stop their forward momentum as they exit (or enter) the roadway. See the Standard Drawings for details of bicycle entrance and exit ramps.

Where cyclists prefer to pass through the roundabout, the designer should treat them as a vehicle in the circulating stream. Any designated bike lanes on the approach to the roundabout should be terminated a minimum of 100 feet upstream of the yield line. This will allow the bicycle to mix with the traffic, both in lane position and speed. Specific pavement markings for bicycles should not be present within the circulatory roadway.

If the roundabout is being designed at a location where there is a designated shared-use path, the design should include those geometric features detailed on standard drawing RD-TS-8. To minimize confusion between bicycle ramps and pedestrian ramps, detectable warning surfaces should be placed at the top of the bicycle ramps rather than at the bottom as is the practice with pedestrian ramps. At rural and urban locations where current pedestrian and bicycle traffic is not significant, but expected to increase, the designer should include measures in the plans to accommodate future needs or demands. These may include:

- Rough grading the perimeter of the roundabout to accommodate future sidewalks, landscaping buffer strip, shared use paths, etc…
- Installing handicap ramps or lowered curb at logical "future" locations along perimeter curbing
- Providing cut-throughs (gaps) at the splitter islands for future crosswalks
- Obtaining adequate right-of-way to accommodate future measures including lighting

Additionally, the designer should refer to the AASHTO Guide for the Development of Bicycle Facilities, 1999.

2-450.00 SIGNING AND PAVEMENT MARKING FOR ROUNDABOUTS

The concept for signing and marking a roundabout is similar to standard intersection signing and marking. The signing and marking plan should stress proper regulatory, advanced warning, and directional guidance to provide positive guidance to the motorist. Each roundabout design will be unique, and the signing and marking plans can become complex. Signing and marking needs are different for urban and rural applications and for varying types of roundabouts.

All signing and marking plans should conform to the current edition of the *Manual on Uniform Traffic Control Devices* (MUTCD). The FHWA's *Roundabouts: An Informational Guide*, the Design Division's *Traffic Design Manual* and the Standard Drawings may be used for additional reference or guidance for signing roundabouts and the approaches to a roundabout.

The following additional sign criteria should be considered for roundabouts over that which may be present at a normal intersection:

- Roundabout ahead signs
- Advanced diagrammatic guide signs and markings
- Yield signs on more than one approach to an intersection
- Long chevron plate typically used in the center circle
- Exit guide signs

For urban roundabouts, the design will need to balance providing adequate signing for a more familiar user of the intersection with the tendency to use too many signs. Street name signs are typically considered a necessity for urban locations. For rural applications, where higher approach speeds are expected and normal signage and geometric features will not produce the desired reduction in speed, the designer should consider the following additional measures:

- Large advanced warning signs
- Word markings on the pavement
- Speed reduction warning signs

Additional requirements for pavement markings and signs for bicycles can be found on the T-M-series Standard Drawings.

2-460.00 ROADWAY LIGHTING FOR ROUNDABOUTS

Illumination may be requested at urban and suburban roundabouts and the design should be coordinated with local officials. The lighting of rural roundabouts is recommended, but may not be necessary in all circumstances. The decision to illuminate a rural intersection should be on a case-by-case basis and will depend on factors such as availability of a power source, volume of anticipated night-time vehicular or pedestrian traffic, and available sight distance. Regardless of lighting, a roundabout intersection should be signed and marked in accordance with the *Manual on Uniform Traffic Control Devices.* The design of roundabouts can vary greatly from project to project; therefore, specific illumination guidelines and design criteria is not appropriate. When lighted, the following features and guidance should be considered by the designer for lighting a roundabout intersection:

- Roundabouts should be illuminated from the outside in towards the center circle. For vehicles approaching the intersection, this will improve the visibility of the central island and of the vehicles already in the circulating stream of the roundabout. Avoid placing light poles within the central island.
- Good illumination should be provided at the approach nose of splitter islands, all conflict areas where vehicles are entering the circulating stream, and at locations where traffic departs from the circulation to exit the roundabout.

- Pedestrian crossings and bicycle merging areas should be given special consideration. Light poles placed 10 to 30 feet in advance of a crosswalk is recommended to provide positive contrast on the pedestrians.
- Clear zone requirements from the AASHTO *Roadside Design Guide* should be considered when lighting is provided. Illumination poles or masts should not be placed within small splitter islands, on the right-hand perimeter just downstream of an exit point, or on the central island directly opposite of an entry roadway.
- In rare cases when it is desired to illuminate objects within the central island the designer should consider using ground-level lighting that shines upward and away from the nearest edge of pavement. In these cases a separate electrical disconnect should be provided for blackout protection.
- It is recommended that the approach and/or exit roadways serving the roundabout be illuminated up to 260 feet beyond the final trajectory changes at each exit, especially at rural sites where lighting is used.
- Short dark areas between a series of roundabouts or dark areas between an illuminated roundabout and an existing illuminated roadway section should be avoided.

On projects developed for the Department with proposed lighting, the designer (or consultant) should forward a set of preliminary plans to the Signal and Lighting Office to determine the need (if any) for lighting, level of illumination, and pole locations at the time of the preliminary plans submittal.

2-470.00 LANDSCAPING GUIDELINES FOR ROUNDABOUTS

Properly designed landscaping typically increases the efficiency of the roundabout and improves safety of the circulatory intersection. For urban areas, landscaping may be requested by the local entity to enhance the aesthetics of the intersection. Landscaping can improve intersection performance and safety for the following reasons:

- When used at the right and/or left of the approaches, vehicle speeds are typically reduced due to the tunneling effect perceived by motorists.
- Landscaping makes the central island more conspicuous (noticeable) to drivers; whereby indicating to the approaching driver that they cannot pass straight through the intersection.
- Properly placed landscaping obstructs the motorists view across the intersection; whereby forcing drivers to look in the standard left and right directions.
- In high pedestrian areas, landscaping will tend to channel pedestrians to designated cross-walk locations reducing unwanted pedestrian/vehicle conflict points. This is vital since roundabouts may not have pedestrian push buttons and signals.

The central island, large splitter islands, and the approaches to the intersection present opportunity for landscaping; however, the landscaping should be designed to optimize safety and operation. The designer should consider the following guidelines for developing a safe, effective, and low-maintenance landscaping plan for a roundabout:

- Maintain required stopping and intersection sight distance for the circulatory roadway around the central island. Keep the outside 6 feet of the central island (above the truck apron) free from significant landscaping features except very low-growth plants and grass (preferable) to maintain sight distance. In no case should this width be less than 6 feet; however the actual width may be greater and should be determined by computing the required circulatory roadway and intersection sight distances.

- Avoid landscaping in splitter islands except where the island is long and/or exceptionally wide. When used, the maximum height of landscaping features at maturity should not exceed 30 inches measured from the nearest pavement edge to the tallest point of the mature vegetation, including the curb height. See RD-SD-2.
- Consider low maintenance, drought resistant grasses and hearty plant material in the raised center island, larger splitter islands, and buffer strips. Minimize fixed objects (trees, large boulders, walls, etc…) in as much as possible. Avoid trees with large canopies. The central island should be considered similar to a median, with all objects being breakaway.
- Splitter islands can be hardscaped (concrete, textured concrete, brick pavers, etc…) to reduce maintenance and maintain required site distances. A hardscaping that is different from the sidewalk or shared-use path is recommended to ensure that pedestrians and bicyclist do not confuse the splitter island with a sidewalk.
- The designer should avoid placing benches, street furniture, or plaques and monuments with small text in the central island so as not to attract pedestrians to the center island.

When landscaping is requested by the local government, the designer should coordinate with the local agency for development of the landscaping plans and for specific landscaping features that may be requested at the intersection, especially for those located in urban or historic districts. Additional guidance regarding landscape design may be found in TDOT Landscape Design Manual.

SECTION III - RIGHT-OF-WAY PLANS

CHAPTER 1 - GENERAL GUIDELINES

CHAPTER 2 – DRAINAGE

3-410.02 PLACEMENT OF TREES IN MITIGATION AREAS

SECTION III - RIGHT-OF-WAY PLANS

CHAPTER 1 - GENERAL GUIDELINES

3-100.00 ROADWAY DESIGN CHECKLIST - R.O.W. PLANS (See 1-105.00)

3-102.00 SIZE OF FULL-SIZE PLAN AND CROSS-SECTION SHEETS (See 2-112.00 and 4-112.00)

3-105.00 IDENTIFICATION OF SUPERVISORS, DESIGNERS, AND CHECKERS ON TITLE SHEET (See 2-115.00)

The signature block in the lower left corner of the project title sheets shall conform to the samples shown in these guidelines.

3-105.05 SIGNATURES OF THE COMMISSIONER AND THE CHIEF ENGINEER ON TITLE SHEET (See 4-115.05)

Please refer to the appropriate Instructional Bulletin for signatures on the title sheets for lettings, right-of-way submittals, and utility submittals.

3-105.10 CONSULTANT'S SEAL, SIGNATURE, AND DATE ON TITLE SHEET

When a consultant submits plans for R.O.W. Appraisals and Acquisition, the consultant's seal, signature, and date shall be placed on the right side of the title sheet above the Chief Engineer's signature.

3-110.02 DESIGN EXCEPTION REQUESTS

Despite the range of flexibility that exists with respect to the controlling elements of design, there are situations in which the accepted criteria are not applicable to the project circumstances or could not reasonably be met. For such instances, when it is appropriate, the design exception process allows for the use of criteria other than the accepted values.

The design exception process requires formal approval for exceptions relating to the following 13 controlling criteria: (1) design speed, (2) lane width, (3) shoulder width, (4) bridge width, (5) structural capacity, (6) horizontal alignment, (7) vertical alignment, (8) grades, (9) stopping sight distance, (10) cross slopes, (11) superelevation, (12) vertical clearance, and (13) horizontal clearance (other than the clear zone).

The approval authority for design exceptions on the Interstate System or the Appalachian Development Highway System is with the **FHWA Division Administrator**. The approval authority for design exceptions on any other system is with the **TDOT Director of the Design Division**.

Design exception requests for Interstate or Appalachian Development Highway System projects shall be submitted to the FHWA Division Administrator **from** the Director of the Design Division.

All applicable material from the following list shall be addressed in narrative form on the **Design Exception and Justification Form**, shown in Figure 3-1, by the Design Division, Design Manager who is responsible for the design of the project for which the design exception request is made. For locally developed projects, the highest local official responsible for the project is responsible for this task.

1. Accident experience or data.

2. The effect of the variance from the design standard on safety and operation of the facility.

3. Any safety mitigation measures considered and provided to minimize the effect of the reduced design.

4. The compatibility of the design and operation with adjacent sections.

5. The comparative cost of the full standard versus the lower design being proposed.

6. The long term effect of the reduced design as compared to the full standard.

7. The difficulty in obtaining the full standard such as right-of-way restriction, delays, environmental impacts, etc.

8. Any capacity reductions or operational problems caused by the proposed exception.

9. Level of service for full standards versus the reduced design.

10. The cumulative effect of more than one standard that is being reduced.

11. The possibility of improving or correcting the reduced design feature in the future.

The completed design exception including any attachments shall be submitted to the appropriate Assistant Director (C.E. Manager 2). The design exception will then be distributed to a Design Exception Review Committee appointed by the Director of the Design Division. The Design Exception Review Committee will review the exception and provide a recommendation regarding approval of the design exception. If necessary, the review committee will provide the Design Manager with any comments regarding the proposed exception prior to making a recommendation regarding approval of the exception.

Approved design exceptions **shall** be noted, with approval date, in the lower right corner of the title sheet.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
NASHVILLE, TENNESSEE 37243-1402

(DESIGN EXCEPTION REQUEST AND JUSTIFICATION FORM)

TO: _____, Division Administrator, FHWA (Exceptions requiring FHWA approval)
Director, Design Division, TDOT (All other exceptions)

FROM: _____, Director, Design Division, TDOT (Exceptions requiring FHWA approval)
Design Manager, Design Division, TDOT
Highest Local Official Responsible for the Project, Title (Locally Developed Projects)

DATE: _____

SUBJECT: **Design Exception Request**
Project No. _____
Pin No. _____
Project Description: _____

CONTROLLING CRITERIA FOR WHICH EXCEPTION IS REQUESTED:

Design Speed	☐	Lane Width	☐	Shoulder Width	☐	Grades	☐
Horizontal Alignment	☐	Vertical Alignment	☐	Cross Slopes	☐		
Stopping Sight Distance	☐	Superelevation	☐	Bridge Width	☐		
Horizontal Clearance (other than clear zone)	☐	Vertical Clearance	☐	Structural Capacity	☐		

DESIGN EXCEPTION REQUESTED:

_____

_____

(Note: List location and controlling element of the feature when an exception is requested. Example: 1) Station 4+50, 30 mph horizontal curve 2) Station 10+00 to 13+00, 11ft. lane width instead of 12ft. 3) 20 mph vertical alignment (Sag K=24) instead of 40 mph)

Figure 3-1
Design Exception and Justification Form

DESIGN DATA:

Highway Functional Classification: _____
Standard for the Above Classification: _____
Existing Posted Speed: _____
Proposed Posted Speed: _____
Type of Terrain: _____
Rural or Urban Area: _____
Traffic Data: ADT (20_____): _____ D: _____
ADT (20_____): _____ T: _____
DHV: _____ V: _____

DESIGN FEATURES:

	Standard	Existing	Proposed	N/A
Cross Slope:				
Superelevation:				
Minimum Radius of Curve:				
Minimum Stopping Sight Distance:				
Minimum "K" Value for Crest Vertical Curve:				
Minimum "K" Value for Sag Vertical Curve:				
Maximum Grade:				

ROADWAY TYPICAL SECTION:

	Standard	Existing	Proposed	N/A
Horizontal Clearance: (Other than the clear zone)				
Shoulder Widths:				
Outside Shoulders:				
Inside Shoulders:				
Lane Width:				

BRIDGE FEATURES:

	Standard	Existing	Proposed	N/A
Traffic Lane Widths:				
Outside Shoulder Widths:				
Inside Shoulder Widths:				
Load Capacity or Sufficiency Rating:				
Vertical Clearance:				
To Waterway:				
To Other Highway:				
To Railroad:				

Figure 3-1 (Continued)
Design Exception and Justification Form

FACTORS CONSIDERED:

(Note: Each of the following factors shall be addressed in narrative form. If a factor is not applicable, or data is not available, only the appropriate box needs to be checked. For factors that are not a consideration, justification should be included.)

1) **Accident experience or data**
   Data Available ☐ No Data Available ☐ Not Applicable ☐

2) **Effect of the variance from the design standards on safety and operation of the facility**
   Effect considered ☐ No effect on the facility ☐ Not Applicable ☐

3) **Safety mitigation measures considered and provided**
   Measures provided ☐ Measures not justified ☐ Not Applicable ☐

4) **Compatibility of the design and operation with adjacent sections**
   Considered ☐ Not a Consideration ☐ Not Applicable ☐

5) **Comparative cost of the full standard versus the lower design proposed**
   Considered ☐ Not a Consideration ☐ Not Applicable ☐

6) **Long term effect of the reduced design as compared to the full standard**
   Considered ☐ Not a Consideration ☐ Not Applicable ☐

7) **Difficulty obtaining the full standard such as right-of-way restriction, environmental impacts, etc.**
   Considered ☐ Not a Consideration ☐ Not Applicable ☐

8) **Capacity reductions or operational reductions caused by the design**
   Considered ☐ Not a Consideration ☐ Not Applicable ☐

9) **Level of service for the full standard versus the proposed design**
   Considered ☐ Not a Consideration ☐ Not Applicable ☐

10) **Cumulative effect of more than one standard that is being reduced**
    Considered ☐ Not a Consideration ☐ Not Applicable ☐

11) **Possibility of improving or achieving the full standard feature in the future**
    Applicable ☐ Not Applicable ☐ Not on the state highway system ☐

Figure 3-1 (Continued)
Design Exception and Justification Form

DESIGN EXCEPTION AND JUSTIFICATION:

(Note: This section shall include a narrative description of the design exception request and includes a recommendation for approval)

ATTACHMENTS:

(Note: Include appropriate items such as plan prints, accident data, estimates, sketches, photos, etc.)

DESIGN EXCEPTION REVIEW COMMITTEE RECOMMENDATION FOR APPROVAL:

_____, Assistant Director, Design Div., Region 1 and 2

_____, Assistant Director, Design Div., Region 3 and 4

_____, Assistant Director, Design Div., Consultant Management

_____, Assistant Director, Design Div., ITS, Traffic, & Standards

_____, Assistant Director, Design Division, Design Support

☐ Comments Attached

APPROVED:_____ _____

Division Administrator, FHWA **Date**
(Director, Design Division, TDOT)

cc: Quality Assurance Section

Figure 3-1 (continued)
Design Exception and Justification Form

3-110.05 SOILS AND GEOLOGY REPORTS (See 3-140.00)

On all projects which have grade and drain, the Soils and Geology Report shall be requested approximately one month prior to scheduling the Preliminary Field Review. A set of plans **with existing contours** on the present layout sheets and cross-sections should be placed on FileNet. An email notice should be sent to the Geotechnical Engineering Section of the Materials and Tests Division for a Soils and Geology Report requesting a Soils and Geology Report. The email should include the Request for Soils and Geology Report Form in MS Word (*.doc) or *.pdf format included as an attachment. A copy of the email shall be placed in the project folder to document the submittal. The designer is to submit a request for C.B.R. tests, which will be needed for pavement design. If a grade or alignment change is made on the project subsequent to the submission of the plans, then replacement plan sheets and cross-section sheets are to be resubmitted.

All soils data shall be incorporated into the plans prior to submission of final Right-of-Way Plans.

Once soils data is added on the cross-sections, a set of plans and cross-sections should be placed on File Net. An email notification should be sent to the Geotechnical Engineering Section requesting review and approval, once the plans have been placed on FileNet. A copy of the email shall be placed in the project folder to document the submittal. On projects with major geotechnical considerations, the Geotechnical Engineering Section may request the plans and/or cross-sections for review at other stages of plans development.

A copy of the Request for Soils and Geology Report Form is shown in Figure 3-2.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
NASHVILLE, TENNESSEE 37243-1402

REQUEST FOR SOILS AND GEOLOGY REPORT

TO: Mr. Len Oliver
Civil Engineering Manager 2
Geotechnical Engineering Section
Materials and Tests Division
6601 Centennial Boulevard
Nashville, TN 37243-1016

FROM: Design Manager
Design Division

DATE OF REQUEST: DATE REQUESTED BACK:

WE REQUEST SOILS SURVEY DATA, C.B.R. and WATER SAMPLE RESULTS, IF NEEDED ON:

PROJECT NO. : COUNTY:

ROUTE NO. : PROJECT LENGTH:

DESCRIPTION OF PROJECT:

PLANS HAVE BEEN ADDED TO FILENET ON 06/15/2011 UNDER THE FILE NAME 040028-01-GeologicalReportRequest.pdf FOR YOUR USE.

REMARKS:

Figure 3-2
Request for Soils and Geology Report Form

3-115.00 UPDATING SURVEYS

All additional survey information requests will be sent to the Regional Survey Supervisor responsible for the survey. An email copy of the request will be forwarded to the Survey Coordinator's Office in Headquarters.

Requests will normally take place following the **Preliminary Field Review** and the **Right-of-Way Field Review**, if necessary. Every effort will be made to make sure all additional information required is requested at these times, this will cut down on the number of times survey crews are sent out repetitively on the same project.

It is the designer's responsibility to thoroughly review their survey information and additional needs prior to requesting additional information from the Regional Survey Office. This will aid in minimizing multiple trips to the project by survey crews.

All requests will consist of a transmittal letter, or the use of *AdditionalSurveyRequestForm.xlt* located under the TDOT Letters tab in Microsoft Excel (New), either option will include:

PIN (from PPRM)
P.E. NUMBER
COUNTY
ROUTE
PROJECT DESCRIPTION

When requesting additional information, requested information will be shown either in electronic format or on a marked set of prints. Also, it may be necessary to include GEOPAK information. This is covered in the CADD Guidelines.

If wetlands were not identified on the original survey, the location and extent of missing wetlands will be requested in one of the additional information requests. Prior to requesting additional information, that includes wetland locations; the Design Division will contact the Environmental Division and make sure wetlands have been marked.

Add the date(s) of the original survey and each survey update in the lower right side of the Right-of-Way Title Sheet.

3-120.00 REVISIONS ON UNECONOMIC REMNANTS

The Regional Office adding the uneconomic remnant acquisition to the plans will submit a plan change request. The parent (original) tract will be left as it appears in the acquisition table. Place the uneconomic remnant in the table separately as an 8000 series number using the parent tract number as the last digits. For example, Tract 25 would be Tract 8025. The "Total Area Acquired" column for Tract 8025 will be the area required from Tract 25 as an uneconomic remnant. In order to identify the remnant properly, it shall be specially shown on the property map and the present layout sheets with broken single cross hatching and labeled as an uneconomic remnant. If an uneconomic remnant is sold, the word "Sold" shall be added to the table of acquisition by footnote. The word "Sold", name of grantee, and date of transfer shall be placed on the property map and present layout sheets adjacent to the remnant.

3-125.00 PAVEMENT DESIGN REQUESTS (See 3-125.05)

The design of a pavement structure takes into consideration many forms of input. Several of these are traffic loadings, soil characteristics (C.B.R. tests), materials availability, construction requirements, past performance, quality control and departmental policy. Paving sections are analyzed for structural capacity and for life-cycle cost. Because of these factors, pavement designs will be set by the Pavement Design Section only. On field reviews, any comments relating to pavement sections shall be noted in the field review report and then brought to the attention of the Pavement Design Section. After reviewing the requested change with the designer, the Pavement Design Section will make the final decision on changes to be incorporated into the project plans relative to paving.

The Pavement Design Section will furnish pavement designs on projects where concrete pavement or plant mix asphalt pavement is required, except for state industrial access projects, metro-urban resurfacing projects, and 100% state resurfacing projects. For BRZE and BR-STP projects with an ADL (Average Daily Loading) of 150 or less, or an ADT (Average Daily Traffic) less than 1,000 and percent trucks less than seven, pavement sections shall be designed as in Section 3-125.05.

For all pavement design request submittals, a pavement design request packet should be emailed to TDOT.PavementDesign@tn.gov. A copy of the email shall be placed in the project folder to document the submittal. The request will be submitted at the same time plans are submitted for preliminary field review. For projects not requiring a preliminary field review, the request shall be submitted upon completion of setting the line and grade. Each person listed in the CC section of the request for pavement design form should be copied on the email along with the design manager. The pavement design request packet shall consist of a single .pdf file that contains the request for pavement design form shown in Figure 3-3, plan sheets (title, typical sections and proposed layout sheets, a traffic report which includes an ADL for the mainline and any other major roads or streets within the limits of the project and soils report once it is received should be forwarded. This information is needed to analyze the needs of side roads, overlays, pavement alternates and other pavement design features.

The naming convention for the pavement design request packet will include the PIN # and the Region #, XXXXXX-XX-PavementDesignRequest-RegX.pdf. If there are modifications, including submitting additional information, then the naming convention will be *XXXXXX-XX-PavementDesign-RegX-Rev-00-00-00.pdf*. Revised pavement design requests will contain the packet in its entirety - i.e. letter, plans, traffic report and soils report.

Example: 123456-00-PavementDesignRequest-Reg1.pdf

When assembling the .pdf file, select small file size or default file size in Adobe Acrobat Standard in order to keep the pavement design request packet under the 15 MB email limit. If the file exceeds 15 MB, the designer should split the packet into multiple emails and add the Part 1, Part 2, etc. to the naming convention.

Example: 123456-00-PavementDesignRequest-Reg1-Part 1.pdf

For the Roadway Plans prepared by consultants, the pavement design request package should be prepared as described above and emailed to the Roadway Design Manager for

review. Upon acceptance, the design manager will forward the package to TDOT.PavementDesign@tn.gov. A copy of the email shall be placed in the project folder to document the submittal.

The pavement design request package should be resubmitted whenever major design revisions are made that could affect the pavement design as determined by the Design Manager.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
DESIGN DIVISION
PAVEMENT DESIGN SECTION
SUITE 1300, JAMES K. POLK BUILDING
Nashville, Tennessee 37243-1402

REQUEST FOR PAVEMENT DESIGN

DATE: _____ DESIGNER: _____
COUNTY: _____ ROUTE: _____
PROJECT NO. _____ PIN: _____
DESCRIPTION: _____
_____

PROPOSED LETTING DATE:_____

PLEASE CHECK THE BOX FOR ALL DESIGN ITEMS THAT APPLY TO YOUR PROJECT.

NEW ALIGNMENT ☐
WIDENING ☐
INTERSECTING ROADS ☐
RESURFACING ☐
DETOUR ROAD ☐
TRAFFIC TO BE MAINTAINED DURING CONSTRUCTION ☐

OTHER COMMENTS:_____

ATTACHMENTS		**DATE REQUESTED**
TRAFFIC REPORT W/ADL'S	☐	_____
SOILS REPORT	☐	_____
PDF OF PLANS	☐	(TITLE, TYPICAL SECTIONS, PROPOSED LAYOUT)

PLEASE EXPLAIN ANY MISSING ATTACHMENTS (include date requested for soils and traffic):

_____

_____

cc: Design Manager

Figure 3-3
Request for Pavement Design Form

3-125.05 PAVEMENT DESIGN - SELECTED BRZE AND BR-STP (See 3-125.00)

For BRZE and BR-STP projects with an ADL of less than 150, the pavement design can be obtained by using the County Soils Groupings, shown in Table 3-1, and Tables 3-2 and 3-3.

ADL's will not be provided when ADT's (Average Daily Traffic) are 1,000 or less and percentage of trucks is 7% or less. In this case, use Pavement Design No. IV for ADT less than or equal to 200 and Pavement Design No. I for ADT greater than 200 but less than or equal to 1,000.

Two examples are given as follows:

1.) The designer has a BRZE project in Hamblen County. The ADL is 53. First, go to the County Soils Groupings, Table 3-1, to obtain the Group No. which is 2. Then refer to Table 3-2, go to the column for Group 2 and down to the row containing 53 ADL. This determines that Pavement Design I shall be used. Refer to Table 3-3 to obtain the pavement design (1.25 in. "D" mix, 2.00 in. "B-M2", 3.00 in. "A" mix, and 8.00 in. "303-01").

2.) The designer has a BRZE project in Hamblen County. The ADT is 874 and the percentage of trucks is 5. No ADL is given, because the ADT and truck percentage is low. As stated above, Pavement Design I shall be used. Refer to Table 3-3 to obtain the pavement design (1.25 in. "D" mix, 2.00 in. "B-M2", 3.00 in. "A" mix, and 8.00 in. "303-01").

When the existing road is crushed stone base only or base and double bituminous surface treatment, the roadway surface shall be replaced in kind.

When the shoulders are 4 feet or less, the designer will distinguish on the field review whether the shoulder shall be stone and double bituminous surface treatment or paved with 1.25 inches of 411 D-mix.

The proposed roadway pavement shall be a higher type or equal surface than that of the shoulders.

When using ADT's for pavement design, use design year traffic.

COUNTY	GROUP	COUNTY	GROUP	COUNTY	GROUP
Anderson	2	Hamilton	3	Morgan	4
Bedford	3	Hancock	6	Obion	5
Benton	2	Hardeman	3	Overton	6
Bledsoe	6	Hardin	2	Perry	3
Blount	4	Hawkins	6	Pickett	5
Bradley	1	Haywood	4	Polk	5
Campbell	4	Henderson	3	Putnam	6
Cannon	4	Henry	3	Rhea	1
Carroll	4	Hickman	4	Roane	4
Carter	6	Houston	6	Robertson	4
Cheatham	3	Humphreys	5	Rutherford	6
Chester	4	Jackson	6	Scott	2
Claiborne	2	Jefferson	4	Sequatchie	3
Clay	6	Johnson	6	Sevier	1
Cocke	5	Knox	4	Shelby	5
Coffee	4	Lake	3	Smith	3
Crockett	4	Lauderdale	4	Stewart	5
Cumberland	5	Lawrence	5	Sullivan	4
Davidson	3	Lewis	4	Sumner	3
Decatur	3	Lincoln	3	Tipton	5
Dekalb	3	Loudon	6	Trousdale	4
Dickson	6	McMinn	3	Unicoi	6
Dyer	5	McNairy	4	Union	5
Fayette	5	Macon	4	Van Buren	5
Fentress	2	Madison	4	Warren	5
Franklin	4	Marion	3	Washington	4
Gibson	5	Marshall	4	Wayne	5
Giles	5	Maury	5	Weakley	4
Grainger	6	Meigs	3	White	4
Greene	5	Monroe	3	Williamson	3
Grundy	2	Montgomery	4	Wilson	2
Hamblen	2	Moore	3		

Table 3-1
County Soil Groupings

FLEX ADLs	COUNTY SOIL GROUP NUMBER					
	GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5	GROUP 6
1-19	I	I	III	III	III	IV
20 - 29	I	I	I	I	III	III
30 - 39	I	I	I	I	I	III
40 - 59	II	I	I	I	I	I
60 - 89	II	II	I	I	I	I
90 - 119	II	II	II	I	I	I
120 - 150	II	II	II	II	I	I

Table 3-2
Pavement Design Number

MIX TYPE	PAVEMENT DESIGN NUMBER			
	I	II	III	IV
"D"	1.25"	1.25"	1.25"	1.25"
"B-M2"	2.00"	2.00"	2.00"	2.00"
"A"	3.00"	3.00"	----	----
303-01 or 02	8.00"	10.00"	12.00"	8.00"

Table 3-3
Pavement Design

3-130.00 ABANDONMENT OF WATER WELLS

If during the location and design phase it is determined that a water well requires abandonment, the Design Office shall request information at the time shown on the Project Activity Status Sheet (see 1-110.00) by notifying the Geologist Water Well Program, Division of Water Supply, 401 Church Street, Sixth Floor L & C Tower, Nashville, Tennessee 37243-1549, telephone 1-800-523-4873 or (615) 532-0176. The Design Office shall also request an inspection of the well and recommendations concerning sealing. Quantities and bid items shall then be set up in the project plans for the contractor to perform the actual sealing of the well.

When requesting a well inspection and recommendations for sealing from the Water Management Division, the designer shall provide the following:

1. A print of the title sheet and of the plan sheet showing the location of the well.

2. The name, address and telephone number of the driller, the date the well was drilled and the name and telephone number of the property owner at the time the well was drilled, if the information is available.

The designer shall take the initiative to ensure that this information is returned in time to incorporate it into the project plans. The well shall be located on the proposed layout sheet and a note added as to whether the well is to be sealed by the contractor.

Every effort is to be made to ensure that this information is on the project plans before turning them in for the letting. All water wells shall be sealed in accordance with the standards set forth by the Tennessee Department of Environment and Conservation (TDEC).

3-140.00 FIELD REVIEW PROCEDURES (See 1-120.00, 2-315.00. 2-315.05, 3-110.05 and 3-330.00)

3-145.00 NOTICE OF INTENT (NOI) FORM

The Notice of Intent (NOI) is an application for the General National Pollutant Discharge Elimination System (NPDES) Permit for Discharges of Stormwater Associated with Construction Activities. This permit is required for any project which will result in the disturbance of one (1) acre or more of total land area. The NOI form should be completed by the Storm Water Pollution Prevention Plan (SWPPP) consultant.

CHAPTER 2 – DRAINAGE

3-200.00 DRAINAGE MANUAL

To assist the designer performing drainage and hydrologic design, the Design Division has developed a Drainage Manual to provide a collection of applicable drainage criteria, policies and examples. The Manual discusses Tennessee Department of Transportation policies, practices and procedures for performing drainage design and hydraulic analyses on projects that are the responsibility of TDOT.

Designers shall use Chapters 1 through 11 of the Design Division's Drainage Manual for all projects designed or constructed by TDOT. These chapters include:

Chapter 1	Introduction
Chapter 2	General Drainage Policies and Practices
Chapter 3	Drainage Plan Requirements
Chapter 4	Hydrology
Chapter 5	Roadside Ditches and Streams
Chapter 6	Culverts
Chapter 7	Storm Drainage Systems
Chapter 8	Stormwater Storage Facilities
Chapter 9	Energy Dissipators
Chapter 10	Erosion Prevention and Sediment Control
Chapter 11	Natural Stream Design

Limited copies of the Manual will be distributed for internal use only. Consultants and other interested persons may download the Manual from the TDOT Internet site. The Manual can be found at:

http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/DrainManChap%201-11.htm

3-200.01 SELECTION OF PIPE MATERIALS

See Drainage Manual, Chapter 6, Section 6.04.2 Culvert Size and Type Selection.

3-200.05 COMPARISON OF LARGE PIPES WITH BOX CULVERTS

See Drainage Manual, Chapter 6, Section 6.04.2.2.2 Selection of Large Pipes vs. Box Culverts.

3-200.10 BRIDGE END DRAINS

See Drainage Manual, Chapter 7, Section 7.03.6 Bridge End Drains.

3-200.30 USE OF TRENCH OR SLOTTED DRAIN PIPE

See Drainage Manual, Chapter 7, Section 7.03.3.4 Use of Longitudinal Drains.

3-205.00 END TREATMENT FOR CROSS DRAINS (UNDER MAINLINE)

See Drainage Manual, Chapter 6, Section 6.04.3.1.1 End Treatments for Culverts Under Mainline.

3-205.05 END TREATMENTS FOR CROSS DRAINS (UNDER PUBLIC SIDE ROADS)

See Drainage Manual, Chapter 6, Section 6.04.3.1.2 End Treatments For Culverts Under Public Side Roads.

3-205.10 END TREATMENTS FOR SIDE DRAINS

See Drainage Manual, Chapter 6, Section 6.04.3.1.3 End Treatments For Culverts Under Private Drives.

3-205.15 END TREATMENTS FOR MEDIAN DRAINS

See Drainage Manual, Chapter 6, Section 6.04.3.1.4 End Treatments For Median Crossovers.

3-205.20 PLACEMENT OF HEADWALLS ON CULVERTS

See Drainage Manual, Chapter 6, Section 6.04.3 Selection of Appurtenances.

3-215.00 PLANS FORMAT FOR CROSS DRAINS

See Drainage Manual, Chapter 6, Section 6.04.1 Site Layout.

3-216.00 SUBMISSION OF ALL CULVERT SECTIONS

See Drainage Manual, Chapter 6, Section 6.02 Documentation Procedures.

3-220.00 USE OF PIPE CULVERTS OTHER THAN "ROUND" PIPE

See Drainage Manual, Chapter 6, Section 6.04.2.2.1 Use of Pipe Culverts Other Than Round Pipe.

3-225.00 HYDRAULIC COMPUTATION RECORDS

See Drainage Manual, Chapter 6, Section 6.02 Documentation Procedures.

3-230.00 IMPROVED INLET GUIDELINES

See Drainage Manual, Chapter 6, Section 6.04.3.2 Improved Inlets.

3-235.00 MANHOLES IN PAVEMENT AREA

See Drainage Manual, Chapter 7, Section 7.03.5.7 Manholes in the Pavement Area.

3-236.00 COMPUTATION OF SIZE FOR CIRCULAR MANHOLES AND CATCH BASINS

See Drainage Manual, Chapter 7, Section 7.03.5.5 Pipe Connections to Structures.

3-240.00 STOCK PASSES

See Drainage Manual, Chapter 6, Section 6.04.3.5 Stock Passes.

3-250.00 CATCH BASIN GRATE ELEVATIONS SHOWN ON THE PLANS

See Drainage Manual, Chapter 7, Section 7.03.3.6 Catch Basin Grate Stations and Elevation Shown on the Plans.

3-251.00 USE OF CATCH BASINS WITH STRUCTURAL STEEL GRATE UNITS

See Drainage Manual, Chapter 7, Section 7.03.3.3.1 Use of Inlets with Structural Steel Grates.

3-253.00 PERFORMANCE OF NUMBER 38, 39, 40, 42, 43 AND 44 AREA DRAINS IN SUMP CONDITIONS

See Drainage Manual, Chapter 7, Section 7.04.4.3 Inlet Performance at Sag Points.

3-255.00 SPACING BETWEEN CATCH BASINS FOR MAINTENANCE CLEAN OUTS

See Drainage Manual, Chapter 7, Section 7.03.5.6 Spacing Between Catch Basins and Manholes.

3-256.00 USE OF JUNCTION BOXES

See Drainage Manual, Chapter 7, Section 7.03.5.4 Junction Boxes.

3-260.00 ALTERNATING CATCH BASINS

See Drainage Manual, Chapter 7, Section 7.03.5.1.1 Alternate Catch Basins.

3-261.00 USE OF NO. 6-72 CATCH BASINS

See Drainage Manual, Chapter 7, Section 7.03.5.1.2 Use of No. 6-72 Catch Basins.

CHAPTER 3 - PLANS DEVELOPMENT AND CALCULATIONS

3-300.00 AREAS SHOWN IN RIGHT-OF-WAY ACQUISITION TABLE

Acquisition Areas and Easement Areas of 0.100 acres or more shall be shown in acres to 3 decimal places. Areas less than 0.100 acres shall be shown to the nearest square foot.

Right-of-way areas left and right shall be based on the centerline used for construction. If the proposed centerline is changed during design, it shall be necessary to re-compute the areas left and right supplied with the survey and appearing in the TOTAL AREA columns of Figure 2-21 of the guidelines.

3-300.05 EASEMENT AREAS (See 2-320.00)

3-305.00 R.O.W. NOTES FOR ALL R.O.W. PROJECTS (See 2-300.00)

3-305.05 R.O.W. NOTES ON PLANS REGARDING DRIVEWAYS (See 2-300.05)

3-305.06 NPDES PERMITTED PROJECTS

All projects which require a NPDES permit shall add the Erosion Prevention and Sediment Control (EPSC) Notes found in Section 6-290.03, Erosion Prevention and Sediment Control Special Notes, NPDES and shall follow the guidance indicated in Section 6-290.03 to determine if “Special Notes” are required.

3-305.07 UTILITY RELOCATION NOTES ON EPSC PLANS

All projects which require utility relocations as part of the contract shall add the notes found in Section 6-290.04, Erosion Prevention and Sediment Control Special Notes, Utility Relocation.

3-305.08 SPECIAL EPSC NOTES

Special Erosion Prevention and Sediment Control (EPSC) Notes found in Section 6-290.00 shall be added to the first sheet of the EPSC Plans. Placement of these notes shall follow the guidance indicated in Section 6-290.00 to determine if a particular note is required.

The designer should add any additional Special EPSC Notes which provide project specific information on requirements for the proposed EPSC measures, as well as specific steps the contractor is to take in the execution of the EPSC Plan. These notes should also be added to the first sheet of the EPSC Plans.

Any additional Special EPSC Notes provided by the Environmental Division shall be shown on the first sheet of the EPSC Plans.

3-305.10 PRIVATE DRIVEWAYS SHOWN ON R.O.W. PLANS (See 2-300.05)

3-305.15 GUIDELINES ON CONSTRUCTION AND RESURFACING OF PUBLIC ROAD INTERSECTIONS AND DRIVEWAYS ON HIGHWAY PROJECTS

(See 2-300.10)

3-310.05 HANDICAP RAMPS

Right-of-Way plans for new construction or reconstruction projects shall accommodate the appropriate curb ramp and truncated dome surface details shown on the current standard drawings. The handicap ramp Standard Drawings detail four (4) types or layouts of handicap ramps that can be used at intersections depending upon the site layout, topography, and right-of-way constraints. Types 1 and 2 are the preferred types to be used. Types 3 and 4 are appropriate for areas with right-of-way constraints. Designers should indicate the type ramp to be used at each intersection on the plans. Designers should use the estimated quantities for a 90 degree intersection on a 0.0% grade when calculating quantities for intersections other than 90 degrees or with grades other than 0.0%. Limits of payments for handicap ramps are shown on the standard drawings.

Ramps shall be indicated on the Right-of-Way Plans for field review. Ramps adjacent to lowered curb for driveways may be eliminated.

Truncated Domes shall be used with all handicap ramps.

Refer to the RP-H-Series Standard Drawings for details.

3-310.10 DRIVEWAY APRONS

Right-of-Way plans for new construction or reconstruction projects shall accommodate the appropriate driveway aprons. The driveway standard drawings have been modified to provide ADA compliant cross-slope for sidewalks through driveway aprons. The aprons have also been modified to provide for a better turning radius into the drive.

3-315.00 CAPPING ROCK FILLS

In areas where a solid rock fill is expected and grassed slopes are designed, provide road and drainage excavation (unclassified) or borrow excavation (unclassified) in sufficient quantity to cap these fills with a minimum of ± 9 inches of common material before placing topsoil and seeding.

3-315.05 TOPSOIL REQUIREMENTS FOR EARTHWORK BALANCES

(See 2-145.05 and 4-203.30)

In areas to be seeded, compute the quantity of topsoil required based on a 3-inch ± thickness with 100% shrinkage.

Topsoil will not be required on projects where all slopes are to be sodded. A note shall be added to the plans detailing any other special areas where topsoil will not be required (such as rock fills not to be seeded).

Do not make deductions in topsoil and seeding quantities for sodded or paved ditch areas on normal projects requiring topsoil and seeded slopes.

Topsoil shall be secured from within the proposed roadway balances where possible. If necessary, embankment areas shall be stripped in addition to excavation areas.

When final earthwork balances are calculated, the topsoil shall be taken into account in the following manner:

1. Calculate the topsoil needed and the topsoil available to see if all the topsoil can possibly be obtained from the proposed roadway areas.

2. Adjust the cross-section end areas as necessary to reflect the topsoil that is to be stripped. These adjusted areas are to be used to balance the job.

3. Balance the project using the proper shrinkage and swell factors.

4. On the profile, when showing the earthwork balance, include the topsoil figures in the balance. See example calculations in 3-315.15.

If enough topsoil cannot be obtained from the proposed earthwork areas, add a "Furnishing and Spreading Topsoil" item to the Roadway Quantity Table for the remainder.

3-315.10 SHRINKAGE AND SWELL FACTORS (See 2-145.10)

3-315.15 EARTHWORK BALANCES IN PLANS (See 2-145.05)

Examples of how to calculate earthwork balances and how to show these balances on the plans profile sheet are as follows:

1. Earthwork balanced.

   A. Show on profile sheet.

EXC. (UNCL.) 295,000 C.Y.	COMMON	250,000 C.Y.	(INCL. 13,000 C.Y. FROM EXCAVATION AREAS AND 5,000 C.Y. FROM EMBANKMENT AREAS; 12,500 C.Y. FROM COUNTY ROADS AND PRIVATE DRIVES)
	ROCK	45,000 C.Y.	

EXC.
EMB.

EMB.	253,489 C.Y.	(INCL. 5,490 C.Y. FOR COUNTY ROADS AND PRIVATE DRIVES; 5,000 C.Y. TO REPLACE STRIPPED TOPSOIL)
	SHR. 15%	
	SW. 15%	

B. Calculation procedure for balanced section

250,000 C.Y. Exc. (Common)

-13,000 C.Y. Topsoil from exc. areas

- 5,000 C.Y. Topsoil from emb. areas

232,000 C.Y. Exc. (Common) available for balance

$$\frac{\text{Exc. (Com)}}{1.15} + [\text{Exc. (Rock)} \times 1.15] \quad \text{vs.} \quad \text{Emb.}$$

$$\frac{232{,}000}{1.15} + (45{,}000 \times 1.15) \quad \text{vs.} \quad 253{,}489 \text{ C.Y.}$$

$$201{,}739 + 51{,}750 \quad \text{vs.} \quad 253{,}489 \text{ C.Y.}$$

$$253{,}489 \text{ C.Y.} = 253{,}489 \text{ C.Y.}$$

Balanced

2. Earthwork unbalanced.

A. Show on profile sheet.

EXC. (UNCL.)	COMMON	350,000 C.Y.	(INCL. 13,000 C.Y. TOPSOIL EXCAVATION AREAS AND 5,000 C.Y. FROM EMBANKMENT AREAS; 12,500 C.Y.FROM COUNTY ROADS AND PRIVATE DRIVES; 100,000 C.Y. EXCESS MATERIAL.)
	ROCK	45,000 C.Y.	
EXC. / EMB.	EMB.	253,489 C.Y.	(INCL. 5,490 C.Y. FOR COUNTY ROADS AND PRIVATE DRIVES; 5,000 C.Y. TO REPLACE STRIPPED TOPSOIL)
		SHR. 15%	
		SW. 15%	

B. Calculation procedure for unbalanced section

350,000 C.Y. Exc. (Common)

-13,000 C.Y. Topsoil from exc. areas

- 5,000 C.Y. Topsoil for emb. area

332,000 C.Y. Exc. (Common) available for balance

$$\frac{\text{Exc. (Com)}}{1.15} + [\text{Exc. (Rock)} \times 1.15] \quad \text{vs. Emb.}$$

$$\frac{332{,}000}{1.15} + (45{,}000 \times 1.15) \quad \text{vs. } 253{,}489 \text{ C.Y.}$$

$$340{,}446 \text{ C.Y.} \quad \text{vs. } 253{,}489 \text{ C.Y.}$$

The 86,957 C.Y. of excess material has had the shrinkage factor applied to it (this assumes all excess material will be common). When this quantity is multiplied by the shrinkage factor (to "un-shrink" it), the excess then becomes 100,000 C.Y.

3-315.20 SUBMISSION OF GRADING QUANTITIES SHEETS (See 2-145.07 and 4-203.50)

3-325.00 RAILROADS (See 1-210.00, 1-210.05 and 1-210.10)

3-330.00 PAVEMENT MARKINGS AND SIGNING ON INTERSTATE AND FULL ACCESS CONTROL ROADWAYS
(See 3-140.00, 4-713.05 and 4-716.13)

For interstate and full access control roadway and interchange projects, prepared by consultants, a determination should be made at the beginning of design concerning who will develop the pavement marking and signing plans. The pavement marking and signing plans will be developed by the roadway design consultant, a continuing contract consultant or the Design ITS, Traffic, and Standards Office. For interstate and full access control roadway and interchange projects, prepared by consultants, currently under design, as of June 15, 2011, the Design Manager will contact the Design ITS, Traffic, and Standards Office prior starting development of the Construction Plans for this determination.

For interstate and full access control roadway and interchange projects, prepared by TDOT designers, an email notification, requesting pavement marking and signing design, should be sent to the Design ITS, Traffic, and Standards Office after preliminary plans are placed on FileNet. A copy of the email shall be placed in the project folder to document the submittal. The Design ITS, Traffic, and Standards Office will determine if the pavement marking and signing design will be developed by their office or by a continuing contract consultant.

Resurfacing projects on interstate and full access control roadways and interchanges are excluded from this section.

For pavement marking and signing plans prepared by roadway design consultants or continuing contract consultants coordination with the Design ITS, Traffic, and Standards Office for review of the plans should be done no later than four weeks prior to the turn-in date for the roadway plans. The Design ITS, Traffic, and Standards Office should be contacted concerning any design issues that arise during the development of the pavement marking and signing plans, including the coordination of design work and structural standard drawing numbers for overhead, cantilever, or bridge mounted structures.

CHAPTER 4 - PLANS SUBMITTALS

3-400.00 SUBMITTAL FOR INCIDENTALS

Submitting plans for "ALL INCIDENTALS EXCEPT APPRAISALS" if the project has more than 10 tracts. (See distribution list below) It shall only be necessary to submit the title sheet, typical sections, property maps (with Right-of-Way Acquisition Table with property owner's name and county records portions completed) and the present layouts. Proposed layouts are not to be printed for incidental right-of-way work. Do not submit for "Incidentals" if there are 10 tracts or less in the plans. There will not be duplicate tract numbers on any one project. During Right-of-Way Plans preparation, tracts may need to be added or deleted, but all tract numbers appearing on the preliminary plans must continue to appear on subsequent Right-of-Way Plans for the project, including the acquisition stage Right-of-Way Plans.

If for any reason the tract number becomes unneeded, it must continue to be shown in the table of acquisition and on the property map and present layout sheets with the number crossed out in all places using a single line. Stamp or mark prints of title sheets for "Incidentals Only". The title sheet must have a right-of-way project number in the upper right-hand corner (not the P.E. number). This applies to all right-of-way projects to be acquired by the State. **For projects whose right-of-way is to be acquired by Local Government,** the preliminary engineering number is to be used in the upper right-hand corner of the title sheet. Using 0.2" lettering, place the text "Right-of-way to be acquired by Local Government" on the right side of title sheet above the signatures. Incidental plans submission will not be submitted for projects whose right-of-way is being acquired by local governments.

It will be the responsibility of the Right-of-Way office to print and distribute copies of the plans as needed.

Submitting for "Incidentals"

Place a pdf of the required plan sheets onto FileNet under the name: nnnnnn-nn-Incidentals.pdf, then notify by email of the electronic distribution the appropriate email address listed below.

Region 1 TDOT.RG1.ROW@tn.gov
Region 2 TDOT.RG2.ROW@tn.gov
Region 3 TDOT.RG3.ROW@tn.gov
Region 4 TDOT.RG4.ROW@tn.gov

3-400.05 SUBMITTAL FOR "UTILITIES ONLY" (See 2-315.00 and 2-315.05)

On any project, other than a paving or resurfacing project, that does not have right-of-way acquisition involved; the designer shall submit Right-of-Way plans and stamp them ROW Plans (Utilities Only) (See 1-115.20). Submission of these plans will be treated as Right-of-Way plans and follow the procedures listed in Section 3-400.15 and 3-400.25.

It will be the responsibility of the Right-of-Way office to print and distribute copies of the plans as needed.

3-400.10 ADVANCE ACQUISITION PROJECTS

Once "Advance Acquisition" has begun, tract numbers may not be changed.

3-400.15 PRELIMINARY CONSTRUCTION QUANTITY ESTIMATES (See 4-140.00 and 4-140.05)

A preliminary construction quantity estimate shall be prepared on all projects when the funding is requested for the Final R.O.W. Plans. The Design Manager responsible for the project will place quantity data on FileNet and send an email notification to **TDOT.Preliminary.Estimates@tn.gov**. This submission should be done concurrently with the right-of-way funding approval request. **Projects shall not be submitted for "appraisals and acquisition" or "utilities only" until the preliminary construction quantity estimate is submitted.**

Each designer shall follow the procedure below to obtain the preliminary construction cost estimates:

1. Calculate preliminary quantities to a reasonable detail. Any known quantities which cannot be estimated (example: signal and signing quantities) should be identified and included in the email transmitted to the Estimating and Bid Analysis Office.

2. The TDOT designer or consultant shall provide the Design Manager responsible for the project a .pdf set of the plans and the preliminary construction quantities estimate data via email or CD. The estimate will contain project description information, pay item numbers, and quantities in the proper format. See Section 4-140.05 for additional information. Design managers and designers shall keep a copy of the estimate data in the project folder and a copy of the estimate file.

3. If bridges, retaining walls, or other structures designed by the Structures Division are proposed, the designer shall indicate structures are required and include the structure designer and manager on the project data portion of the estimate file. This information is necessary to insure that the structures are included in the preliminary estimate.

4. Where open-ended item numbers are used, the designer shall fill in the descriptions in the estimate data file. Where lump sum item numbers are used, description and break down of the quantities must be submitted with the estimate data file. Without completing these item descriptions, there is no way the estimator in the Estimating and Bid Analysis Office can complete the preliminary construction cost estimate.

5. Preliminary construction quantities estimates shall be updated whenever a revision to the plans is made that will significantly alter the project cost or every twelve (12) months until construction plans turn-in. In the event that no plan changes are made during the previous twelve month period, the Design Manager will resubmit the original data file with a request that the estimate be updated since the previous estimate is a year old.

6. For federal over-site projects, a preliminary estimate using the construction plans quantities shall be submitted to the Estimating and Bid Analysis Office when the plans are distributed for the construction field review. A construction estimate will still be submitted with construction plans submittal in accordance with Section 4-140.00 and 4-140.05.

3-400.17 SUBMITTAL OF PRELIMINARY CONSTRUCTION QUANTITIES ESTIMATES

For in-house and consultant design projects, the Design Manager, or designer shall place the final right-of-way plans and the completed construction estimate Excel on FileNet. An email notification should be sent to the following email address: TDOT.Preliminary.Estimates@tn.gov once the required materials are placed on FileNet. A copy of the email shall be placed in the project folder to document the submittal of the preliminary construction quantities. In the subject line of the email state the following information: "County: Pin No"

3-400.20 RIGHT-OF-WAY FUNDING APPROVAL REQUESTS (See 4-140.00)

Funding approval shall be requested and received on all right-of-way projects prior to their submission for "appraisals and acquisition." The funding approval shall be requested approximately two (2) weeks prior to the anticipated right-of-way turn-in date. See Section 3-400.15 for further details.

When requesting funding approval for right-of-way "appraisals and acquisition", email TDOT.PDSO@tn.gov a pdf copy of the title sheet and the right-of-way funding approval request transmittal letter, example shown in Figure 3-4, to the Program Operations Office, Federal Aid Section.

An approved signed and dated copy of the right-of-way funding request approval transmittal letter shall be attached to the first page of the Right-of-Way Plans uploaded to FileNet.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
NASHVILLE, TENNESSEE 37243-1402

MEMORANDUM

TO: Programs Operations Office
Attn: Federal Aid Section
Suite 600, James K. Polk Bldg.
Nashville, TN 37243-1402

FROM: Larry Jordan, Transportation Manager 1
Design Office, Headquarters

DATE: December 30, 1999

SUBJECT: Right-of-Way Funding Approval Request
Project No.: STP-13(15), 43005-2234-14, 43005-1226-04
Description: S.R. 13 from S.R. 230 to Main Street in Waverly
Humphreys County

In accordance with the Roadway Design Guidelines, I am requesting funding approval for R.O.W. appraisals and acquisition. For your use, I have attached one (1) half-size title sheet of this project.

At your earliest convenience following funding approval, please initial and date below and return a copy of this form to my office.

Funding Approval for Right-of-Way Appraisals and Acquisition:

By: _____

Date: _____

Figure 3-4
Right-of-Way Funding Approval Request Transmittal Letter Example

3-400.25 SUBMITTALS OF ROW APPRAISALS AND ACQUISITION (See 2-315.00, 2-315.05, and 3-400.00)

When submitting a project for right-of-way "appraisals and acquisition," the Design Manager in charge of the project is to upload all required files to FileNet (see Section 1-115.00) send email notification of right-of-way plans turn-in to the following:

HQ ROW	TDOT.HQ.ROW@tn.gov
Environmental Division	TDOT.EnvironmentalDoc@tn.gov Permits.Filenet.TDOT@tn.gov Ecology.Plans@tn.gov TDOT.Historians@tn.gov
Structures Division	TDOT.Structures@tn.gov
Program Development and Scheduling Office Program Operations Office	TDOT.PDSO@tn.gov
Project Manager (if appropriate)	Individual TDOT email account
Railroad Coordinator (if appropriate)	Individual TDOT email account*
Appropriate Regional ROW Office ROW Region 1 ROW Region 2 ROW Region 3 ROW Region 4	 TDOT.RG1.ROW@tn.gov TDOT.RG2.ROW@tn.gov TDOT.RG3.ROW@tn.gov TDOT.RG4.ROW@tn.gov

* See Contact List at:
http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/DesGuide.htm

The email subject line shall include the Region, County, State Route Number or Route Name, PIN, "ROW Turn-in"

It will be the responsibility of the Right-of-Way office to print and distribute copies of the plans as needed.

Refer to Section 3-400.15 for preliminary construction quantity estimate. This estimate shall be completed and submitted to the Estimating and Bid Analysis Office prior to submitting plans for "appraisals and acquisition". The date the information was submitted to the Estimating and Bid Analysis Section shall be included in the right–of-way submittal transmittal letter.

It is important that the incidentals report data be incorporated into the plans before finalizing the Right-of-Way Plans to reduce right-of-way revisions. However, **if it is imperative** that final Right-of-Way Plans be submitted before receiving the incidentals report data, the TDOT C.E. Manager 2 will give the approval to proceed to the Design Manager in charge of the project. This approval shall be noted on the Right-of-Way Funding Request approval transmittal letter to the Program Operations Office, Federal Aid Section. See Section 3-400.00 for additional information not shown on this page.

When a consultant submits plans for right-of-way "appraisals and acquisition," the consultant's seal, signature, and date shall be placed on the right side of the title sheet above the Chief Engineer's signature.

All cross-sections will have the project number shown and be numbered in the upper right-hand project identification block. The sheet numbering will follow the numbering used on the plan sheets in the same manner used in the construction plans.

Before plans are submitted for “appraisals and acquisition” of right-of-way, all information which might affect the existing or relocated utilities shall be shown on the plans. This includes, but is not limited to, the following:

1. Storm sewers, catch basins, manholes, cross drains, side drains, box culverts, channel changes, special ditches and other drainage facilities
2. Preliminary bridge layouts and hydraulic data
3. Retaining walls
4. Guardrails
5. Detour roads
6. Traffic signal pole locations including attachment heights and footing details
7. Street light pole locations
8. Erosion prevention and sediment control devices (EPSC Plan)
9. Other details which might affect utilities

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
NASHVILLE, TENNESSEE 37243-1402

MEMORANDUM

TO: Director, Right-of-Way Division

FROM: CE Manager over project

DATE:

SUBJECT: Project No. (Federal and State ROW)
PIN
Project Description
County

The subject project is being submitted for (Right-of-Way or Utilities Only) plans submittal. The following information is being forwarded for plans distribution:

Right-of-Way Funding Approved	date received
Plans have been placed on FileNet:	PDF file name EXE file name date added
Preliminary Estimate Emailed	date sent

Comments:

For further information, please contact Project Point of Contact and phone number/email.

The Regional Utility Office is responsible for printing and mailing plans to affected utilities.

cc: Program Development and Scheduling Office
Program Operations Office
Environmental Division
Structures Division
Region _ Right-of-Way Office
Project Manager (If Applicable)

Figure 3-5
Right-of-Way "Appraisals and Acquisition" Transmittal Letter Template

3-400.35 ADDITION OF EROSION PREVENTION AND SEDIMENT CONTROL (EPSC) PLANS INTO FIELD REVIEW AND FINAL ROW PLANS

Erosion Prevention and Sediment Control (EPSC) Plans sheets shall be included in the plans submitted for Right-of-Way Appraisals and Acquisition. EPSC Plan sheets shall also be included in right-of-way field review and construction field review plans. EPSC Plan sheets shall immediately follow the Culvert Cross Sections. The EPSC Plan should be complete to the extent possible; however, quantity tabulations will not be required until printed for construction field review.

Once plans are formally submitted, any changes to the EPSC Plan sheets due to design revision, right-of-way revision, permit requirements, mitigation requirements, ecological evaluation requirements, EPSC notes revisions, addition or deletion of sheets, etc. will require a formal plan revision.

The Design Manager should contact the Technical Studies Section of the Environmental Division when EPSC Plans are revised to determine if revised plan sheets or other information is needed.

3-400.40 ADDITION OF CONTOURS TO PLANS

Contours shall be included in plans for all projects submitted for Right-of-Way Appraisal and Acquisition and Construction except for resurfacing projects, projects where a survey is not required, and small projects or projects of limited scope where a surface is not developed. Contours shall also be included in right-of-way field review and construction field review plans. Contours should include existing (pre-construction) and proposed contours. Contours for intermediate construction phases are not required. For small projects or projects of limited scope where a surface is not developed, cross sections shall be included in all plans submittals in lieu of contour sheets.

Contour sheets should be developed at the same scale as the EPSC Plan sheets. Designers should refer to Design CADD standards for contour sheet development. Existing contours should be included on Phase 1 of the EPSC Plan or may be developed as a separate sheet. Existing contour sheets will include the project centerline, contours at an interval sufficient to show the direction of flow, contour elevations, north arrow, scale, existing edges of pavement, and streams and rivers. Proposed contours should be included on the final phase of the EPSC Plan or as separate sheets. Proposed contour sheets will include the project centerline, contours at an interval sufficient to show the direction of flow, contour elevations, north arrow, streams and rivers, proposed edges of pavement, and proposed slope lines. Proposed contours will only be required to the top of cut or toe of slope. It will not be required to connect to existing contours outside the slope lines. Surface development should include the mainline and side roads. When developed as a separate set of sheets, contours should immediately follow the EPSC sheets.

Since site conditions and topography are unique to each project, designers should seek input from the Natural Resources Office, Permits Section, of the Environmental Division to determine contour intervals.

3-405.00 RIGHT-OF-WAY REVISIONS

When a project has been submitted for right-of-way appraisals and acquisition, and a change becomes necessary anywhere on the project, a Right-of-Way Plans revision is required. All right-of-way revisions will be submitted through the Design Manager responsible for the project in an accurate and timely manner.

The Design Manager responsible for the project will upload the revised plan set to Design FileNet (See Section 1-115.00) and submit an email notification to the appropriate personnel. The email will contain the revision letter and a pdf of the revised sheets only. In the event that the pdf is larger than the 15 MB email limit, then the pdf should be broken down into smaller files and additional emails sent.

Distribution of Right-of-Way Plans Revisions

The following plans revision distribution shall be sent by email for all of right-of-way revisions regardless of whether they have been let to contract or not.

TO	EMAIL ADDRESS
Director, State Right-of-Way Division	TDOT.HQ.ROW@tn.gov
Appropriate Regional Right-of-Way Manager	TDOT.RG1.ROW@tn.gov TDOT.RG2.ROW@tn.gov TDOT.RG3.ROW@tn.gov TDOT.RG4.ROW@tn.gov
Environmental Division	TDOT.EnvironmentalDoc@tn.gov Permits.Filenet.TDOT@tn.gov Ecology.Plans@tn.gov TDOT.Historians@tn.gov
Design Division, Quality Assurance Office	TDOT.QualityAssurance@tn.gov
Railroad Coordinator (if railroad involvement)	Use individual email address*

* See Contact List at:
http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/DesGuide.htm

The email subject line shall include the Region, County, State Route Number or Route Name, PIN, “ROW-Revision”

It will be the responsibility of the Right-of-Way office to print and distribute copies of the plans as needed.

3-410.00 ENVIRONMENTAL PERMIT REQUIREMENTS

After the Environmental Division receives both the email notification for Right-of-Way Field Review Plans submittal and the Ecology Report, they will complete the permit evaluation. The permit evaluation shall determine the necessary permits required for the project. The findings of the permit evaluation will be documented in a report called the Permit Assessment.

If the project does not require items submitted for permit evaluation, the Designer shall send a letter to the Environmental Division, copied to the Program Scheduling Office, stating that no environmental impacts will occur as a result of the project.

Figure 3-6 contains a flow chart depicting the steps which should be followed to complete permit application approval.

Figure 3-7 is an example of a permit assessment, which has been completed by the Environmental Division and returned to the appropriate Design Manager. Along with the appropriate project and reference information, the Permit Assessment provides an itemized list of revisions and instructions for the designer to complete, which should insure prompt permit approval.

Once the project has been evaluated for required permits, and the Designer receives the permit assessment, the Designer will be responsible for preparing any and all requested information and sketches required for the Environmental Division to apply for permits. The permit sketches and applicable information shall be submitted as indicated in the Permit Assessment. If there is a lag in the schedule due to unforeseen delays the permit sketches and applicable information shall be submitted 12 months prior to the projected letting date. The permits sketches and applicable information shall be submitted to the Natural Resource Office Permit Section for permit application.

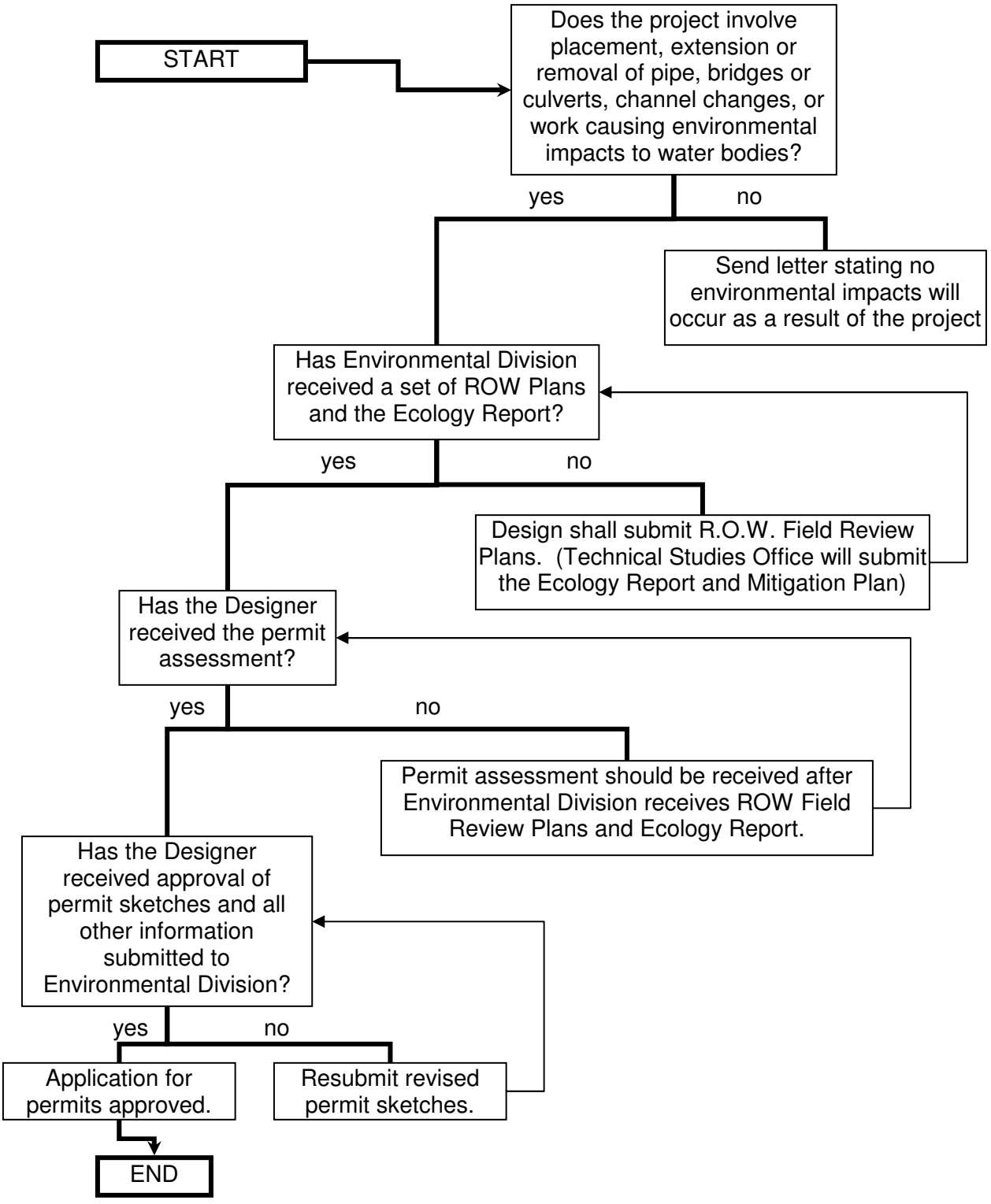


Figure 3-6
Permitting Process Flow Chart

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
ENVIRONMENTAL DIVISION
SUITE 900, J. K. POLK BUILDING
505 DEADERICK STREET
NASHVILLE, TN 37243-0334
TELEPHONE: (615) 253-2477 FAX: (615) 741-1098

MEMORANDUM

TO: Mr. Jim Bivens, Roadway Specialist Supervisor 2
Region 1 Design Office

FROM: John L. Hewitt, C.E. Manager 1
Environmental Permits Office

DATE: January 24, 2005

SUBJECT: PERMIT ASSESSMENT / DISTRIBUTE PERMIT REQUIREMENTS
P.E. # 40115-1406-94
FED # BRZE-4000(34)
PIN 100618.00
Lampkin Road
Bridge over Walnut Fork Creek
Henry County

Thank you for sending the plans for review on the above referenced project. Please refer to the Environmental Boundaries and Mitigation Design Memorandum dated November 19, 2004 from Ms. Lilah Miller when making the following adjustments:

1) Please make the following revisions to the erosion control sheet 6:
   - Please list standard drawings EC-STR-31 "Temporary Diversion Channels" and EC-STR-25 "Temporary Road Crossing", on the standard drawing index sheet and in the appropriate Erosion Control Legends.
   - Please relocate or remove the temporary silt fence from within Walnut Fork Creek (west bank around abutment).
   - Please show all existing wetlands.
   - Please show erosion control notes.
   - If haul roads are needed please show on the erosion control sheet.

2) Please make the following revisions for the impact between station 102+50 ± (Rt. & Lt.) and 108+50 ± (Rt. & Lt.):
   - Permit sketches will be required for this impact. Please refer to comment number three and the enclosed example set of permit sketches for information and requirements.
   - Revise the present layout (sheet 4) to show the existing wetland along Walnut Fork Creek. Please refer to Ms. Miller's Memorandum for information concerning wetland location.
   - Revise sheet 4A (proposed layout sheet) to show only wetlands remaining after construction.
   - Please label cut and fill lines on the present layout sheet (sheet 4).

Figure 3-7
Example Permit Assessment

- If haul roads are needed, please show on the present and proposed layout sheets (4 and 4A).
- For all temporary wetland impacts please indicate all trees that are to be planted on the proposed layout sheets, erosion control sheets, and permit sketches that involve the replacement of trees from Ms. Miller's Memorandum. Also please add the tree planting scheme for temporary wetland impact areas and the following notes to the proposed layout sheet and permit sketches:
  - The area of temporary wetland impact shall be restored to pre-construction elevation and reseeded / or replanted according to the mitigation design and permit sketches as soon as possible following the completion of construction activities.
  - "No substitutions for any of the tree species will be accepted without written permission from the TDOT Environmental Division. No Clones or Cultivars will be accepted. Any trees found to be either incorrect species, improperly planted, or which do not survive, at anytime prior to termination of the contract, shall be removed and replaced at the contractor's expense. Stakes and wires will be removes immediately prior to contract termination."

3) For each wetland impact requiring permit sketches, please provide the information listed in the current roadway guidelines, as well as, a wetland impact table with the temporary and permanent impact areas and volumes listed, separately. The permit sketches are required to indicate the temporary and permanent wetland impacts, cross-hatched separately. Where trees are to be planted on-site (i.e. temporary replacement of wetlands), please show the mitigation (tree species, spacing, location, note for no substitutions, etc.) on the permit sketches and proposed layout plan sheet in the plans.

4) Please show and label the wet weather conveyance (WWC-1) on the present layout sheet (sheet 4). Please refer to Ms. Miller's Memorandum for location and information concerning wet weather conveyances.

5) To avoid additional delays, please verify that all comments and corrections mentioned in this Memorandum and the Memorandum from Ms. Miller have been completed and are accurate before submittal to this office.

6) Please provide our office with four sets of revised half-size plans, including erosion control plan sheets, and one set of permit sketches.

If you have any questions, please contact Anthony Myers at (615) 532-9945.

JLH:ARM:kek

Enclosures

cc: Mr. Freddy Miller, Roadway Design Office
Mr. Sam Cardwell, Program Scheduling Section
Dr. Deedee Kathman , Technical Studies Office
Permit File, Reading File, Chronological File

Figure 3-7 (continued)
Example Permit Assessment

Permit Issuing Agencies

Several State and Federal Agencies issue permits for impacts to Waters of the United States and Waters of the State of Tennessee. These agencies have regulatory authority over the Tennessee Department of Transportation. These agencies, and the permits the agencies issue, are described in the following paragraphs. Included are links to the agencies' website. The following agencies issue the permits for various environmental impacts.

Tennessee Department of Environment and Conservation (TDEC)

The following is a link to TDEC's permit website:

http://www.state.tn.us/environment/permits/

Aquatic Resource Alteration Permit (ARAP)

Many impacts to wetlands and streams considered Waters of the State of Tennessee are covered by one of the previously issued **"General"** permits (road crossings, wet weather conveyances, bank stabilization, utility line crossings, etc.).

Impacts to Waters of the State of Tennessee not covered by one of the General ARAP's require an **"Individual"** permit. The "Individual" permit is also referred to as a **"Section 401 Water Quality"** permit. Typically, Individual permits are required for channel changes and wetland impacts greater than 0.25 acres of isolated wetlands or 0.1 acres of non-isolated wetlands. Individual permits require a 30 day public notice before they can be issued.

Individual Federal permits, (Corps of Engineers and Coast Guard) require a **"401 Water Quality Certification"** from TDEC. Typically, a 401 certification is similar to an Individual ARAP. It is usually issued under one of the federal permits that utilize the federal public notice process. This is typically required for impacts to Waters and Wetlands of the United States.

National Pollutant Discharge Elimination System Permit (NPDES)

This permit controls water pollution by regulating point sources discharges (i.e. ditches, pipes, etc.) of stormwater from construction activities that discharge pollutants into Waters of the State of Tennessee. The Storm Water Pollution Prevention Plan (SWPPP) Consultant shall be responsible for completing the SWPPP document and the "Notice of Intent" (NOI), which is required when the disturbed area for a project is one acre or more.

Class V Injection Well Permit (Sinkholes)

This permit is required for any project that fills or affects stormwater runoff flowing into an open sinkhole or cave within the Right-of-Way or in the vicinity of the project. This permit is also required for any project that may affect the ground water via a sinkhole.

A treatment plan may be required from the Geotechnical Engineering Section of the Division of Materials and Tests, and will need to be placed in the plans for submittal with the application for this permit. A geotechnical report may also be needed with the application for this permit.

Since a sketch is not required for this permit, the entire sinkhole must be shown on the present layout sheet of the plans. The proposed layout sheet should show the remaining portion of the sinkhole (if any) and applicable treatment.

Tennessee Wildlife Resources Agency (TWRA)

The following is a link to the TWRA's website:

http://www.state.tn.us/twra/index.html

Reelfoot Watershed Management Permit

The Reelfoot Watershed Management permit is required for all projects that effects water flowing within the drainage basin of Reelfoot Lake. This permit requires a joint application to the TWRA and TDEC.

United States Army Corps of Engineers (USACE)

The following is a link to the USACE's permit website:

http://www.usace.army.mil/CECW/Pages/cecwo_reg.aspx

Section 404 Permit

Permits for Section 404 include environmental impact to Waters of the United States (including Waters of the State of Tennessee). The permit will either be "Nationwide" or "Individual" Permit, as describe below.

Nationwide Permits

This permit is required for environmental impacts to Waters of the United States (including Waters of the State of Tennessee). Many impacts are covered under previously issued general or **"Nationwide"** Permits (minor road crossings, categorical exclusions, bank stabilization, isolated waters and headwaters, etc.). TDEC ARAP permits **are required** to accompany most Nationwide Permits.

Individual Permits

Impacts to streams and wetlands considered Waters of the United States (including Waters of the State of Tennessee), not covered by one of the Nationwide permits require an **"Individual"** permit. These are generally impacts to streams or wetlands larger than 0.5 acres. TDEC 401 Water Quality Certification is required along with the Individual Section 404 Permits.

Section 404 – Federal Emergency Management Agency (FEMA) Requirements

All projects with either the Nationwide or Individual Section 404 Permits must conform to FEMA standards. If the roadway project is located within a flood study area where either base flood elevations or a designated floodway has been determined, contact the Hydraulic Design Section of the Structures Division for further guidance and design procedures on FEMA Study information.

The appropriate coordination information for Flood Study streams (i.e. "no-rise" certification and letter to corresponding officials, Conditional Letter of Map Revision (CLOMR), FEMA map name and number, FEMA Flood Insurance Study Name, etc.), should be supplied to the Environmental Division by the Hydraulic Design Section of the Structures Division for the permit submission.

Additional information is needed from the Designer when projects impact Corps of Engineers reservoirs. This is typically when TDOT is acquiring right-of-way from the Corps of Engineers. Contact the Environmental Permits Office for affected reservoir elevations. The quantities of cut and fill, in cubic yards, are required within the affected reservoir elevations. If the project causes a loss of flood storage for the reservoir, an offset plan may be required. Once the Environmental Permits Office receives this information, the Designer will be informed of the appropriate Corps of Engineers official to contact for determining if an offset plan is necessary. This may require the purchase of additional right-of-way or additional design work on the subject reservoir or route.

Section 10 Permit

A Section 10 permit is required for streams considered navigable by the Corps of Engineers, but not covered by a Coast Guard Bridge Permit. With a Section 10 Permit, TDEC will require a 401 Water Quality Certification.

Coast Guard Bridge Permit

The following is a link to the Coast Guard's Bridge permit website:

http://www.uscg.mil/hq/cg5/cg5411/default.asp

This permit is required for projects which impact streams or rivers deemed navigable by the Coast Guard. TDEC will require a 401 Water Quality Certification with this permit.

Tennessee Valley Authority

The following is a link to TVA's permit website:

http://www.tva.gov/river/26apermits/

Section 26a Permit

A TVA Section 26a permit is required for all projects within the Tennessee River Watershed that may affect Waters of the United States, Waters of the State of Tennessee, and/or TVA administered public land. All impacts (except minor impacts) require a Section 26a permit which is an individual permit. Minor impacts will typically require a letter of "No-Objection" from TVA.

If a TVA Section 26a permit is required, the Hydraulic Design Section of the Structures Division shall provide an offset plan. Power storage and flood storage elevations may be obtained from the Hydraulic Design Section of the Structures Division.

Information Required for Submittal to Environmental Division for Permit Processing

The Designer shall prepare the permit sketches and applicable information including half-size plans, vicinity map, a table listing the environmental impacts, and project specific permit sketches. The project specific permit sketches identified in the Project Assessment shall also include a location map. The following is a detailed list of information required for submittal to the Environmental Division for permit processing:

1) The permit assessment will indicate the number of copies of half-size plans required for permit processing. The roadway plans shall be provided and should include:

   - Cover sheet with location map
   - Typical sections
   - Present and proposed layouts, including information contained in the ecology report, with:
     - Cut and fill slope lines
     - Streams and springs
     - Wetland boundaries
     - Proposed structures on streams
     - Open sinkholes and caves that will be filled in, undercut, and/or receive runoff from the project
     - Mitigation features (meanders in proposed relocated streams, and tree plantings for both relocated streams and wetlands, if indicated in the ecology report)
     - Information on how in-stream work will be separated from flowing water and specific engineering details required for the contractor to build the project
   - Roadway profiles
   - Culvert sections of all culverts on streams
   - Erosion prevention and sediment control plans
   - Detour and construction access or haul roads (if they require temporary stream or wetland crossings) with streams

2) A vicinity map based on a color 7 ½-minute Quadrangle map, showing the stream crossings. The vicinity map shall be on an 8 ½ × 11-inch sheet. If the Quadrangle portion showing the project is larger than that which will fit on the 8½ x 11-inch sheet, it shall be divided into 8½ x 11-inch segments and labeled with match lines. The vicinity map shall provide the following information:

   - Proposed alignment
   - Scale shall be indicated graphically
   - Circle the stream crossings, and other impacts such as wetland fills, sinkholes, caves, and structure locations
   - Label the station of each crossing
   - Label the location and stations of the project termini and the construction limits of the roadway project
   - Date prepared (and date of latest revision)
   - Contour interval
   - North arrow
   - An information block containing the following information:

- The Tennessee Department of Transportation shall be identified as the applicant
- The Quadrangle sheet name and number
- Preliminary Engineering number
- Project Identification Number (PIN)
- Route number and name
- Official project description
- County
- Nearest town or city

Figure 3-8 is an example Vicinity Map required for submittal with the permit sketches.

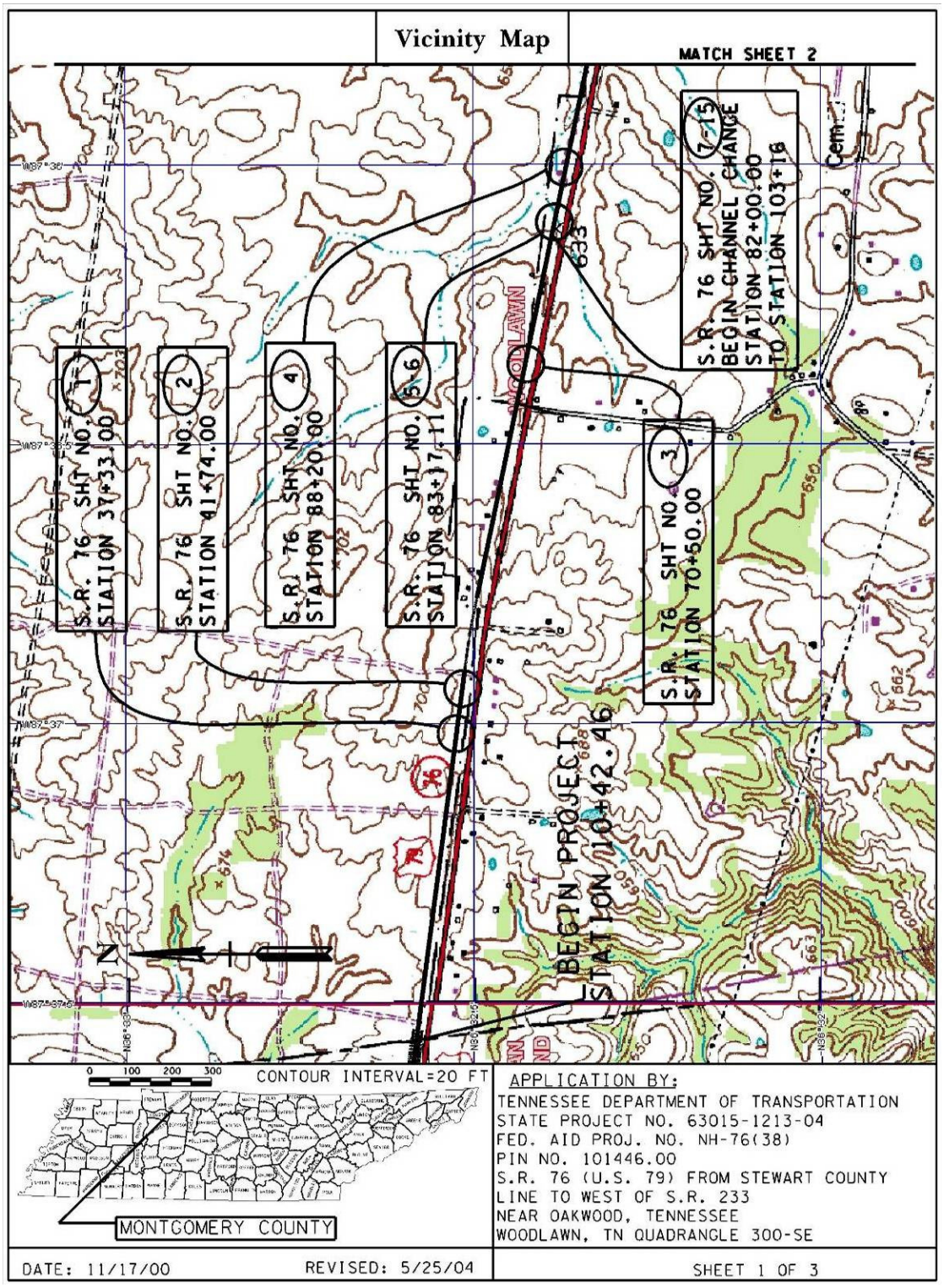


Figure 3-8
Example Vicinity Map

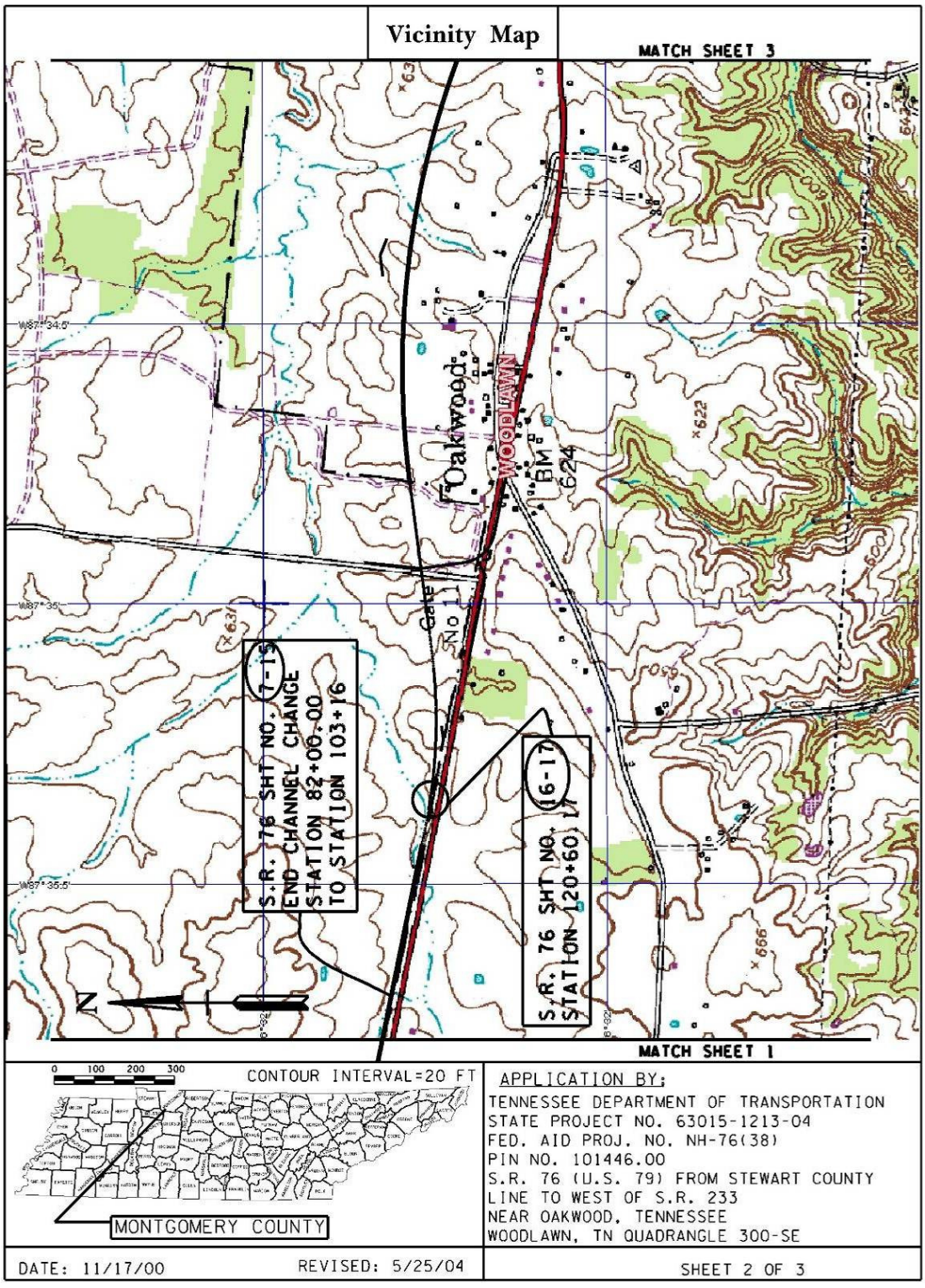


Figure 3-8 (continued)
Example Vicinity Map

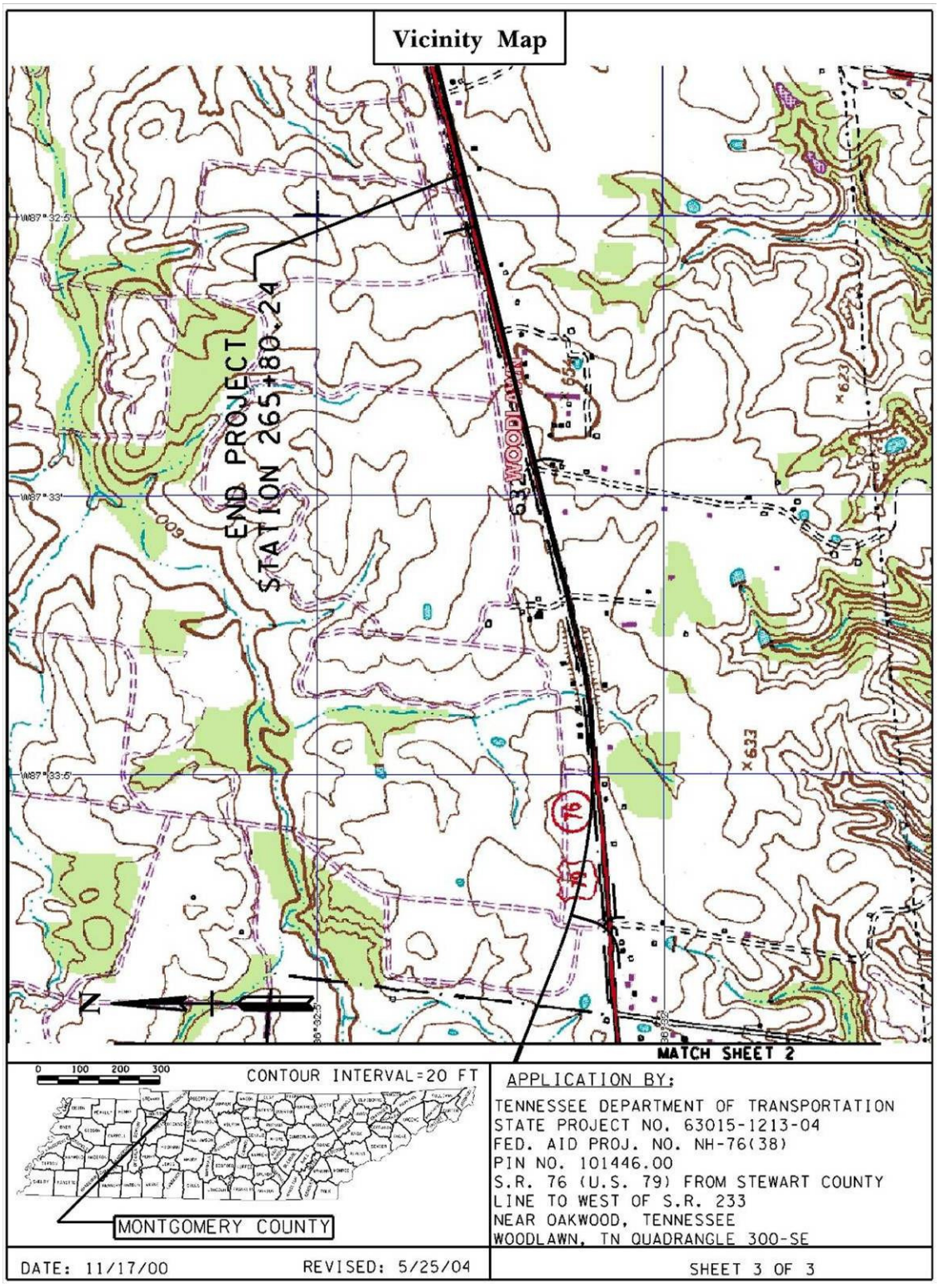


Figure 3-8 (continued)
Example Vicinity Map

3) Provide a table of environmental impacts listing the following:

- Station or range of stations of impact (i.e. STA. 65+20.00 or STA. 82+00 to 103+16)
- Feature impacted (wetland, channel, stream, etc.)
- Specific impact on the feature (wetland fill, channel change, stream relocation, etc.)

Figure 3-9 is an example of a table listing the environmental impacts for project.

S.R. 76 List of Enviromental Impacts

Table One

Station No.	Impact	Area in Acres	Feature Impacted
37+33	Wetland Fill	0.044	Isolated Wetland
41+74	Wetland Fill	0.065	Isolated Wetland
70+50	Wetland Fill	0.531	Isolated Wetland
88+20	Wetland Fill	0.008	Isolated Wetland

Station No.	Impact	Length in ft.	Feature Impacted
83+17.11	Culvert	297	Fletchers Fork Creek
82+00 to 103+16	Channel Changes	2116	Fletchers Fork Creek
120+60.17	Culvert	219	Fletchers Fork Creek

	Property Owner	Address
37+33	Jane Smith	556 Quali Hollow Road, Clarksville, Tn 55555
41+74	Jane Smith	556 Quali Hollow Road, Clarksville, Tn 55555
70+50	Jane Smith	556 Quali Hollow Road, Clarksville, Tn 55555
88+20	John Doe	555 Quali Hollow Road, Clarksville, Tn 55555
83+17.11	John Doe	555 Quali Hollow Road, Clarksville, Tn 55555
82+00 to 103+16	John Doe	555 Quali Hollow Road, Clarksville, Tn 55555
120+60.17	Jane Smith	556 Quali Hollow Road, Clarksville, Tn 55555

Figure 3-9
Example Table of Impacts

4) Provide permit drawings as required

Site specific permit drawings will be required for certain impacts. The purpose of the drawings is to provide the regulatory agencies with details of the impacts which can then be brought to the attention of the general public via the public notice process. The drawings shall be of a nature so as not to overwhelm the non-engineering public with technical information, yet specific enough to provide details of the environmental impacts and any on-site mitigation. Specific engineering details required for the contractor to build the project shall be detailed in the plans and included with the submission of material to the Environmental Division. Templates to be used in preparing permit sketches and location map can be found at:

http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/v8/v8design.htm

Location Map

A Location Map will be required for all permit drawing submittals. Where multiple impacts occur within a single project, a single location map shall be utilized that indicates each specific impact requiring permit sketches. In addition to the information required on the vicinity map, the following additional information will be required on the Location Map:

- Project site indicated on portion of county map
- County indicated on inset state map
- Location of all site-specific environmental impacts shall be indicated with station number
- Show proposed project alignment
- Scale shall be indicated graphically
- Label the beginning and ending stations of the proposed project
- Date prepared and date of latest revision
- North arrow
- An information block in the bottom right containing the following information:
  - The Tennessee Department of Transportation shall be identified as the applicant
  - The Preliminary Engineering (PE) number
  - Project Identification Number (PIN)
  - Route number and/or name
  - Project start location (“From”)
  - Project end location (“To”)
  - County
  - Sheet __ of __

Figure 3-10 is an example of a Location Map showing the necessary information.

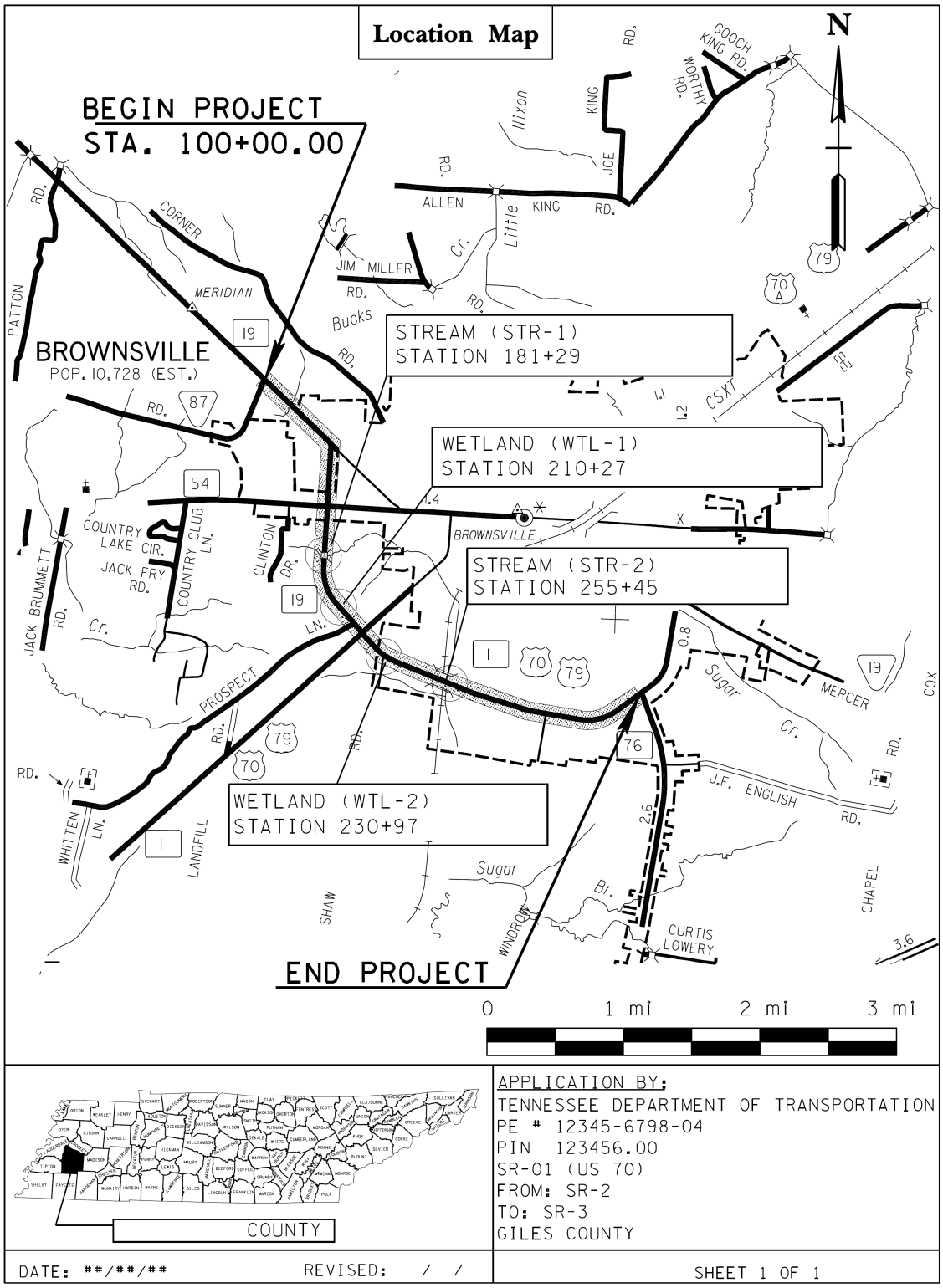


Figure 3-10
Example Location Map

General Permit Drawings

All permit drawings shall have the following general information (See "Permit Border Cell"):

- All maps and drawings shall be on 8½ x 11-inch reproducible paper
- Submit the fewest number of drawings necessary to adequately show the proposed activity. The orientation may be either portrait or landscape (portrait preferred).
- Since drawings must be reproduced by photocopying, color shading shall not be used. Drawings may show work as dot shading, or other similar graphic symbols. Only use hatching and cross-hatching for wetland impacts.
- A 1-inch margin shall be left at the top edge and left side for binding purposes
- A ½-inch bottom edge and right side border shall also be utilized
- The adjacent property owner's names and tract numbers labeled (A separate permit drawing listing the property owner's names, tract numbers and addresses of each impact may be required.)
- North arrow
- All drawings shall be to scale, and the scale shall be indicated graphically
- Roadway alignments, stationing, and tick marks adjacent to proposed impact
- Proposed right-of-way boundaries and all easements shown and labeled
- Buffer Zones where applicable
- Proposed cut and fill slope lines shown and labeled
- Turn off unnecessary levels so to minimize non-applicable information and avoid clutter
- An information block containing the following information:
  - The Tennessee Department of Transportation shall be identified as the applicant
  - The Preliminary Engineering (PE) number
  - Project Identification Number (PIN)
  - Route number and/or name
  - Project start location ("From:____")
  - Project end location ("To:_____")
  - Name of County
  - Sheet __ of __

In addition to the above general information, the following additional information will be required on the site specific permit drawings:

Channel Changes or Stream Relocation

The following information is required on permits for channel changes or stream relocations, alterations, or longitudinal encroachments (transitions of up to 50 feet on either end of a culvert are not included in this category):

- Beginning and ending stations of the stream impact along with the stream name or number (i.e. STR-3)
- Plan view of the stream relocation showing:
  - Location of and labeling the existing stream, relocated stream, channel changes, alterations or longitudinal encroachments
  - Proposed trees, meanders, deflectors, species, spacing, etc. for replacement of channel
- Typical cross-section of existing and proposed channel (to scale). The proposed channel dimensions shall match the existing channel dimensions as closely as possible. If channel widening is needed for high flow, contact the Technical Studies Office for an appropriate channel design. This shall also be shown on the proposed layout sheet in the plans.
- Any additional channel cross-sections necessary to show proposed channel geometry and proposed bank stabilization measures
- A Stream Impact Table providing existing and proposed length of stream
- Length of riprap and/or relevant features with the channel change. Riprap shall only be used in streams where absolutely necessary and when used the evidence to support its use shall be given (to prevent erosion, velocity, etc...)
- Notes specific to the mitigation or vegetative plantings (trees, etc.) and to the sequence of construction when necessary
- Estimated quantities table for specific plantings
- Any necessary planting details specific to the proposed mitigation
- Any other relevant features (to scale)

The Hydraulic Design Section of the Structures Division will perform the design of a channel change if the 50-year discharge exceeds 500 cubic feet per second at the downstream section of the proposed change.

Figure 3-11 is an example of a Permit Sketch required for a-stream relocation.

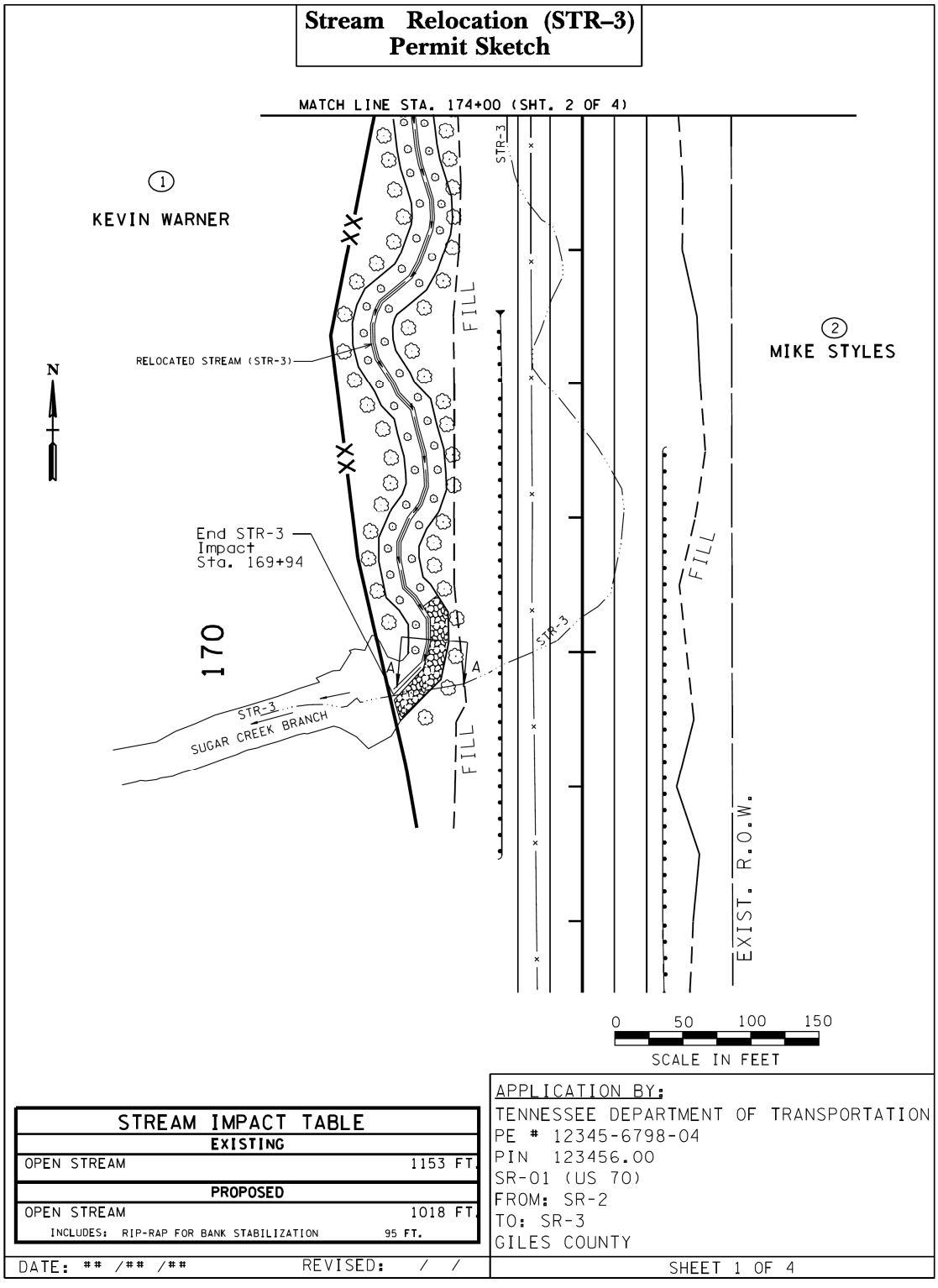


Figure 3-11
Example Channel Change Permit Sketches

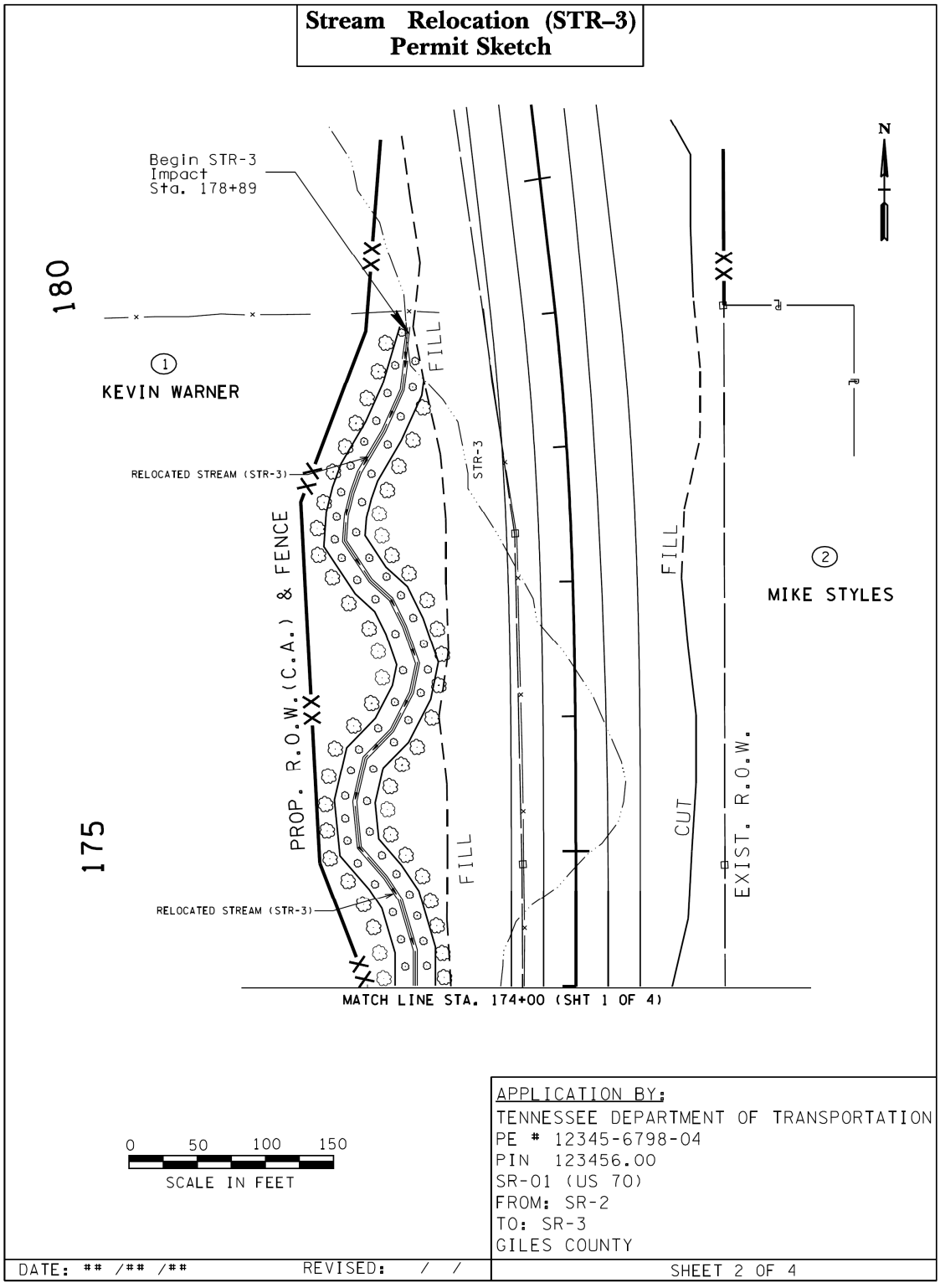
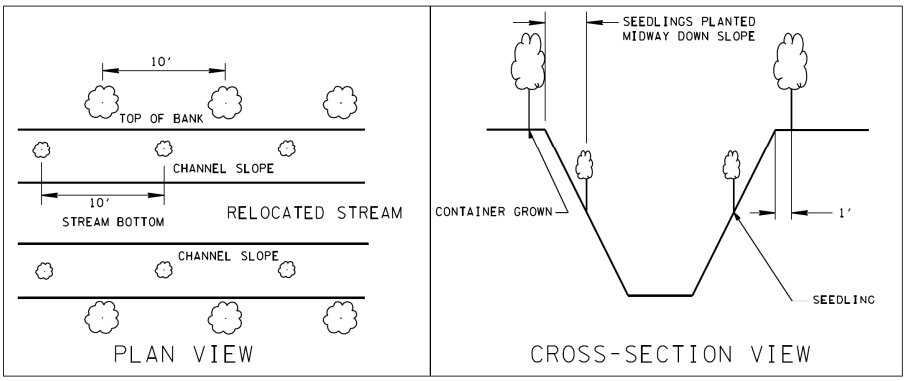
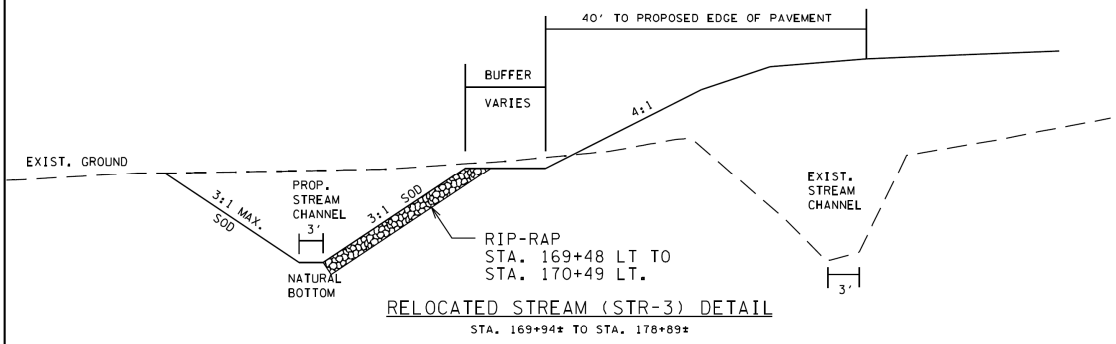


Figure 3-11 (continued)
Example Channel Change Permit Sketches

Stream Relocation (STR–3)
Permit Sketch

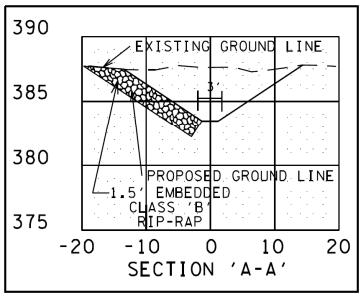
TREE PLANTING SCHEME FOR STR-3





RELOCATED STREAM (STR-3) DETAIL
STA. 169+94± TO STA. 178+89±

ESTIMATED TREE QUANTITIES			
ITEM NO.	DESCRIPTION	QUANTITY	UNIT
802-02.30	CUTTINGS: SALIX NIGRA (BLACK WILLOW, 18 - 24 IN)	14	EACH
802-11.01	ACER NEGUNDO (BOX ELDER 2 - 5 FT CNTR GRWN)	14	EACH
802-11.18	LIQUIDAMBER STYRACIFULA (SWEETGUM 2 - 5 FT CNTR GRWN)	14	EACH
802-11.07	BETULA NIGRA (RIVER BIRCH 2 - 5 FT CNTR GRWN)	14	EACH
802-11.26	PLATANUS OCCIDENTIALS (SYCAMORE 2 - 5 FT CNTR GRWN)	14	EACH
TOTAL		70	



APPLICATION BY:
TENNESSEE DEPARTMENT OF TRANSPORTATION
PE # 12345-6798-04
PIN 123456.00
SR-01 (US 70)
FROM: SR-2
TO: SR-3
GILES COUNTY

DATE: ## /## /## REVISED: / / SHEET 3 OF 4

Figure 3-11 (continued)
Example Channel Change Permit Sketches

Stream Relocation (STR–3)
Permit Sketch

STANDARD STREAM MITIGATION :

1) IF THE RELOCATED CHANNEL FLOWS INTO A PROPOSED CULVERT, THE NEW CHANNEL SHALL BE RELOCATED PRIOR TO INSTALLATION OF THE CULVERT TO ENSURE CORRECT ELEVATION LEVELS ARE SET FOR THE INLET. THE NEW CHANNEL SHALL BE EXCAVATED AND STABILIZED DURING A LOW-WATER PERIOD. RIP-RAP (ONLY AS SHOWN ON PLANS), SEEDING OR SOD SHALL BE INSTALLED IMMEDIATELY FOLLOWING CHANNEL COMPLETION. TREES SHALL BE INSTALLED IN THE FIRST PLANTING SEASON FOLLOWING CHANNEL EXCAVATION. WATER SHALL BE DIVERTED INTO THE NEW CHANNEL ONLY AFTER IT IS COMPLETELY STABILIZED, AND ONLY DURING A LOW WATER PERIOD. STABILIZED MEANS THAT ALL SPECIFIED ROCK AND EROSION CONTROL BLANKET IS IN PLACE , AND SEEDING AND SOD ARE IN PLACE AND ESTABLISHED.

2) CHANNEL RELOCATION SEQUENCE
   A) FLAG EDGE OF THE NEW CHANNEL TOP OF BANK PRIOR TO CLEARING. DO NOT CLEAR LARGE TREES IN POSITION TO SHADE THE NEW CHANNEL. LEAVE AS MANY TREES AND SHRUBS AS POSSIBLE BETWEEN TOE OF THE NEW HIGHWAY SLOPE AND THE STREAM.
   B) EXCAVATE THE NEW CHANNEL 'IN THE DRY' BY LEAVING AREAS OF UNDISTURBED EARTH (DIVERSION BERMS) IN PLACE AT BOTH ENDS.
   C) SHAPE CHANNEL TO SPECIFICATIONS SHOWN. REMOVE LOOSE SOILS AND DEBRIS.
   D) PLACE TOPSOIL, EROSION CONTROL BLANKET, SEED AND SOD AS SPECIFIED.
   E) REMOVE DIVERSION BERMS, BEGINNING WITH THE MOST DOWN STREAM. BANKS AND BOTTOM ELEVATION OF THE OLD CHANNEL SHOULD TRANSITION SMOOTHLY INTO THE NEW CHANNEL. THE ELEVATIONS OF THE NEW CHANNEL BOTTOM AT EACH END OF THE RELOCATION SEQUENCE SHOULD MATCH THE ELEVATIONS OF THE EXISTING CHANNEL, AND A STEADY PERCENT SLOPE SHOULD BE MAINTAINED THROUGHOUT THE RELOCATED CHANNEL CENTERLINE OR AS SPECIFIED.
   F) INSTALL TREES ACCORDING TO STANDARD SPECIFICATIONS SECTION 802.

3) ONLY RIP-RAP SHOWN ON PLANS SHOULD BE USED IN THE RELOCATED CHANNEL REACH. ANY OTHER PROPOSED RIP-RAP SHOULD BE COORDINATED WITH THE ENVIRONMENTAL DIVISION.

4) REQUESTS BY ANY AGENCY THAT WOULD REQUIRE THE MODIFICATION OF CHANNELS, DITCHES, ELEVATIONS, RIP-RAP OR ANY OTHER STREAM MITIGATION ITEMS ASSOCIATED WITH THE CHANNEL RELOCATIONS SHALL BE REFERRED TO THE TDOT ENVIRONMENTAL DIVISION VIA THE HEADQUARTERS CONSTRUCTION OFFICE FOR THE COORDINATION WITH ALL AGENCIES AND TDOT DIVISIONS. THE TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION MAY MAKE RECOMMENDATIONS CONCERNING EROSION CONTROL VIA THE ENGINEER WITHOUT SUCH REFERRAL.

TREES:

1. NO SUBSTITIONS OF TREE SPECIES OR SIZES SHALL BE ALLOWED WITHOUT THE WRITTEN APPROVAL OF TDOT ENVIRONMENTAL DIVISION. TREES SHALL BE THE VARIETY REQUESTED AND FIRST QUALITY. NO CLONES OR CULTIVARS WILL BE ACCEPTED. ANY FOUND TO BE INCORRECT SPECIES, OR IMPROPERLY PLANTED, AT ANY TIME PRIOR TO TERMINATION OF THE CONTRACT SHALL BE REMOVED AND REPLACED AT THE CONTRACTORS EXPENSE. STAKES AND WIRES SHALL BE REMOVED IMMEDIATELY PRIOR TO CONTRACT TERMINATION.UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
2. THE CONTRACTOR SHOULD ARRANGE SEVERAL MONTHS AHEAD OF TIME TO OBTAIN THE CORRECT TREE SPECIES, AS SOME MAY REQUIRE SOME TIME TO LOCATE.
3. TREES SHALL BE WATERED AS REQUIRED THROUGH THE PERIOD OF ESTABLISHMENT TO ENSURE SURVIVAL.

APPLICATION BY;
TENNESSEE DEPARTMENT OF TRANSPORTATION
PE # 12345-6798-04
PIN 123456.00
SR-01 (US 70)
FROM: SR-2
TO: SR-3
GILES COUNTY

DATE: ** /** /** REVISED: / / SHEET 4 OF 4

Figure 3-11 (continued)
Example Channel Change Permit Sketches

Stream Relocation with Structure

The following information is required on permit sketches for stream relocations that include a drainage structure as part of the relocation plan:

- Beginning and ending stations of the stream impact along with the stream name or number (i.e. STR-3)
- Plan view of the stream relocation showing:
  - Location of and labeling the existing stream, relocated stream, channel changes, alterations or longitudinal encroachments, and relevant roadway features so as to locate stream work in relation to the roadway project.
  - Proposed trees, meanders, species, spacing, etc…
  - Length and size of structure(s) located along the stream relocation
  - Length of riprap and/or relevant features with the channel change. Riprap shall only be used in streams where absolutely necessary and when used the evidence to support its use shall be given (to prevent erosion, velocity, etc...)
  - Right-of-Way and easements, cut and fill slopes, and property owner names and tract numbers
- Stream Impact Table indicating:
  - Length of existing open stream
  - Length of proposed open stream
  - Length of proposed riprap at outlet (where applicable)
  - Length and size of proposed structure
  - Total proposed post-project length
- Typical cross-section of existing and proposed channel (to scale). The proposed channel dimensions should match the existing channel dimensions as closely as possible. If channel widening is needed for high flow, contact the Technical Studies Office for an appropriate channel design. This shall also be shown on the proposed layout sheet in the plans.
- Any other additional channel cross-sections necessary to show proposed channel geometry and proposed bank stabilization measures
- Typical cross-section of the structure (to scale) showing size, length, inverts, channel stabilization measures, and direction of flow
- Notes specific to the mitigation or vegetative plantings (trees, etc.) and to the sequence of construction when necessary
- Estimated quantities table for specific plantings
- Any necessary planting details specific to the proposed mitigation
- Any other relevant features (to scale)

Figure 3-12 is an example of the typical sketches required for a culvert longer than 200 feet.

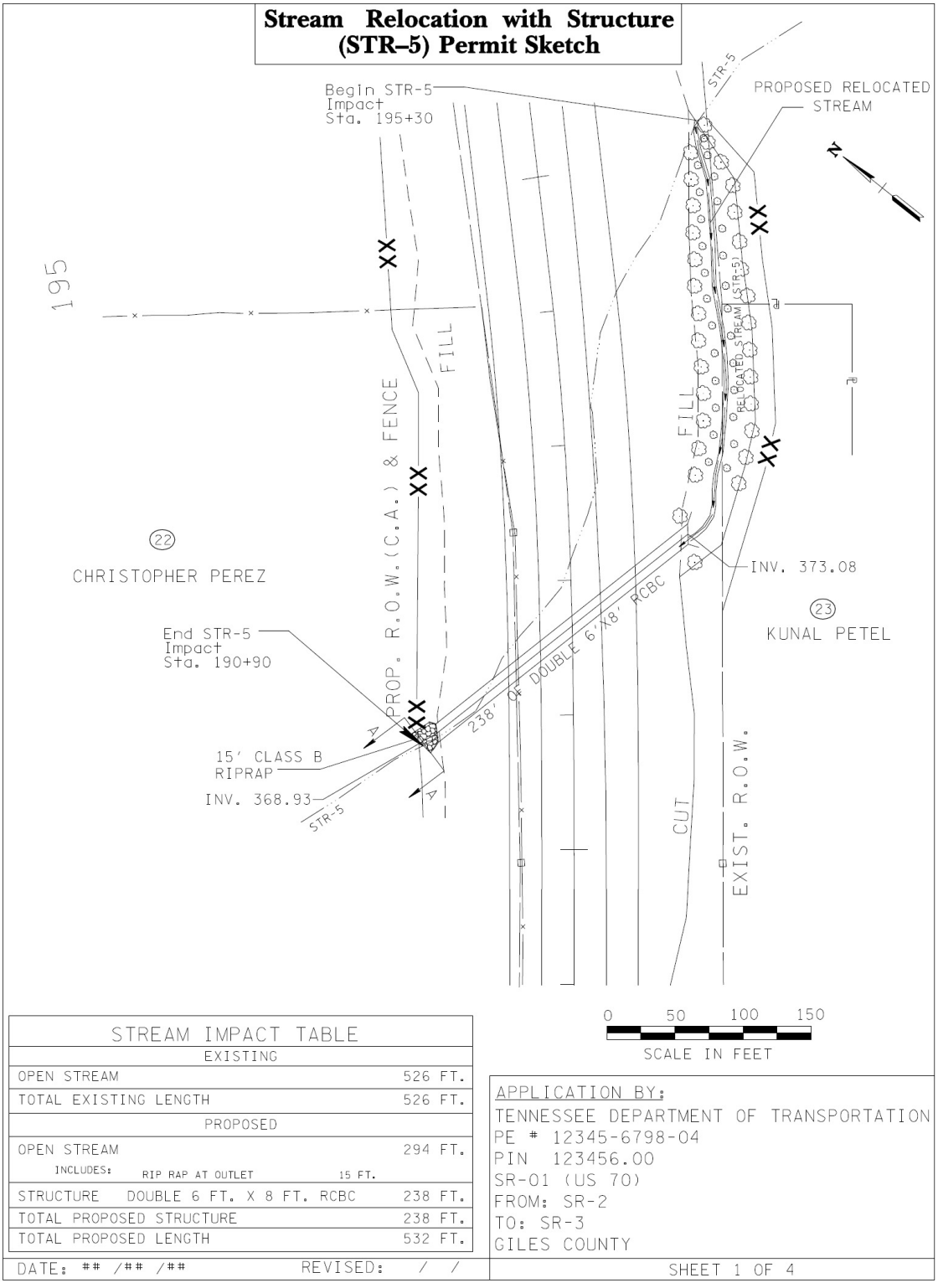


Figure 3-12
Example Permit Sketches for Stream Relocation with Structure

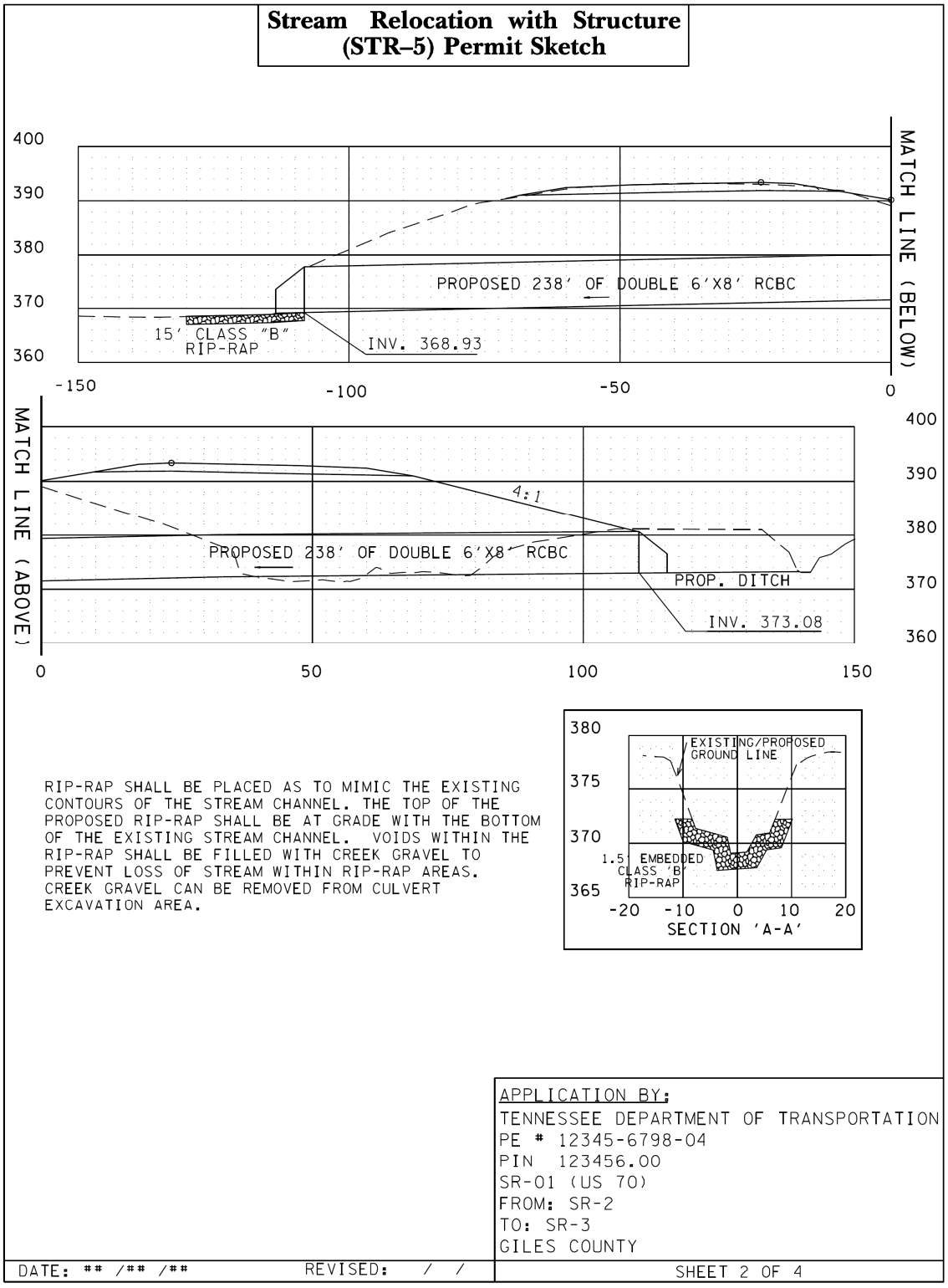
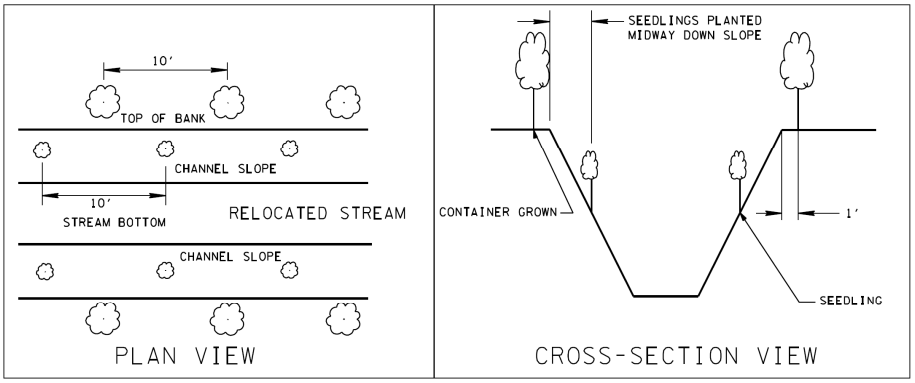
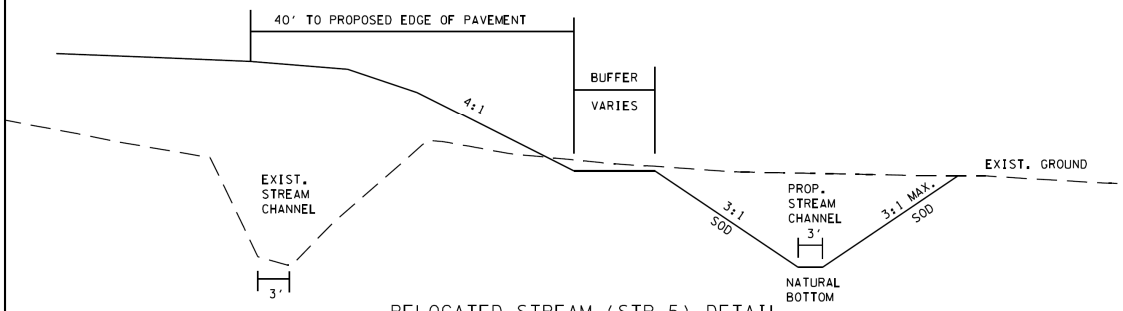


Figure 3-12 (continued)
Example Permit Sketches for Stream Relocation with Structure

Stream Relocation with Structure (STR–5) Permit Sketch

TREE PLANTING SCHEME FOR STR-5





RELOCATED STREAM (STR-5) DETAIL

STA. 000+00± TO STA. 000+00±

ESTIMATED TREE QUANTITIES

ITEM NO.	DESCRIPTION	QUANTITY	UNIT
802-02.30	CUTTINGS: SALIX NIGRA (BLACK WILLOW, 18 - 24 IN)	14	EACH
802-11.01	ACER NEGUNDO (BOX ELDER 2 - 5 FT CNTR GRWN)	14	EACH
802-11.18	LIQUIDAMBER STYRACIFULA (SWEETGUM 2 - 5 FT CNTR GRWN)	14	EACH
802-11.07	BETULA NIGRA (RIVER BIRCH 2 - 5 FT CNTR GRWN)	14	EACH
802-11.26	PLATANUS OCCIDENTIALS (SYCAMORE 2 - 5 FT CNTR GRWN)	14	EACH
TOTAL		70	

APPLICATION BY:
TENNESSEE DEPARTMENT OF TRANSPORTATION
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PIN 123456.00
SR-01 (US 70)
FROM: SR-2
TO: SR-3
GILES COUNTY

DATE: ## /## /## REVISED: / / SHEET 3 OF 4

Figure 3-12 (continued)
Example Permit Sketches for Stream Relocation with Structure

Stream Relocation with Structure (STR–5) Permit Sketch

STANDARD STREAM MITIGATION :

1) IF THE RELOCATED CHANNEL FLOWS INTO A PROPOSED CULVERT, THE NEW CHANNEL SHALL BE RELOCATED PRIOR TO INSTALLATION OF THE CULVERT TO ENSURE CORRECT ELEVATION LEVELS ARE SET FOR THE INLET. THE NEW CHANNEL SHALL BE EXCAVATED AND STABILIZED DURING A LOW-WATER PERIOD. RIP-RAP (ONLY AS SHOWN ON PLANS), SEEDING OR SOD SHALL BE INSTALLED IMMEDIATELY FOLLOWING CHANNEL COMPLETION. TREES SHALL BE INSTALLED IN THE FIRST PLANTING SEASON FOLLOWING CHANNEL EXCAVATION. WATER SHALL BE DIVERTED INTO THE NEW CHANNEL ONLY AFTER IT IS COMPLETELY STABILIZED, AND ONLY DURING A LOW WATER PERIOD. STABILIZED MEANS THAT ALL SPECIFIED ROCK AND EROSION CONTROL BLANKET IS IN PLACE , AND SEEDING AND SOD ARE IN PLACE AND ESTABLISHED.

2) CHANNEL RELOCATION SEQUENCE
   - A) FLAG EDGE OF THE NEW CHANNEL TOP OF BANK PRIOR TO CLEARING. DO NOT CLEAR LARGE TREES IN POSITION TO SHADE THE NEW CHANNEL. LEAVE AS MANY TREES AND SHRUBS AS POSSIBLE BETWEEN TOE OF THE NEW HIGHWAY SLOPE AND THE STREAM.
   - B) EXCAVATE THE NEW CHANNEL 'IN THE DRY' BY LEAVING AREAS OF UNDISTURBED EARTH (DIVERSION BERMS) IN PLACE AT BOTH ENDS.
   - C) SHAPE CHANNEL TO SPECIFICATIONS SHOWN. REMOVE LOOSE SOILS AND DEBRIS.
   - D) PLACE TOPSOIL, EROSION CONTROL BLANKET, SEED AND SOD AS SPECIFIED.
   - E) REMOVE DIVERSION BERMS, BEGINNING WITH THE MOST DOWN STREAM. BANKS AND BOTTOM ELEVATION OF THE OLD CHANNEL SHOULD TRANSITION SMOOTHLY INTO THE NEW CHANNEL. THE ELEVATIONS OF THE NEW CHANNEL BOTTOM AT EACH END OF THE RELOCATION SEQUENCE SHOULD MATCH THE ELEVATIONS OF THE EXISTING CHANNEL, AND A STEADY PERCENT SLOPE SHOULD BE MAINTAINED THROUGHOUT THE RELOCATED CHANNEL CENTERLINE OR AS SPECIFIED.
   - F) INSTALL TREES ACCORDING TO STANDARD SPECIFICATIONS SECTION 802.

3) ONLY RIP-RAP SHOWN ON PLANS SHOULD BE USED IN THE RELOCATED CHANNEL REACH. ANY OTHER PROPOSED RIP-RAP SHOULD BE COORDINATED WITH THE ENVIRONMENTAL DIVISION.

4) REQUESTS BY ANY AGENCY THAT WOULD REQUIRE THE MODIFICATION OF CHANNELS, DITCHES, ELEVATIONS, RIP-RAP OR ANY OTHER STREAM MITIGATION ITEMS ASSOCIATED WITH THE CHANNEL RELOCATIONS SHALL BE REFERRED TO THE TDOT ENVIRONMENTAL DIVISION VIA THE HEADQUARTERS CONSTRUCTION OFFICE FOR THE COORDINATION WITH ALL AGENCIES AND TDOT DIVISIONS. THE TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION MAY MAKE RECOMMENDATIONS CONCERNING EROSION CONTROL VIA THE ENGINEER WITHOUT SUCH REFERRAL.

TREES:

1. NO SUBSTITIONS OF TREE SPECIES OR SIZES SHALL BE ALLOWED WITHOUT THE WRITTEN APPROVAL OF TDOT ENVIRONMENTAL DIVISION. TREES SHALL BE THE VARIETY REQUESTED AND FIRST QUALITY. NO CLONES OR CULTIVARS WILL BE ACCEPTED. ANY FOUND TO BE INCORRECT SPECIES, OR IMPROPERLY PLANTED, AT ANY TIME PRIOR TO TERMINATION OF THE CONTRACT SHALL BE REMOVED AND REPLACED AT THE CONTRACTORS EXPENSE. STAKES AND WIRES SHALL BE REMOVED IMMEDIATELY PRIOR TO CONTRACT TERMINATION.UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
2. THE CONTRACTOR SHOULD ARRANGE SEVERAL MONTHS AHEAD OF TIME TO OBTAIN THE CORRECT TREE SPECIES, AS SOME MAY REQUIRE SOME TIME TO LOCATE.
3. TREES SHALL BE WATERED AS REQUIRED THROUGH THE PERIOD OF ESTABLISHMENT TO ENSURE SURVIVAL.

APPLICATION BY:
TENNESSEE DEPARTMENT OF TRANSPORTATION
PE # 12345-6798-04
PIN 123456.00
SR-01 (US 70)
FROM: SR-2
TO: SR-3
GILES COUNTY

DATE: ** /** /** REVISED: / / SHEET 4 OF 4

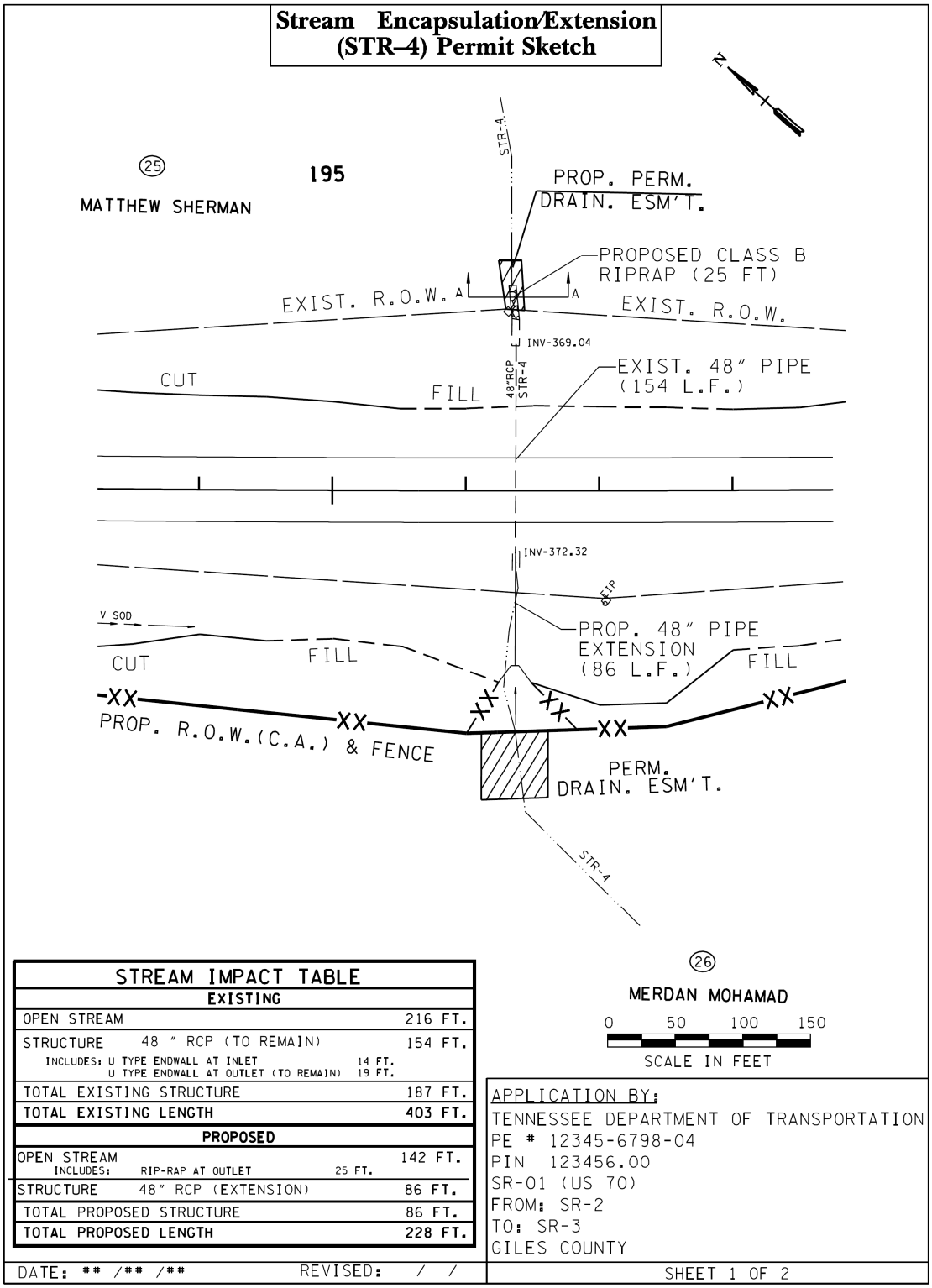
Figure 3-12 (continued)
Example Permit Sketches for Stream Relocation with Structure

Stream Encapsulation/Extension

The following information is required on permit sketches for a stream encapsulation with a new structure or a structure extension:

- Station or range of stations of the impact
- Plan view of impact area showing existing and proposed conditions (to scale) showing:
  - Existing and proposed structure size and length
  - Direction of flow
  - Drainage easements
  - Stream number or name
  - Riprap location shown graphically along with the riprap class and linear feet of riprap placement in the channel identified
  - A stream impact table providing existing and proposed stream and structure lengths, structure sizes, and end treatments
- Profile view of encapsulation or extension (i.e. culvert cross-section) showing existing and proposed conditions (to scale):
  - Existing and proposed structure size and length
  - Direction of flow
  - End treatments (i.e. endwalls, etc…) and inverts
  - Riprap location shown graphically along with the riprap class and linear feet of riprap placement in the channel
  - Hydraulic data table from roadway drawings
  - Notes specific to placement of any material into channel
  - Typical channel cross-section

Figure 3-13 is an example of the typical sketch required for a stream encapsulation with a structure extension.



STREAM IMPACT TABLE		
EXISTING		
OPEN STREAM		216 FT.
STRUCTURE	48 " RCP (TO REMAIN)	154 FT.
INCLUDES: U TYPE ENDWALL AT INLET	14 FT.	
U TYPE ENDWALL AT OUTLET (TO REMAIN)	19 FT.	
TOTAL EXISTING STRUCTURE		187 FT.
TOTAL EXISTING LENGTH		**403 FT.**
PROPOSED		
OPEN STREAM		142 FT.
INCLUDES: RIP-RAP AT OUTLET	25 FT.	
STRUCTURE	48" RCP (EXTENSION)	86 FT.
TOTAL PROPOSED STRUCTURE		86 FT.
TOTAL PROPOSED LENGTH		**228 FT.**

APPLICATION BY:
TENNESSEE DEPARTMENT OF TRANSPORTATION
PE # 12345-6798-04
PIN 123456.00
SR-01 (US 70)
FROM: SR-2
TO: SR-3
GILES COUNTY

DATE: ** /** /** REVISED: / / SHEET 1 OF 2

Figure 3-13
Example Permit Sketch for Stream Encapsulation/Structure Extension

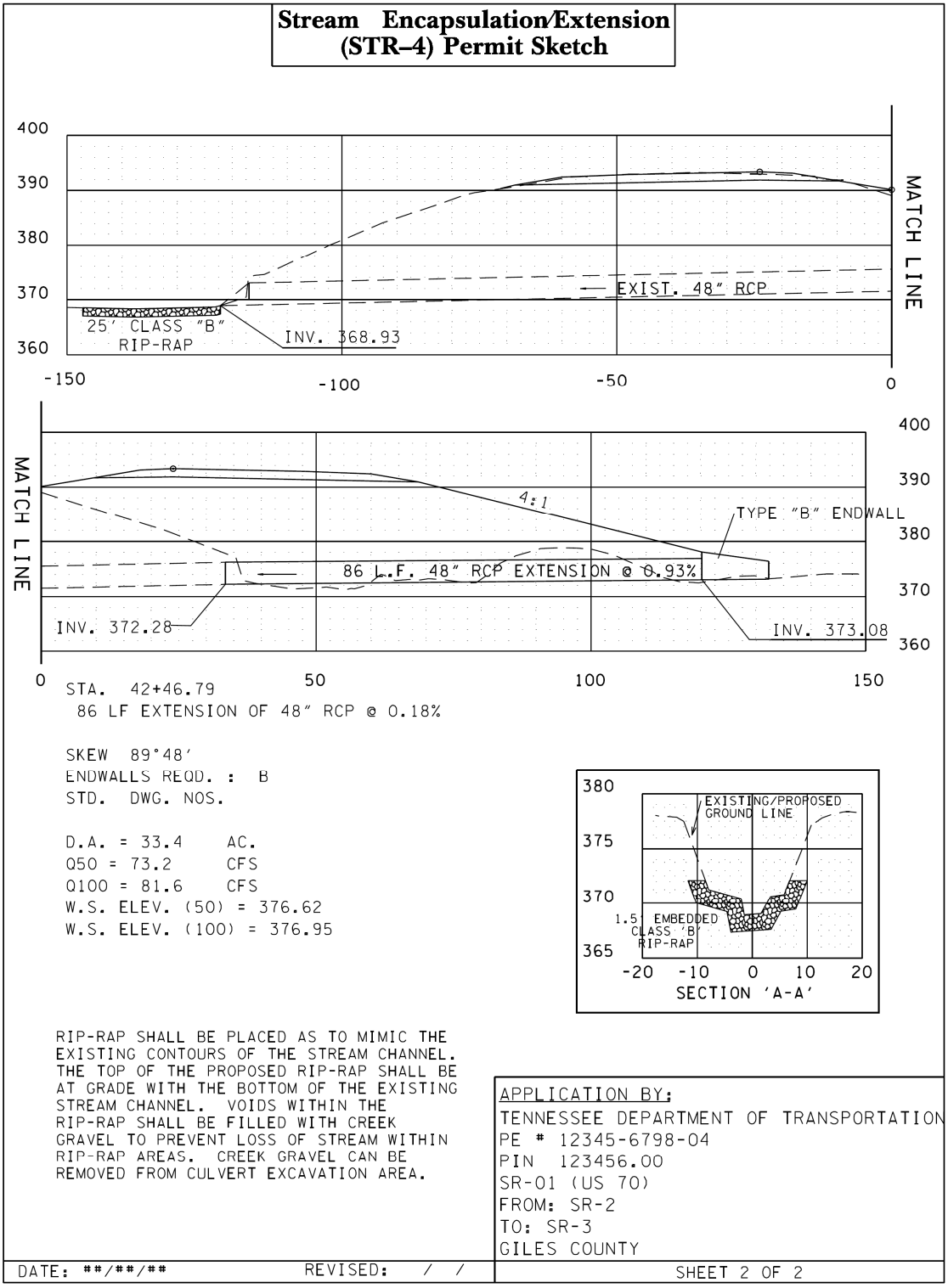


Figure 3-13 (Continued)
Example Permit Sketch for Stream Encapsulation/Structure Extension

Wetland Impacts

The following information is required on permit sketches for wetland impacts:

- Station or range of stations of the impact.
- Plan view of impact area showing:
  - Existing and proposed conditions (to scale)
  - Wetland Number identified (i.e. WTL-2, etc.)
  - Cross-hatch the permanent wetland impacts and hatch the temporary wetland impacts
  - Construction haul/access roads where applicable
  - Note indicating if a portion of the wetland is outside of TDOT Right-of-Way, easements, and/or not to be disturbed during construction
- Boundaries of the existing wetland shall be indicated even if the wetland extends past the Right-of-Way or easement lines.
- List all property owners that are directly impacted or adjacent to all wetland impacts.
- Notes regarding mitigation (tree, species, etc...) of wetland impact as indicated in the ecology report.
- Wetland Impact Table indicating:
  - Legend of hatching for the permanent and temporary wetland impacts
  - Area of the permanent and temporary wetland impacts in acres
  - Volume of the permanent and temporary wetland impacts in cubic yards (assume 1 foot depth)
- Notes specific to mitigation or vegetative plantings (trees, etc.).
- Estimated quantities table for specific plantings.
- Any necessary planting details specific to mitigation.

Figure 3-14 is an example of the typical sketches required for a wetland impact.

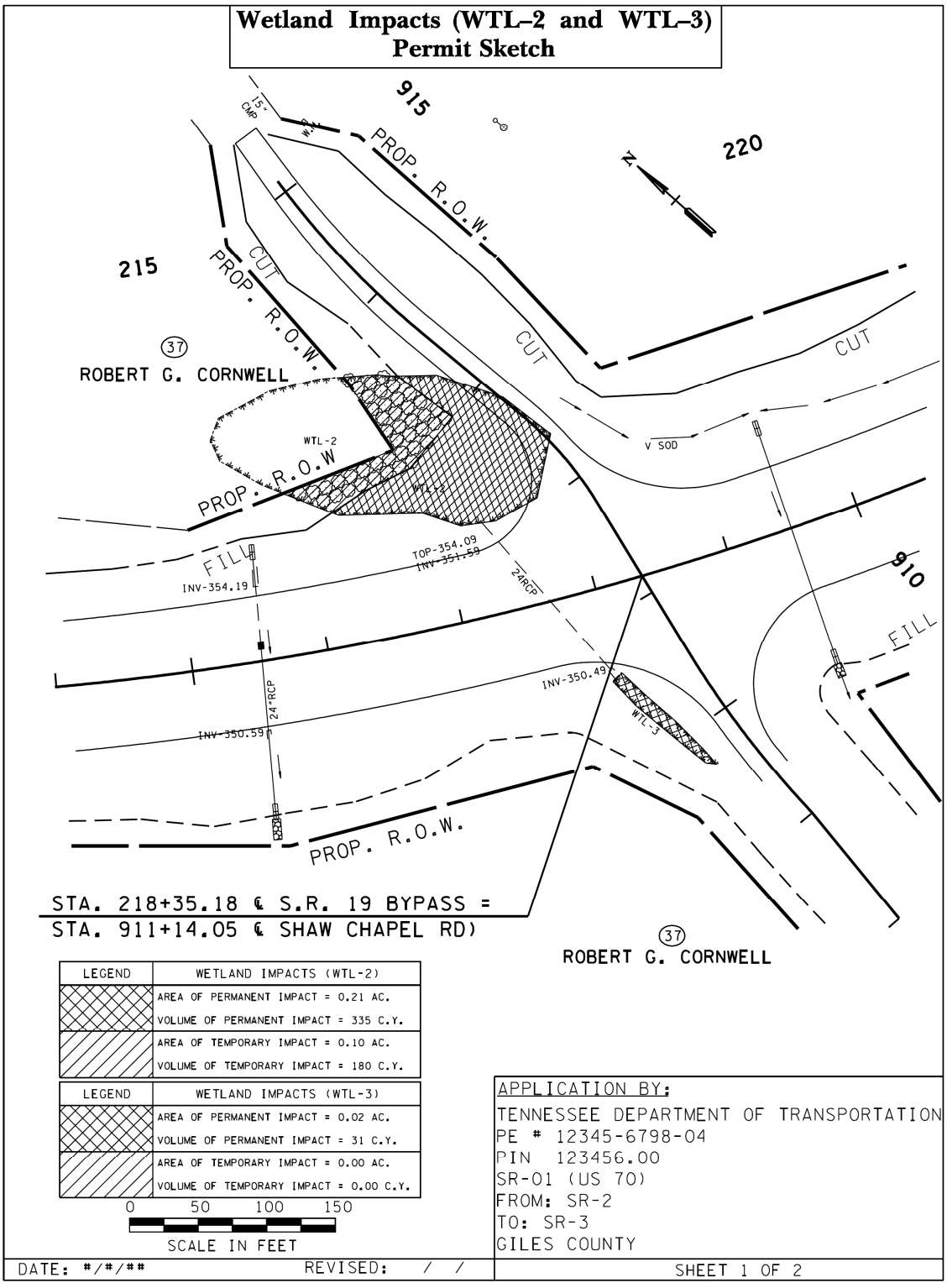


Figure 3-14
Example Permit Sketches for Wetland Impacts

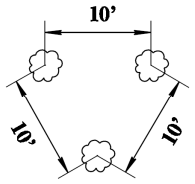
Wetland Impacts (WTL–2 and WTL–3) Permit Sketch

MITIGATION NOTES:
1. REMOVE THE TOP 12 INCHES OF TOPSOIL AND STOCKPILE IT UNTIL CONSTRUCTION IS COMPLETE.
2. ONCE CONSTRUCTION ACTIVITIES ARE COMPLETED, RESTORE ALL TEMPORARY WETLAND IMPACT AREAS TO PRE-CONSTRUCTION CONDITIONS. THIS INCLUDES REMOVING HAUL ROADS (IF APPLICABLE), RESTORING THE SITE TO THE ORIGINAL (PRE-CONSTRUCTION) ELEVATION AND SPREADING STOCKPILED TOPSOIL BACK OVER THE WETLAND SITE.
3. THE AREA OF TEMPORARY IMPACTS WILL BE STABILIZED ACCORDING TO STANDARD PRACTICES. PLANTING WILL BE BASED ON NOTES PROVIDED BY ECOLOGY
4. WETLAND AREAS LOCATED OUTSIDE OF PROPOSED RIGHT-OF-WAY AND CONSTRUCTION EASEMENTS ARE TO BE CLEARLY MARKED AND NOT TO BE DISTURBED.

TREES:
1. NO SUBSTITIONS OF TREE SPECIES OR SIZES SHALL BE ALLOWED WITHOUT THE WRITTEN APPROVAL OF TDOT ENVIRONMENTAL DIVISION. TREES SHALL BE THE VARIETY REQUESTED AND FIRST QUALITY. NO CLONES OR CULTIVARS WILL BE ACCEPTED. ANY FOUND TO BE INCORRECT SPECIES, OR IMPROPERLY PLANTED, AT ANY TIME PRIOR TO TERMINATION OF THE CONTRACT SHALL BE REMOVED AND REPLACED AT THE CONTRACTORS EXPENSE. STAKES AND WIRES SHALL BE REMOVED IMMEDIATELY PRIOR TO CONTRACT TERMINATION.UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
2. THE CONTRACTOR SHOULD ARRANGE SEVERAL MONTHS AHEAD OF TIME TO OBTAIN THE CORRECT TREE SPECIES, AS SOME MAY REQUIRE SOME TIME TO LOCATE.
3. TREES SHALL BE WATERED AS REQUIRED THROUGH THE PERIOD OF ESTABLISHMENT TO ENSURE SURVIVAL.

ESTIMATED TREE QUANTITIES

ITEM NO.	DESCRIPTION	QUANTITY	UNIT
	Seedling (Red maple (Acer rubrum) 18" - 24" Ht, BR)		EACH
	Seedling (Sycamore (Platanus occidentalis) 18" - 24" Ht, BR)		EACH
	Seedling (White oak (Quercus alba) 18" - 24" Ht, BR)		EACH
	Seedling (Green ash (Fraxinus pennsycanica) 18" - 24" Ht, BR)		EACH
	Seedling (Black willow (Salix nigra) 18" - 24" Ht, BR)		EACH
TOTAL		0	



PLANTING DETAIL

APPLICATION BY:
TENNESSEE DEPARTMENT OF TRANSPORTATION
PE # 12345-6798-04
PIN 123456.00
SR-01 (US 70)
FROM: SR-2
TO: SR-3
GILES COUNTY

DATE: #/#/## REVISED: / / SHEET 2 OF 2

Figure 3-14 (continued)
Example Permit Sketches for Wetland Impacts

Scenic River/Endangered Species

The following information is required on permit sketches for projects involving areas of concern such as the National Wild and Scenic River System, a State Scenic River, or waters designated as Outstanding National Resource Waters or projects where Endangered Species are affected or jeopardized.

- Station or range of stations of the impact
- Plan view of site indicating the area of concern
- Notes regarding mitigation of impact (when applicable)
- Name of the stream or surface waters
- Other relevant features (to scale)

Figure 3-15 is an example of the typical sketch required for a Scenic River Impact.

Bank Stabilization

The following information is required on permit sketches for bank stabilization:

- Station or range of stations of the impact
- Plan view of bank stabilization location
- Type of material to be used
- Typical cross-section of the bank stabilization (to scale)
- Longitudinal impact of the bank stabilization
- Any other relevant features (to scale)

Streams Containing Contaminated Sediments

The following information is required on permit sketches for streams containing contaminated sediments:

- Station or range of stations of the impact
- Plan view of site indicating the area containing contaminated sediments
- Type of material to be used to decontaminate the location
- Notes regarding mitigation of impact
- Other relevant features (to scale)

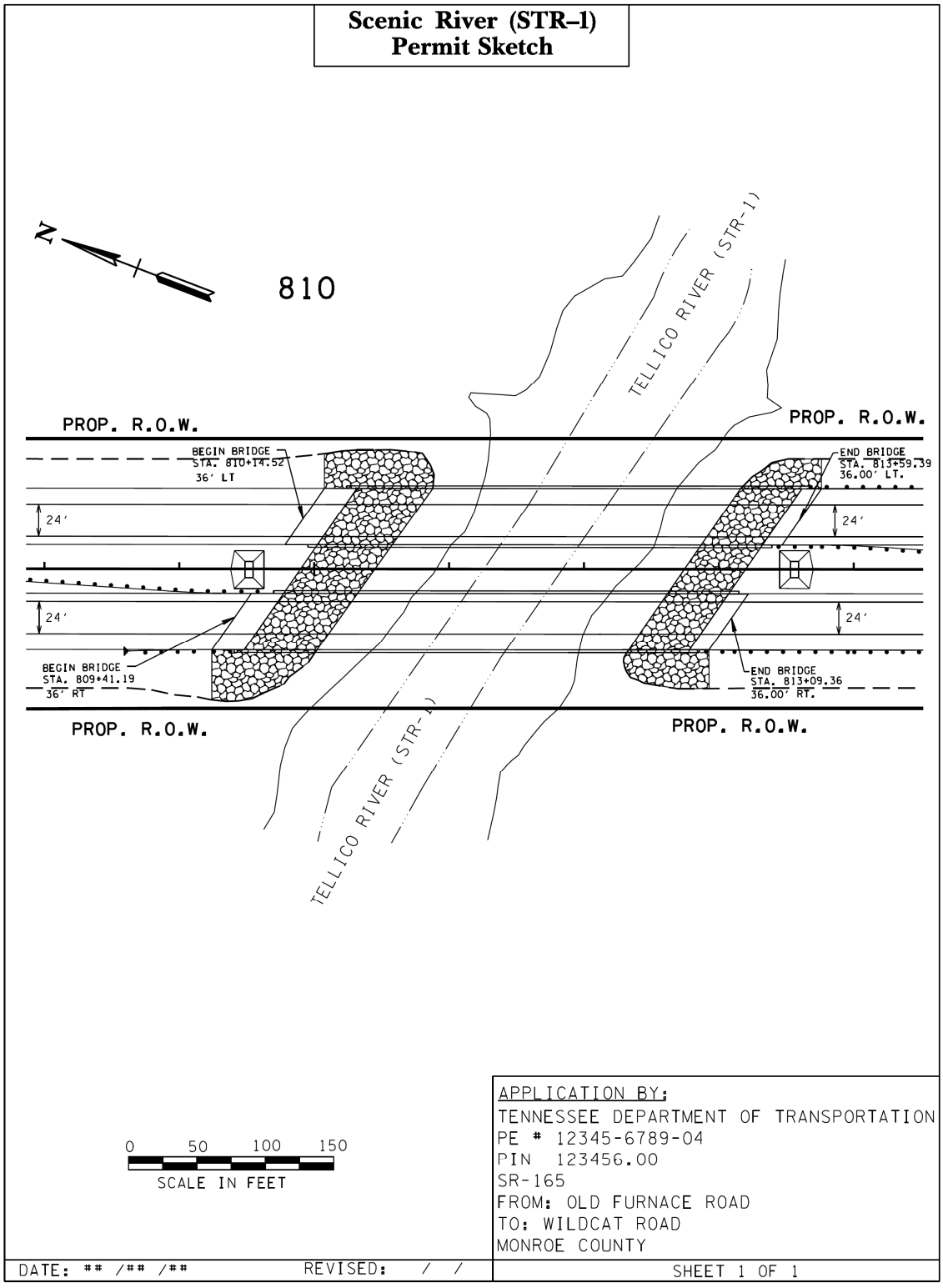


Figure 3-15
Example Permit Sketch for Scenic River Impacts

Application for Permit Approval

Once the Application for Permits is approved and submitted to the regulatory agency (TDEC, TVA, etc…) by the Environmental Division, an email will be sent to the Design Manager. Please note, if the regulatory agency disagrees with the Environmental Divisions assessment, the regulatory agency will request more information.

Figure 3-16 is an example email that will be sent to the Design Manager.

PE # 39945-1679-04
PIN 104395.00
SIA - Mt. Ararat Road
Serving Beech River Airport
Henderson County

Our office reviewed the above referenced project for a permit assessment (Activity 670-PPRM) and application (Activity 675-PPRM). We applied for Water Quality Permits on November 28, 2005 and no further information is needed at this time. If the regulatory agencies have specific requests, we will notify your office, as soon as possible, for any additional information that may be needed. If the plans change from the date of application, in areas shown as a stream on the quad map or listed as a stream in the ecology report dated July 22, 2005, please notify our office, as soon as possible, for further review.

Figure 3-16
Example Approved Application for Permits Notification Email

Table 3-4 identifies typical project activities for the permitting process required for a typical three mile grade and drain project with some environmental concerns. Table 3-5 identifies project activities for the permitting process required for a typical bridge and approach project. Some of the activities have designated Activity Numbers as designated in the Program Project and Resource Management Activities Manual. Please note the number of weeks may very per project due to unforeseeable delays. Activities which are identified in the Program, Project, and Resource Management Activities Manual are designated in Tables 3-4 and 3-5.

Grade & Drain Project Week No.	Design Division Description of Activity	Other Divisions Description of Activity
0	Design Begins. (Begin Activity No. 340)	
6	Designer sends plans to Structures Division for Grade Approval and to Environmental Division for locating Environmental Boundaries and to distribute plans to SWPPP Consultant. (End of Activity No. 340)	
7		Environmental Division to send Plans to SWPPP Consultant.
11		Structures Division sends Grade Approval to Design Division. (Activity No.345)
15		SWPPP Consultant to send Design Division information concerning highly impaired waters (if such are on project).
17	Design Manager Distributes Preliminary PS&E Field Review Plans and for Technical Studies. (Activity No. 365)	
18		Environmental Division starts reviewing plans for natural resources impacts etc. (Beginning of Activity No. 370) and sends Preliminary PS&E Plans to SWPPP Consultant.
21*	Design Manager Conducts Preliminary PS&E Field Review. (Activity No. 375)	SWPPP Consultant to provide comments at Preliminary PS&E Field Review.

Table 3-4
Typical Grade and Drain Project Timeline Including Permit Activities
Note: Number of weeks may vary. * Denotes project milestones

Grade & Drain Project Week No.	Design Division Description of Activity	Other Divisions Description of Activity
23	Design Manager Distributes Preliminary PS&E Field Review Report. (Activity No. 390)	
24		Environmental Division ends reviewing plans for natural resource impacts and provides: "Environmental Boundaries and Avoidance memoranda" to Design, Geotechnical and Structures Divisions. (End of Activity No. 370)
33*	Design Office Conducts Design Meeting. (Activity No. 400)	
44	Design Manager reviews Hearing Transcript & prepares Response Letter. Design Director reviews and approves Response Letter. Design Manager distributes Response Letter. Design Manager **notifies** Environmental Division of any alignment changes. (Activity No. 410)	
45		Environmental Division revises Environmental Document for any alignment changes and does any required field work necessary due to alignment shift.
53	Designer Completes ROW Plans Preparation (End of Activity No. 535) and Design Manager Distributes ROW PS&E Field Review Plans to Environmental Division for Environmental Permit Evaluation.	
54		Environmental Division Receives ROW PS&E Plans to develop Mitigation Plans (Activity No. 565) and sends ROW PS&E Plans to SWPPP Consultant.

Table 3-4 (continued)
Typical Grade and Drain Project Timeline Including Permit Activities
Note: Number of weeks may vary. * Denotes project milestones

Grade & Drain Project Week No.	Design Division Description of Activity	Other Divisions Description of Activity
56*	Design Manager Conducts ROW PS&E Field Review. (Activity No. 540)	SWPPP Consultant attends ROW Field Review.
60		SWPPP Consultant to send comments concerning EPSC Plan Sheets to the Design Division.
64	Designer to respond to all of comments from SWPPP Consultant.	
67	Designer begins Finalizing ROW Plans. (Beginning of Activity No. 585)	Environmental Division prepares Final Mitigation Plan. (Activity No. 570)
72	Designer Finalizes ROW Plans. (End of Activity No. 585)	
77	Designer Begins Refining ROW Plans. (Beginning of Activity No. 588)	Environmental Division Distributes Permit Assessment, with permit locations, and final mitigation design to Design Division. (Activity No. 670)
80*	Design Manager Distributes Final ROW and/or Utility Plans and Preliminary Estimate. (Activity No. 600)	
146	Design Manager Submits Permit Sketches and Plan Sheets to Environmental Division. (End of Activity No 575) *(** If there is a lag in the schedule due to other issues this should take place 12 months or 52 weeks prior to Letting Date*)	
147		Environmental Division to begin reviews of Permit Sketches and Plan Sheets and makes any request for adjustment to the appropriate Design Manager of Project. (Beginning of Activity No. 675)

Table 3-4 (continued)
Typical Grade and Drain Project Timeline Including Permit Activities
Note: Number of weeks may vary. * Denotes project milestones

Grade & Drain Project Week No.	Design Division Description of Activity	Other Divisions Description of Activity
159		Environmental Division to apply for Permits (End of Activity No. 675) notifies Design Division via email. *(**If there is a lag in the schedule to other issues this should take place 9 months or 39 weeks prior to Letting Date)*
180	Design Manager Distributes Construction PS&E Field Review Plans. (End of Activity No. 705)	Environmental Division sends Construction PS&E Plans to SWPPP Consultant.
183	Design Manager Conducts Construction PS&E Field Review. (Activity No. 710)	SWPPP Consultant comments concerning EPSC Plans to be included in report.
183	Design Manager informs Environmental Division (Permits) of any changes resulting from Construction PS&E Field Review that would require a permit application revision.	
185	Design Manager to Distribute Construction PS&E Field Review Report.	Environmental Division Obtains Permits. (End of Activity No. 680)
189	Design Manager Submits Final Roadway Plans w/estimate to Program Operation Office, Estimate Section. (End of Activity No. 715)	Environmental Division sends Final Roadway Plans to the SWPPP Consultant for the completion of the SWPPP.
198*		**CONTRACT LETTING**

Table 3-4 (continued)
Typical Grade and Drain Project Timeline Including Permit Activities
Note: Number of weeks may vary. * Denotes project milestones

Bridge & Approach Project Week No.	Design Division Description of Activity	Other Divisions Description of Activity
0	Design Begins. (Begin Activity No. 340)	
6	Design Manager sends Preliminary Plans to Structures Division for Grade Approval and to Environmental Division to distribute plans to SWPPP Consultant. (End of Activity No. 340)	
7		Environmental Division to send Plans to SWPPP Consultant.
11		Structures Division sends Grade Approval to Design Division. (Activity No. 345)
15	Design Division sends Preliminary Plans (that have received Grade Approval from Structures Division) to Environmental Division for Technical Studies. (Activity No. 365)	
20		Environmental Division conducts technical studies to verify environmental boundaries, wetlands, hazardous material, biological concerns, mitigation measures and/or commitments in plans are consistent with environmental document. Environmental Division provides Environmental Boundaries & Avoidance Memo. (Activity No. 370)
23		Structures Division provides Preliminary Bridge Layout to the Design Division. (Activity No. 490)
25	Design Division distributes ROW Plans for Preliminary/ROW PS&E Field Review and to the Environmental Division for the permit assessment process and for the SWPPP Consultant.	

Table 3-5
Typical Bridge and Approach Project Timeline Including Permit Activities
Note: Number of weeks may vary. * Denotes project milestones

Bridge & Approach Project Week No.	Design Division Description of Activity	Other Divisions Description of Activity
28*	Design Division conducts PREL/ROW PS&E Field Review. (Activity No. 540)	SWPPP Consultant to provide comments on the EPSC Plans Sheets to be included in PS&E Field Review Report.
30	Design Manager Distributes Preliminary/ROW Field Review Report.	
31		Environmental Division sends "Permit Assessment Report" to the Design Division. (Activity No. 670)
35*	Design Division distributes Final ROW and/or Utility Plans and Preliminary Estimate. (**this milestone is contingent on getting authorization for Right-of-Way Funding) (Activity No. 600)	
39	Design Division submits Permit Sketches and Plan Sheets to the Environmental Division. (Activity No. 575)	
40	Design Division prepares Construction Plans. (Activity No. 705)	Environmental Division to begins Review of Permit Sketches and Plan Sheets and makes any request for adjustment to the appropriate Design Manager of Project.
46		Environmental Division to apply for Permits and notifies Design Division via email. (Activity No. 675)
50	Design Division distributes Construction PS&E Prints.	Environmental Division sends Construction PS&E Plans to SWPPP Consultant.
53	Design Manager Conducts Construction PS&E Field Review. (Activity No. 710)	SWPPP Consultant comments concerning EPSC Plans to be included in Field Review Report.

Table 3-5 (continued)
Typical Bridge and Approach Project Timeline Including Permit Activities
Note: Number of weeks may vary. * Denotes project milestones

Bridge & Approach Project Week No.	Design Division Description of Activity	Other Divisions Description of Activity
53	Design Manager informs Environmental Division (Permits) of any changes from Construction PS&E Field Review that would require a permit application revision.	
55	Design Manager to Distribute Construction PS&E Field Review Report.	Environmental Division Obtains Permits. (Activity No. 680)
61	Design Manager submits Final Roadway Plans w/estimate to Program Operation Office, Estimate Section.	Environmental Division sends Final Roadway Plans to the SWPPP Consultant for the completion of the SWPPP.
70*		**CONTRACT LETTING**

Table 3-5 (continued)
Typical Bridge and Approach Project Timeline Including Permit Activities
Note: Number of weeks may vary. * Denotes project milestones

Permit Drawing Cells

The following cells shall be used for permit drawings and can be found in the TDOT Design Division's standard cell libraries (**STDS.CEL**):

- **PMLOCP** Permit drawing location map form (portrait)
- **PMLOCL** Permit drawing location map form (landscape)
- **PMSK** Permit drawing sketch form (portrait)
- **PMSKGR** Permit drawing sketch form (landscape with profile grid)

These cells can be accessed through the TDOT Design Division Microstation© interface on the "Permits and Forms" dialog. This dialog can be brought up through the TDOT drop down menu on the Microstation© title bar.

The latest versions of the standard cell libraries and programs to access them can be obtained on TDOT Design Division's CADD web page at:

http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/v8/v8design.htm

Plans Distribution Notification to the Environmental Division

For all projects requiring permits Table 3-6 shows the Environmental Division units that need notification that plans have been placed on FileNet.

1. Email notification at major milestones will include an email to the Director of the Environmental Division, Suite 900, James K. Polk Building. Refer to Table 3-6 for additional units in the Environmental Division that should be notified. This will eliminate printings and distributions for permit assessments and technical studies including archaeological, ecological, historical, and hazardous waste purposes.

2. The right-of-way field review plans shall include the proposed EPSC plan sheets. Quantity tabulations are not needed for the field review plans.

3. The plans submitted for permit application purposes shall include mitigation plans and EPSC sheets.

4. The Environmental Division will be responsible for requesting final construction plans from the print shop after plans are submitted.

Activity	Email Notification FileNet Distribution
Structural Grade Approval/Tech Studies Request **(Only Required for Projects with Access Control or when Noise Walls are Proposed)**	TDOT.EnvironmentalDoc@tn.gov Ecology.Plans@tn.gov
Preliminary Field Review	TDOT.EnvironmentalDoc@tn.gov Ecology.Plans@tn.gov Permits.FileNet.TDOT@tn.gov TDOT.Historians@tn.gov
Design Public Hearing/Meeting	TDOT.EnvironmentalDoc@tn.gov No prints required; however, notify Director of Environmental Division (by email) of any alignment changes.
Right of Way Field Review or combined Preliminary & ROW Field Review **Note:** Include all erosion prevention and sediment control plan sheets	TDOT.EnvironmentalDoc@tn.gov Ecology.Plans@tn.gov Permits.FileNet.TDOT@tn.gov
Permit Sketches **Note:** Includes any additional requirements as indicated by the Permit Assessment Report	Permits.FileNet.TDOT@tn.gov
Construction Field Review	TDOT.EnvironmentalDoc@tn.gov Ecology.Plans@tn.gov Permits.FileNet.TDOT@tn.gov
Final Construction Plans	TDOT.EnvironmentalDoc@tn.gov Ecology.Plans@tn.gov Permits.FileNet.TDOT@tn.gov

Table 3-6
Typical Plan Distribution

3-410.02 PLACEMENT OF TREES IN MITIGATION AREAS

Areas designated for tree planting for water quality impacts typically include restored or existing wetlands, channel changes, and when specified, areas around streams and the inlet and outlet areas at culverts. The Technical Studies Office in the Environmental Division shall be consulted to determine which areas require tree planting. All required tree planting must be located within the permanent right-of-way rather than in a drainage easement. Sufficient room shall be designated for the placement of trees and seedlings near culverts, channel relocations and along stream banks, or other mitigation features, within the right-of-way boundaries. These trees should be protected from disturbance during construction and from maintenance activities after construction. Within the approved permit, the regulatory agencies will specify how long and what percentage of survival is needed to satisfy the conditions of the specific permit.

All notes required by the Technical Studies Office, Environmental Division, or specified in the Ecology report must be placed in the final ROW plans for the permit applications.

SECTION IV – CONSTRUCTION PLANS

CHAPTER 1 - GENERAL PROVISIONS

SECTION IV – CONSTRUCTION PLANS

CHAPTER 1 - GENERAL PROVISIONS

4-100.00 INTRODUCTION

This chapter addresses construction matters, which do not fit neatly into any of the other chapters.

4-105.00 ROADWAY DESIGN CHECKLIST - CONSTRUCTION PLANS (See 1-105.00)

4-110.00 PROJECT ACTIVITY STATUS SHEET (See 1-110.00)

4-112.00 SIZE OF FULL-SIZE PLAN AND CROSS-SECTION SHEETS (See 2-112.00 and 3-102.00)

4-112.01 SIZE OF FINAL CONSTRUCTION PLANS AND CROSS-SECTION SHEETS (See Section 1-115.10)

4-115.00 IDENTIFICATION OF SUPERVISORS, DESIGNERS, AND CHECKERS ON TITLE SHEET

On the lower left-hand corner of the project title sheet list the name of the TDOT Civil Engineering Manager 1, TDOT Design Manager 1 or TDOT Roadway Specialist Supervisor 2 in charge of the project, the name of the firm designing the project (if being done by a consultant), the name of the designer, the name of the person(s) who checked the plans and the Design Project (P.E.) number. See Figures 4-1a and 4-1b.

CONSULTANT DESIGN CONSTRUCTION

TDOT C.E. MANAGER 1 OR
TDOT DESIGN MANAGER 1: _____

DESIGNED BY: (Firm Name)
DESIGNER: (Responsible Person) CHECKED BY: _____

P.E. NO. _____
PIN NO. _____

Figure 4-1a
Title Sheet Identification Format for Consultant Designed Construction

T.D.O.T. DESIGN CONSTRUCTION

T.D.O.T. ROAD SP. SV. 2: _____

DESIGNER: _____ CHECKED BY: _____

P.E. NO. _____
PIN NO. _____

Figure 4-1b
Title Sheet Identification Format for TDOT Designed Construction

4-115.05 SIGNATURES OF THE COMMISSIONER AND THE CHIEF ENGINEER ON TITLE SHEET (See 3-105.05)

4-115.10 ENGINEER'S SEAL, SIGNATURE, AND DATE ON TITLE SHEET

When plans are submitted for Construction, the engineer's seal, signature, and date shall be placed on the right side of the title sheet inside the sealed by box. The engineer's seal, signature, and date must also be placed on every subsequent sheet of the Construction Plans (except the cross-sections). Certified digital signatures will be required for all plan submittals.

The Department is utilizing Adobe Certified Document Services (CDS) for PDF documents. Vendors supplying the CDS certificates can be found on Adobe's website at www.adobe.com/security/partners_cds.html. Any of the companies listed can be used to purchase a token. A certification is to be specific to a single professional engineer utilizing the desktop-based document certification process and may not be done on a companywide basis. The professional engineer may not allow anyone else to use the certification on his behalf.

Refer to the document Digital Signature Certification Workflow for information in applying a digital signature to a plan set. Digital Signature Certification Workflow.pdf

4-115.15 PROJECT LENGTHS

All projects shall show - "Roadway Length, Bridge Length, Box Bridge Length and Project Length" - on the title sheet. If there are no bridges or box bridges, show those lengths as "0.000 miles". If box bridges serve as a riding surface for vehicles, that length shall be added together in the same manner as roadway and regular bridge length for a total project length. If the box bridge does not serve as a riding surface, the box-bridge length will not be added in with the others, and a footnote to the Box Bridge Length will be added below the project length to say "Not included in the project length".

4-115.20 EQUATION BLOCKS ON TITLE SHEET (See 2-115.05)

4-115.25 EXCLUSIONS ON TITLE SHEET (See 2-115.10)

4-115.30 PROJECT DESCRIPTIONS (See 2-115.20)

4-115.35 TRAFFIC DATA BLOCK ON TITLE SHEET

The designer will place the traffic design data block on all construction title sheets, except for those used on 100% State Resurfacing Projects, as per Construction Plans checklist in Section 1-105.00 of the Design Guidelines. For an example of a traffic data block, see Section 2-115.15 of the Design Guidelines.

On 100% State Resurfacing Projects, the designer will be required to show only the current ADT as taken from the report prepared by the Bureau of Planning and Development titled *Traffic Flow Maps - Tennessee Roads and Streets* and the posted speed as submitted by the Regional Construction Office.

4-120.00 HAUL ROADS ON ALL PROJECTS

Haul roads shall be shown on the traffic control plans unless it is decided during the Construction Field Review that one is not required. All necessary construction items required to keep the road in satisfactory condition for the contractor shall be included in the plans.

4-125.00 BRIDGE CLEARANCES ON PAVING PROJECTS

The designer shall furnish the Structures Division with a list of all bridges under which the roadway passes. The Structures Division will check the vertical clearance records and furnish the designer with the maximum permissible thickness of overlay under the structure.

4-130.00 SALVAGE CREDITS ON FEDERALLY-FUNDED PROJECTS

Salvage credit (credit to Federal funds) is to be considered when there is a need to dispose of expendable and nonexpendable tangible personal property previously acquired with Federal funds. Such property may be unused construction materials, salvaged highway appurtenances or other equipment and/or material for which the useful life extends beyond the construction contract.

Salvage, for credit to Federal funds, need not be a consideration under the following circumstances:

1. The value of the item(s) is less than $5,000.

2. Salvageable item(s) become the contractor's property by virtue of the contract provisions.(See last paragraphs Subsection 104.10 of the Standard Specifications.)

3. The item(s) will be reused on a future project eligible under Title 23 U.S.C.

4. The cost of salvaging an item(s) would exceed the value of the item(s) salvaged.

If salvage credits are to be applied, the FHWA shall be made aware so that a fair market value may be determined.

If items are to be considered under No. 3 above, maintenance personnel need to be made aware, because certain record keeping will be involved.

4-133.00 CONSTRUCTION PLANS INDEX

The format used in the following construction index is to be adhered to on all construction projects.

The sheet names and sequence of sheets shown in Figure 4-2 are intended to establish a general order for placement of the sheets in the plans. Actual sheet numbers will be determined based on the sheets used on a specific construction project.

SHEET NAME	SHEET NO.
Title Sheet	1
Roadway Index and Standard Drawings Index	1A
Project Commitments	1B
Estimated Bridge Quantities and Bridge Index	2
Estimated Roadway Quantities	2A - 2A1
Estimated Utilities Quantities	2B - 2B1
Typical Sections and Paving Schedule	2C - 2F
General Notes and Special Notes	2G
Tabulated Quantities	2H - 2J
Detail Sheets	2K - 2L
Property Maps and Right-of-Way Acquisition Tables	3, 3A - 3B
Present Layouts	4 - 14
Proposed Layouts	4A - 14A
Proposed Profiles (if needed)	4B - 14B
Public Side Roads and Ramp Profiles	15 - 17
Private Drive and Field Ramp Profiles	18 - 21
Interchange Grading Plans	22 - 24
Drainage Maps	25 - 27
Culvert Sections	28 - 30
Erosion Prevention and Sediment Control (EPSC) Plans	31 - 33
Natural Stream Design Plans	34-35
Environmental Mitigation Plans	36-37
Traffic Control Plans with Construction Phasing Notes	38, 38A - 38Z
Signing and Pavement Marking Plans	39, 39A - 39Z
Sign Schedule Sheets	40, 40A - 40Z
Miscellaneous Signing Details	41, 41A - 41Z
Signal Layouts	42, 42A - 42Z
Lighting Layouts	43, 43A - 43Z
Soils Sheets	44, 44A - 44Z
Roadway Cross-Sections	45 - 191
Side Road Cross-Sections	192 - 200
Utilities Index, Utility Owners, and Utility Sheets	U1-1 - U1-xx
Storm Water Pollution Prevention Plan (SWPPP)	S-1 – S-x

Figure 4-2
Typical Index of Sheets

4-135.00 GENERAL NOTES ON CONTRACT PLANS (See 6-100)

A list of general notes frequently used on project plans is included in Section VI. The designer shall place these notes on the second sheet series of the plans under the heading of "General Notes."

Good engineering judgment is required in the use of these notes and any other notes in the plans. If notes are extracted from other parts of this document, refer to the appropriate part to determine the intent of the note.

These notes have been agreed upon by the various offices of the Department involved in the design, right-of-way acquisition, utility relocation and adjustment, construction, etc.; therefore, care shall be taken that the notes are reproduced on the plans exactly as they are in this document, unless there is an excellent reason for revising the wordage.

4-135.05 SPECIAL NOTES ON CONTRACT PLANS (See 6-200)

A list of special notes frequently used on project plans is included in Section VI. Special notes also include notes written specifically for the project or notes that vary in any way from the computerized list of general or special notes listed in Section VI. The designer shall place these notes on the second sheet series of the plans under the heading "Special Notes". The designer should also be aware that individual notes may be required to be included on specific plans sheets as indicated in Section VI.

Special Notes are to be placed and identified on the plans as follows:

1. Special Notes are to be placed immediately following General Notes in the plans.
2. Special Notes are to be identified with the header “Special Notes”. The heading “Special Notes” should not be included as a sub-header under General Notes.
3. The Index Sheet should include “Special Notes” when applicable.
4. General Notes that are modified are to be included as Special Notes.
5. Special Notes are to be grouped together and sub-headers used. For modified general notes, the same sub-header found in the general notes should be used in the Special Notes. Special Notes specific to the project should be placed under the appropriate sub-header or an appropriate sub-header be created.
6. Notes requested by the Environmental Division should be included as Special Notes except for special circumstances that require the note to be shown on the specific plan sheet for which the note applies. In these cases, a special note should be included in the Special Notes indicating the location of the note.

7. For notes added at the direction of the Environmental Division, the following sub-headers should be used:

    A. Environmental - Air and Noise
    B. Environmental – Archaeology
    C. Environmental – Ecology
    D. Environmental - Hazardous Materials
    E. Environmental - Historic Preservation
    F. Environmental – Mitigation
    G. Environmental – Permits

Notes in the Design Guidelines and Instructional Bulletins specified to be placed in other locations in the plans should continue to be placed as directed.

TYPE	YEAR	PROJECT NO.	SHEET NO.
CONST.	2007	BRZE-9999(11)	2C

TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

GENERAL NOTES

GRADING

(1) ANY AREA THAT IS DISTURBED OUTSIDE LIMITS OF CONSTRUCTION DURING THE LIFE 0F THIS PROJECT SHALL BE REPAIRED BY THE CONTRACTOR AT HIS EXPENSE.

(2) CERTIFICATION FOR ALL BORROW PITS MUST BE OBTAINED IN ACCORDANCE WITH SUBSECTION 107.06 OF THE STANDARD SPECIFICATIONS.

(3) THE CONTRACTOR SHALL NOT DISPOSE OF ANY MATERIAL EITHER ON OR OFF STATE-OWNED R.O.W. IN A REGULATORY FLOOD WAY AS DEFINED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY WITHOUT APPROVAL BY SAME. ALL MATERIAL SHALL BE DISPOSED OF IN UPLAND (NON-WETLAND) AREAS AND ABOVE ORDINARY HIGH WATER OF ANY ADJACENT WATERCOURSE. THIS DOES NOT ELIMINATE THE NEED TO OBTAIN ANY OTHER LICENSES OR PERMITS THAT MAY BE REQUIRED BY ANY OTHER FEDERAL, STATE OR LOCAL AGENCY.

SEEDING AND SODDING

(4) ALL EXISTING ROADS WITHIN THE RIGHT-OF-WAY AND NOT IN THE GRADED AREA THAT ARE TO BE ABANDONED SHALL BE SCARIFIED, OBLITERATED, TOPSOILED AND SEEDED. SCARIFYING AND OBLITERATING THE PAVEMENT WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COST WILL BE INCLUDED IN THE COST OF OTHER ITEMS. TOPSOIL, IN ACCORDANCE WITH SECTION 203 OF THE STANDARD SPECIFICATIONS, WILL BE MEASURED AND PAID FOR UNDER ITEMS 203-04 AND/OR 203-07. SEEDING, IN ACCORDANCE WITH SECTION 801 OF THE STANDARD SPECIFICATIONS, WILL BE MEASURED AND PAID FOR UNDER ITEM 801-01.

(5) SOD SHALL BE PLACED AT LOCATIONS SHOWN ON THE PLANS TO PREVENT DAMAGE TO ADJACENT FACILITIES AND PROPERTY DUE TO EROSION ON ALL NEWLY GRADED CUT AND FILL SLOPES AS WORK PROGRESSES.

(6) ITEM NO. 801-01, SEEDING (WITH MULCH), SHALL BE USED ON ALL SLOPES.

GUARDRAIL

(7) GUARDRAIL IS TO BE COMPLETE IN PLACE BEFORE THE MAINLINE ROADWAY IS OPENED TO TRAFFIC.

DRAINAGE

(8) THE CONTRACTOR SHALL SHAPE DITCHES TO THE SPECIFIED DESIGN. THIS WORK WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COST WILL BE INCLUDED IN THE COST OF OTHER ITEMS.

(9) CULVERT EXCAVATION FOR CONCRETE BOX OR SLAB TYPE CULVERTS OR BRIDGES WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COST WILL BE INCLUDED IN THE COST OF OTHER ITEMS.

(10) THE CUTTING OF INLET AND OUTLET DITCHES WHERE SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER WILL BE MEASURED AND PAID FOR AS ITEM NO. 203-01 ROAD AND DRAINAGE EXCAVATION (UNCLASSIFIED).

(11) WHERE A CULVERT (PIPE, SLAB OR BOX) IS MOVED TO A NEW LOCATION OTHER THAN THAT SHOWN ON THE PLANS, INCREASING OR DECREASING THE AMOUNT OF CULVERT EXCAVATION, NO INCREASE OR DECREASE IN THE AMOUNT OF PAYMENT WILL BE MADE DUE TO SUCH CHANGE.

(12) DURING CONSTRUCTION OF DRAINAGE STRUCTURES ALL COST ASSOCIATED WITH MAINTAINING THE FLOW OF WATER AND TRAFFIC, AT THESE STRUCTURES, DURING THE PHASED CONSTRUCTION OF THIS PROJECT ARE TO BE INCLUDED IN THE UNIT PRICE OF THE DRAINAGE STRUCTURES AND TRAFFIC CONTROL ITEMS.

MISCELLANEOUS

(13) THE CONTRACTOR SHALL BE REQUIRED TO REMOVE AND RESET MAILBOXES WHERE AND AS DIRECTED BY THE ENGINEER.

(14) NOTHING IN THE GENERAL NOTES OR SPECIAL PROVISIONS SHALL RELIEVE THE CONTRACTOR FROM HIS RESPONSIBILITIES TOWARD THE SAFETY AND CONVENIENCE OF THE GENERAL PUBLIC AND THE RESIDENTS ALONG THE PROPOSED CONSTRUCTION AREA.

ROAD CLOSURE NOTES

(15) NO LESS THAN SEVEN (7) DAYS PRIOR TO THE CLOSURE OF THE ROAD, THE CONTRACTOR SHALL NOTIFY THE FOLLOWING INDIVIDUALS OR AGENCIES COMPLETELY DESCRIBING THE AFFECTED ROADS AND THE APPROXIMATE DURATION OF THE CONSTRUCTION: THESE PARTIES INCLUDE, BUT ARE NOT LIMITED TO: (1) LOCAL LAW ENFORCEMENT OFFICE, (2) LOCAL FIRE DEPARTMENT, (3) AMBULANCE SERVICE, (4) LOCAL SCHOOL SUPERINTENDENT, (5) UNITED STATES POSTAL SERVICE, AND (6) LOCAL ROAD SUPERINTENDENT.

PAVEMENT MARKINGS

(16) PERMANENT PAVEMENT LINE MARKINGS SHALL BE REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK. SHORT, UNMARKED SECTIONS SHALL NOT BE ALLOWED. THESE MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 716-10.01 PAINTED PAVEMENT MARKING (4" LINE), LIN. MI.

GRADED SOLID ROCK

(17) THE ROCK FILL (GRADED SOLID ROCK) MATERIAL SHALL CONSIST OF SOUND, NON-DEGRADABLE LIMESTONE OR SANDSTONE WITH A MAXIMUM SIZE OF 3'-0". AT LEAST 50% (BY WEIGHT) OF THE ROCK SHALL BE UNIFORMLY DISTRIBUTED BETWEEN 1'-0" AND 3'-0" IN DIAMETER, AND NO GREATER THAN 10% (BY WEIGHT) SHALL BE LESS THAN 2" IN DIAMETER. THE MATERIAL SHALL BE ROUGHLY EQUIDIMENSIONAL; THIN, SLABBY MATERIALS WILL NOT BE ACCEPTED. THE CONTRACTOR SHALL BE REQUIRED TO PROCESS THE MATERIAL WITH AN ACCEPTABLE MECHANICAL MEANS (A SCREENING PROCESS CAPABLE OF PRODUCING THE REQUIRED GRADATION). THE ROCK SHALL BE APPROVED BY A REPRESENTATIVE OF THE DIVISION OF MATERIALS AND TESTS BEFORE USE.

(18) THIS GRADED SOLID ROCK MATERIAL SHALL BE PLACED IN LAYERS NOT EXCEEDING FIVE FEET IN DEPTH.

CONSTRUCTION WORK ZONE & TRAFFIC CONTROL NOTES

(19) IF THE CONTRACTOR MOVES OFF THE PROJECT, HE SHALL COVER OR REMOVE ALL UNNEEDED SIGNS AS DIRECTED BY THE ENGINEER. COSTS OF REMOVAL, COVERING, AND REINSTALLING SIGNS SHALL NOT BE MEASURED AND PAID FOR SEPARATELY, BUT ALL COSTS SHALL BE INCLUDED IN THE ORIGINAL UNIT PRICE BID FOR ITEM NO 712-06, SIGNS (CONSTRUCTION) PER SQUARE FOOT.

(20) A LONG TERM BUT SPORADIC USE WARNING SIGN, SUCH AS A FLAGGER SIGN, MAY REMAIN IN PLACE WHEN NOT REQUIRED PROVIDED THE SIGN FACE IS FULLY COVERED.

(21) TRAFFIC CONTROL DEVICES SHALL NOT BE DISPLAYED OR ERECTED UNLESS RELATED CONDITIONS ARE PRESENT NECESSITATING WARNING.

(22) USE OF BARRICADES, PORTABLE BARRIER RAILS, VERTICAL PANELS, AND DRUMS SHALL BE LIMITED TO THE IMMEDIATE AREAS OF CONSTRUCTION WHERE A HAZARD IS PRESENT. THESE DEVICES SHALL NOT BE STORED ALONG THE ROADWAY WITHIN THIRTY (30) FEET OF THE EDGE OF THE TRAVELED WAY BEFORE OR AFTER USE UNLESS PROTECTED BY GUARDRAIL, BRIDGE RAIL, AND/OR BARRIERS INSTALLED FOR OTHER PURPOSES FOR ROADWAYS WITH CURRENT ADT'S LESS THAN 1500 AND DESIGN SPEED OF LESS THAN 60 MPH. THIS DISTANCE SHALL INCREASE TO FORTY-FIVE (45) FEET FOR ROADWAYS WITH CURRENT ADT'S OF 1500 OR GREATER AND DESIGN SPEED OF 60 MPH OR GREATER OR ON THE OUTSIDE OF A HORIZONTAL CURVE. THESE DEVICES SHALL BE REMOVED FROM THE CONSTRUCTION WORK ZONE WHEN THE ENGINEER DETERMINES THEY ARE NO LONGER NEEDED. WHERE THERE IS INSUFFICIENT RIGHT-OF-WAY TO PROVIDE FOR THIS REQUIRED SETBACK, THE CONTRACTOR SHALL DETERMINE THE ALTERNATE LOCATIONS AND REQUEST THE ENGINEER'S APPROVAL TO USE THEM.

SPECIAL NOTES

CONSTRUCTION WORK ZONE & TRAFFIC CONTROL NOTES

(1) ADVANCED WARNING SIGNS SHALL NOT BE DISPLAYED MORE THAN SEVENTY-TWO (72) HOURS BEFORE PHYSICAL CONSTRUCTION BEGINS. SIGNS MAY BE ERECTED UP TO ONE WEEK BEFORE NEEDED, IF THE SIGN FACE IS FULLY COVERED.

EROSION CONTROL

(2) REFER TO THE EROSION CONTROL PLAN, SHEET 10C, FOR NOTES REGARDING SEASONAL WORK LIMITATION OR LIMITATION ON THE TOTAL AREA OF EXPOSED SOIL.

EXCAVATION OR PLACEMENT OF RIP-RAP IN THE DRY

(3) ANY EXCAVATION OF THE STREAM CHANNEL AREA (e.g., FOR PIER FOOTING OR RIP-RAP PLACEMENT) SHALL BE SEPARATED FROM FLOWING WATER OR EXPECTED FLOW PATH AND PERFORMED DURING LOW FLOW CONDITIONS. THIS SHALL BE ACCOMPLISHED BY THE USE OF SHEET PILES, FLUMES, DIVERSION PIPE WITH SAND BAG DAM AT PIPE INLET, LINED DIVERSION CHANNEL WITH SAND BAG OR CLEAN ROCK BERM, JERSEY BARRIERS, ETC. ALL WORK FOR EXCAVATION IN THE STREAM CHANNEL AREA INCLUDING EROSION PREVENTION AND SEDIMENT CONTROL PLAN, SHALL BE PAID FOR UNDER ITEM NO. 209-65.20.21. 22, SEQUENCING FOR CONSTRUCTION IN THE DRY (DESCRIPTION), LS. THIS ITEM SHALL INCLUDE ALL COSTS FOR MATERIALS, LABOR, MAINTENANCE, REMOVAL, SITE RESTORATION, AND OTHER MISCELLANEOUS ITEMS.

ENVIRONMENTAL-ECOLOGY

(4) STAFF FROM TDOT ENVIRONMENTAL DIVISION OR A DESIGNEE WILL ADVISE THE CONTRACTOR DURING THE PRE-CONSTRUCTION MEETING CONCERNING WHEN ENVIRONMENTAL DIVISION PERSONNEL OR DESIGNATED CONSULTANT WILL NEED TO BE ON-SITE FOR WORK BEING DONE WHICH COULD AFFECT THE STREAM OR SPECIES.

(5) STAFF FROM THE TDOT ENVIRONMENTAL DIVISION OR A DESIGNEE WILL ATTEND THE PRE-CONSTRUCTION MEETING FOR ALL PROJECTS WHICH HAVE THREATENED OR ENDANGERED SPECIES OR CRITICAL HABITAT PROXIMAL TO SCHEDULED BRIDGE WORK. THIS WILL PROVIDE THE OPPORTUNITY TO ENSURE THAT PERSONNEL INCLUDING THE CONTRACTOR'S PERSONNEL AND SUBCONTRATORS ARE MADE AWARE OF THE NECESSARY PRECAUTIONS WHICH MUST BE FOLLOWED.

(6) ALL BRIDGE PROJECTS WITH THREATENED OR ENDANGERED SPECIES OR CRITICAL HABITAT IDENTIFIED MUST HAVE MEASURES IN PLACE TO CONTAIN CONCRETE DUST, CEMENT DUST AND ALL OTHER MATERIALS. THESE MATERIALS ARE NOT ALLOWED TO ENTER THE STREAM.

ENVIRONMENTAL-HISTORIC PRESERVATION

(7) ANY DRIVEWAY WORK AT THE HISTORIC PROPERTY WILL BE AS MINIMAL AS POSSIBLE.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

GENERAL NOTES AND SPECIAL NOTES

08-AUG-2007 13:38
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Figure 4-3
Example of General Notes and Special Notes Sheet

4-136.00 PROJECT COMMITMENTS SHEET IN CONSTRUCTION PLANS

All environmental commitments as well as any other commitments made during the planning and development of the project will be required to be added to the project commitments page found in Project Manager on PPRM. Those commitments will then be required to be included on a separate project commitments sheet in the construction plans.

In order to ensure that all environmental commitments required are included in the construction plans, environmental staff will be required to verify that all project commitments are included in the construction plans as part of the construction re-evaluation.

The project commitments sheet shall be developed using the project commitments sheet excel template developed by the CADD Section. The sheet shall be placed in the plans as sheet 1B or the first 1 sheet in the plans after the Roadway Index and Standard Drawing Index sheet. For projects with no project commitments, the following note shall be placed at the bottom of the Index of Sheets, “No project commitments sheet included in this set of plans.”

The following procedures shall be used for identifying project commitments and developing the project commitments sheet.

1. It will be the responsibility of the project manager or the division responsible for the project commitment to place the project commitment into PPRM on the project commitments page found in Project Manager.

2. Design manager and design supervisor will be responsible for checking the project commitments page in PPRM and supplying the commitment information to in-house designers and consultants to develop the project commitments sheet.

3. The project commitments sheet shall be developed at the beginning of construction plans development and updated as needed prior to distributing plans or .PDF plans for permit applications, construction field review, and final construction plans submittal.

4. Each commitment shown on the project commitment sheet shall contain the commitment ID, source division, commitment description, and the station/location.

5. Design managers shall be responsible for verifying that the commitment does not violate any of the 13 controlling elements of design or design standards. In the event a commitment requires a design exception or other documentation, it shall be the responsibility of the design manager to obtain a design exception or provide appropriate documentation needed to document the variance from the standard design practice prior to adding the commitment to the project commitments sheet.

6. Project commitments are intended to include commitments made during the development of the environmental document, to mitigate environmental impacts, or to address issues related to the project design, or right-of-way acquisition that the Department has agreed to during project planning and development. Commitments should not include items normally included as part of a set of construction plans,

covered under standard specifications, or other contract documents. In the event that the design manager believes a commitment has been added that is not warranted, the design manager will notify the assistant director in design responsible for the project. The assistant director will follow up with the appropriate person or persons in the division which added the commitment to determine if the commitment is appropriate.

Figure 4-4 shows an example of the Project Commitments Sheet.

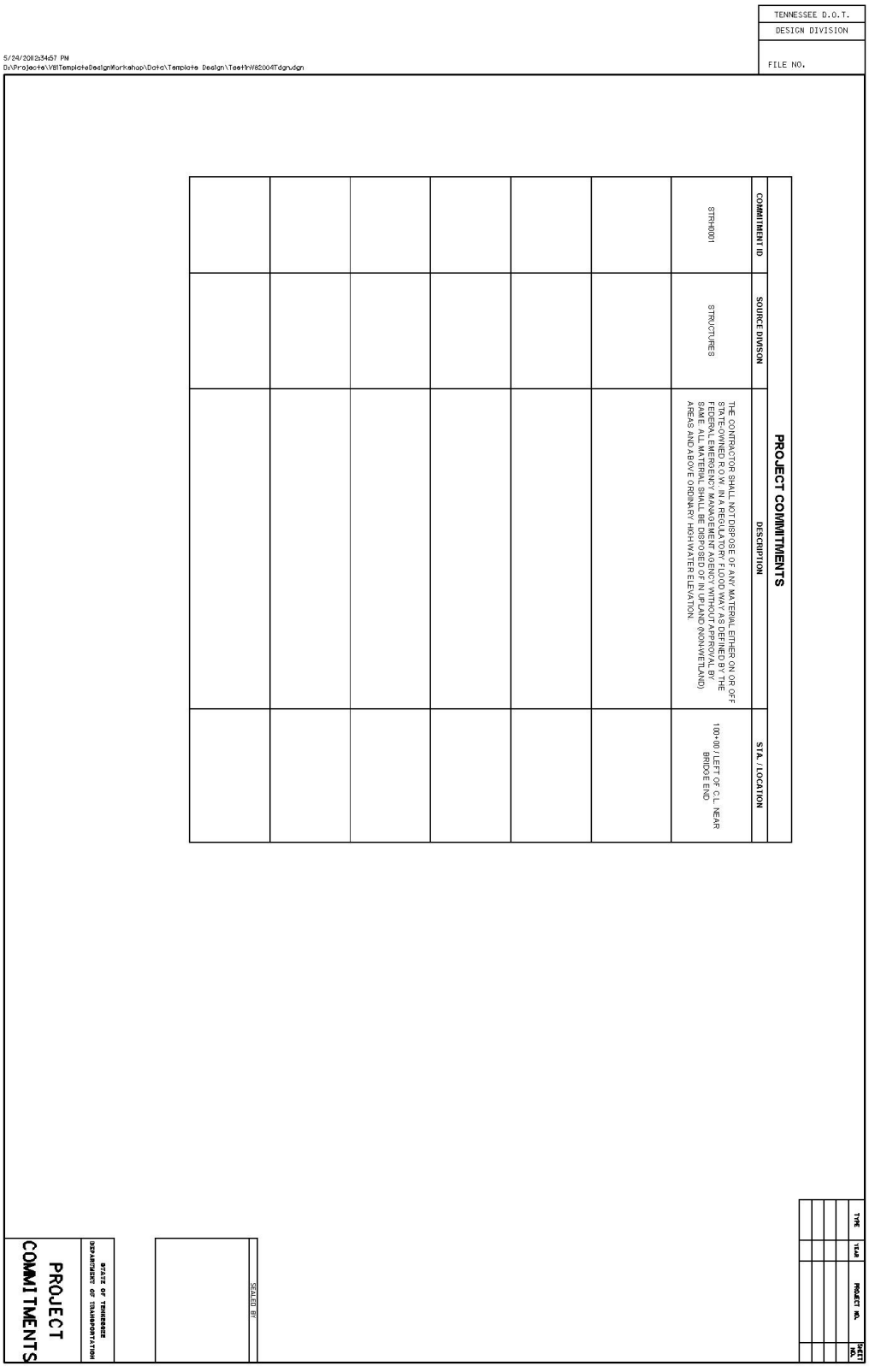


Figure 4-4
Example of Project Commitments Sheet

4-137.00 ADDITION OF UTILITY SHEETS TO CONSTRUCTION PLANS

The Commissioner is authorized to reimburse utilities for the cost of utility relocation as established by Tennessee Code Annotated, Title 54, Chapter 5, Part 8. As a result of this legislation, utilities will have the option of including their relocations in the Department's plans for certain projects. Construction plans for local controlled projects may include utility relocation plans if requested by the local government.

The Regional Utilities Office will submit a pdf of Utility Sheets, Utility Relocation Plans, and a Utilities Index Sheet directly to the FileNet and notify by email EPlans.Turnin.TDOT@tn.gov for letting, just as roadway and structure plans are submitted. If utilities are to be included in the construction contract, the Utilities Office will also submit estimated utility quantities to the Design Manager. The roadway designer will be responsible for developing the "Estimated Utility Quantities Sheet" to be included in the roadway plans, using quantities provided by the Design Manager.

In order to establish a uniform procedure for adding utility estimated quantities and sheets to the plans the following guidelines will be used:

1. The Design Manager shall contact the Regional Utilities Office approximately fourteen (14) weeks prior to the letting date to determine if utilities will be included as part of the construction contract. (Responsible Office: Design)

2. The Utilities Office will submit estimated utility quantities (in excel .xls format) with **assigned item numbers, units of measurement, and descriptions** to the Design Manager a minimum of twelve (12) weeks prior to the letting. (Responsible Office: Utilities)

3. Sheet No. 2B will be used for the "Estimated Utilities Quantities" sheet. If additional sheets are needed, sheet numbers 2B1, 2B2, etc. should be used. The following footnote should be added to sheet 2B: "See Sheet U1-1 for index of utility sheets. Applicable footnotes for Estimated Utilities Quantities will be on the utility tabulation blocks." (Responsible Office: Design)

4. The Utilities Office will be responsible for the Utility Estimate. The Utilities Office will supply the Estimating and Bid Analysis Office with the estimate file and unit prices for all utility items included in the plans. (Responsible Office: Utilities)

5. Sheet No. U1-1, "Utilities Index, Utility Owners, and Utility Sheets" will be shown in the "Roadway Index" after the Cross Sections. If there are no Utility Sheets in the plan set the designer will place the note: "No Utility Sheets" at the bottom of the index. (Responsible Office: Design)

6. All utility sheets (including utility relocation sheets) and utility owners shall be listed on Sheet U1-1, "Utilities Index, Utility Owners, and Utility Sheets." This sheet may include the first utility sheet or it may follow as Sheet U1-2. See Figure 4-5. For format of Utility Owners see Figure 4-6. (Responsible Office: Utilities)

7. All utility sheets (including utility relocation sheets) will use the standard TDOT box in the upper right corner to identify the sheet. See Figure 4-7. (Responsible Office: Utilities)

8. All sheets shall be placed onto FileNet under the name nnnnnn-nn-Utility.pdf and a notification shall be sent to Eplans.turnin.TDOT@tn.gov (Responsible Office: Utilities)

9. An engineer licensed in the State of Tennessee shall seal utility relocation sheets. (Responsible Office: Utilities)

10. Revisions to utility sheets will be follow the revision procedure for Letting (See Section 4-140.02) or Construction (See Section 4-150.00).

11. Utility quantities and item numbers will be consistent with the units of measurement used for the roadway plans. (Responsible Office: Utilities)

UTILITIES INDEX (EXAMPLE)

SHEET NAME	SHEET NUMBER
Utilities Index, Utility Owners, and Utility Sheets	U1-1 – U1-xx
Electrical Relocation Sheets	U2-1 – U2-xx
Water Relocation Sheets	U3-1 – U3-xx
Sewer Relocation Sheets	U4-1 – U4-xx
Gas Relocation Sheets	U5-1 – U5-xx
Cable TV Relocation Sheets	U6-1 – U6-xx
TVA Relocation Sheets	U7-1 – U7-xx

Figure 4-5
Typical Utilities Index

UTILITY OWNERS AND CONTACTS

Water:
Metro Water and Sewer
P.O. Box 123
Nashville, TN 37243
Contact: John Smith
Telephone: 615-555-1212
Fax: (if available)
Email: (if available)

Electrical:
Nashville Electric
1000 Church Street
Nashville, TN 37216
Contact: Mike Jones
Telephone: 615-555-1234
Fax: (if available)
Email: (if available)

Sewer:
Metro Water and Sewer
P.O. Box 123
Nashville, TN 37243
Contact: Bill Williams
Telephone: 615-555-1213
Fax: (if available)
Email: (if available)

Figure 4-6
Typical Format for Utility Owner Information

TYPE	YEAR	PROJECT NO.	SHEET NO.
CONST.	2003	NH-I-40-7(157)359	U1-1

Figure 4-7
Upper Right Hand Corner Box

1. Use "**CONST.**" for the type project. The designation "ROW" should not be added since utility sheets are not included in the right-of-way plans.
2. Use year project is let for construction.
3. Insert federal construction project number. If not a federal project, use the state construction project number.

4-140.00 SUBMITTAL OF CONSTRUCTION PROJECT PLANS (See 1-220.00 and 3-400.15)

Final sealed and signed construction plans shall be posted onto FileNet and the Construction Plans Transmittal Letter (see Figure 4-8) shall be emailed to Eplans.turnin.TDOT@tn.gov. (See Table 3-6 for notification to be sent to Environmental Division). For projects involving railroads shall also copy the Railroad Coordinator on the transmittal notice.

A copy of the Right-of-Way Title Sheet and construction plans transmittal letter shall also be attached at the front of the pdf.

The email subject line shall include the Region, County, State Route Number or Route Name, PIN, "Construction Turn-in"

If the project includes grading quantities, a pdf copy of the grading quantity calculation sheets will be emailed to Eplans.turnin.TDOT@tn.gov.

4-140.02 LETTING REVISIONS

The determination of a letting revision will be made by the Headquarters Construction Office. An estimate revision may or may not require a Letting Revision. The designer should check with the Printing Services Office to see if the plans have been printed. If the plans have not been printed the revised sheets may be swapped out without formal revision.

The Design Manager responsible for the project will upload the revised plan set to Design FileNet (See Section 1-115.00) and submit an email notification to the appropriate personnel. The email will contain the revision letter and a pdf of the revised sheets only. In the event that the pdf is larger than the 15 MB email limit, then the pdf should be broken down into smaller files and additional emails sent.

Distribution of Letting Plans Revisions

TO:	EMAIL ADDRESS
Construction Division Director	TDOT.HQ.Construction@tn.gov
Design Division – Plans Assembly	Eplans.turnin.TDOT@tn.gov
C.E. Manager 2, Design Division	Use individual email address*
Railroad Coordinator (if railroad involvement)	Use individual email address*
Environmental Division	TDOT.EnvironmentalDoc@tn.gov Permits.Filenet.TDOT@tn.gov Ecology.Plans@tn.gov TDOT.Historians@tn.gov
Printing Services Superintendent	TDOT.CopyCenter@tn.gov

* See Contact List at:
http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/DesGuide.htm

Letting Revision Distribution for projects with the following prefixes: **I, IM, ID, NH-1, STP-1, CM-1, MA-1, IXA-1, BR-1 and DPI**; also must send the following:

- FHWA Division, Project Management Engineer W/1 set prints (half size) & 4 copies of the letter

The email subject line shall include the Region, County, State Route Number or Route Name, PIN, "Letting-Revision"

Estimate Revisions

An “Estimate Revision Request” form, shown in Figure 4-9, must be filled out anytime a quantity is changed after the submission of the construction estimate and/or a Letting Revision is issued. If a Letting Revision is issued but no quantities were revised the designer shall state “No Quantities Affected” in the body of the email. This information is necessary in order to maintain a current and accurate state estimate**.** The completed form shall be emailed to: TDOT.Construction.Estimates@tn.gov and TDOT.EstimatingOffice@tn.gov**.**

In the subject line of the email state the following information: County: PIN REVISION.
e.g. Carter: 123456.00 REVISION

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
NASHVILLE, TENNESSEE 37243-1402

MEMORANDUM

TO: Eplans.Turnin.TDOT@tn.gov

FROM:

DATE:

SUBJECT: Project No.:
PIN
Description:

The following completed Construction Plan items for the referenced project are being transmitted for the _____ Letting Process.

- ☐ Original Construction Drawings (_____ Sheets)
- ☐ Original Roadway Cross-Sections (_____ Sheets)
- ☐ Original R.O.W. Title Sheet
- ☐ To Be Printed with Plans Standard Drawings (Sheets)
- ☐ Copy Grading Quantity Sheets emailed
- ☐ Estimate e-mailed to TDOT.Construction.Estimates@tn.gov
- ☐ Resurfacing Plans (_____ Sheets)

Plans have been placed on FileNet: Filename:
Added On Date:

Comments:

For further information, please contact Phone: ( ) - .

cc: Environmental Division

Figure 4-8
Example Construction Plans Transmittal Letter

ESTIMATE REVISION REQUEST

Project No. 1: _____ Submitted By: _____ email to:Construction.Estimates@tn.gov

Project No. 2: _____ County: _____

Project No. 3: _____ Rev. Date: _____

CHANGES				ADDITIONS				DELETIONS
ITEM NO.	QUANTITY			ITEM NO.	QUANTITY			ITEM NO.
	PROJECT 1	PROJECT 2	PROJECT 3		PROJECT 1	PROJECT 2	PROJECT 3	

Figure 4-9
Estimate Revision Form

4-140.03 ITEM NUMBERS

Item numbers, item descriptions, and units of measurement which are to be used with the March 1, 2006 Standard Specifications for Road and Bridge Construction Book are available at the following website:

http://www.tdot.state.tn.us/RoadItemLists/roaditem_index.htm

The list is updated daily by the Construction Division. A list of the item numbers and descriptions is not printed in the Design Guidelines or Instructional Bulletins.

If an item number is needed, the Design Manager should contact the ITS, Traffic and Standards Office, Suite 1300, James K. Polk Building, Nashville, Tennessee 37243 TDOT.ITS.SignalDesign@tn.gov to determine if an item number will be assigned or included in another item.

4-140.05 CONSTRUCTION QUANTITIES ESTIMATE DATA FILE

The construction quantities estimate is an Excel file, as shown in Figure 4-10.

The templates are available in the self-extracting archive, 2ndSheets.exe at:

http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/v8/v8design.htm

Instructions for use of these templates are in **2ndSheetsV8.pdf,** also at the same site.

The Excel estimate templates will accommodate projects with one, two or three State project numbers. For jobs with more than three State project numbers, contact the Estimates and Bid Analysis Office for instructions.

No prices are to be entered in the estimate. Quantities cannot contain commas.

All items shall be listed in numerical order, regardless of the order they are listed in the plans.

SUBTOTAL CODES: (See **2ndSheetsV8.pdf** for detailed instructions)

a) Roadway items shall be listed on a sheet separate from the Box-Bridge items. The sheet name for Roadway items must start with **Col.**

b) Box-Bridge items shall be listed on a sheet separate from the Roadway items. The sheet name for Box Bridge items must start with **Box.**

c) Alternate Roadway items shall be listed after all of the other roadway items. The alternates will be designated in column C as Alternate AA1, Alternate AA2, Alternate AA3, Alternate AB1, Alternate AB2, etc. Alternates AA1 would alternate with AA2 and AA3. AB1 would alternate with AB2, etc.

d) Non-participating items are listed by column as designated on the **Proj Data** sheet.

4-140.06 SUBMITTAL OF CONSTRUCTION QUANTITIES ESTIMATES

For in-house design projects, the designer should place the completed construction estimate Excel file on FileNet at the time final plans are submitted. The Excel file shall also be emailed to: TDOT.Construction.Estimates@tn.gov and TDOT.EstimatingOffice@tn.gov. A copy of the email shall be placed in the project folder to document the submittal of the construction estimate.

For consultant design projects, the completed Excel file is to be forwarded with the final construction plans to the Design Manager for submittal. Submittal may be on either CD, DVD, or via email. The manager should place the construction estimate Excel file on FileNet at the time final plans are submitted. The Excel file shall also be emailed to: TDOT.Construction.Estimates@tn.gov and TDOT.EstimatingOffice@tn.gov. A copy of the email shall be placed in the project folder to document the submittal of the construction estimate.
In the subject line of the email state the following information: “County: Pin No.”

The following information is also required at the time of Construction plans submittal:

1. If the project includes right-of-way removal items, the unit prices furnished by the Right-of-Way Office will be shown in the unit price column of the submitted estimate. A copy of the letter from the Right-of-Way Office stating the values of the various removal items shall be submitted to the Estimating and Bid Analysis Office. All other unit prices will be set by the Estimating and Bid Analysis Office.

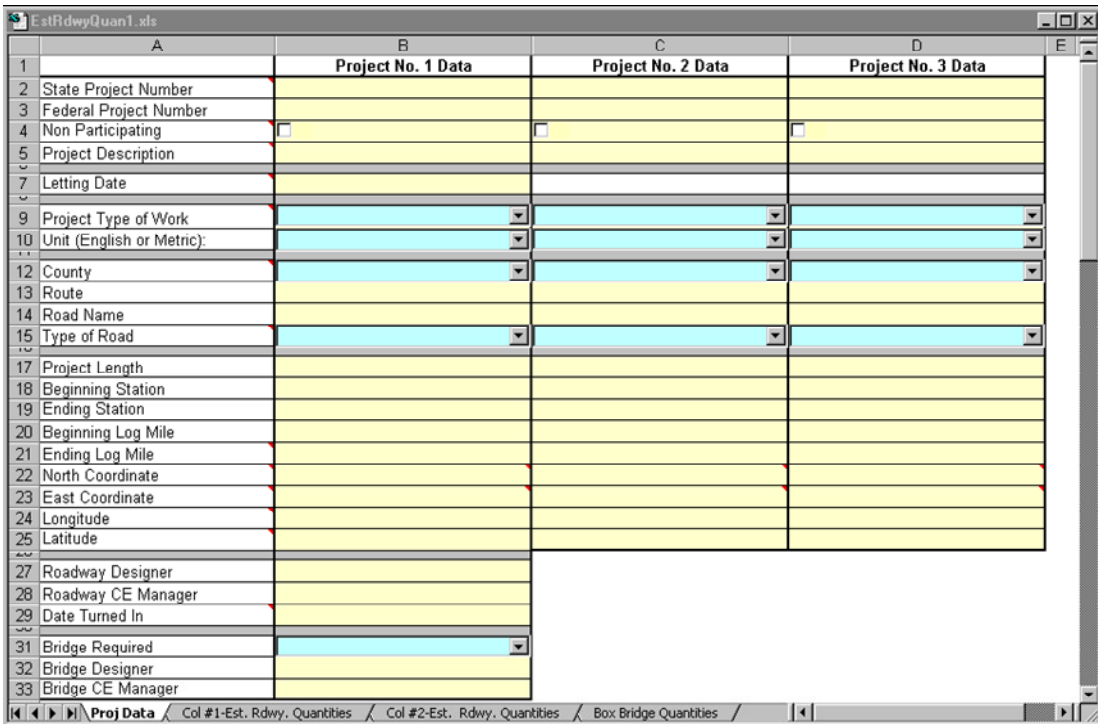
2. If the project includes non-participating items, any information concerning price will be furnished to the Estimating and Bid Analysis Office.

Any and all changes to the items after submittal must be revised in accordance with the Plans and Estimates Revision guidelines. (See Section 4-140.02.)

If further information is required, please contact the Estimating and Bid Analysis Office.

4-140.07 SUBMITTAL OF PRELIMINARY CONSTRUCTION QUANTITIES ESTIMATES (See 3-400.15)

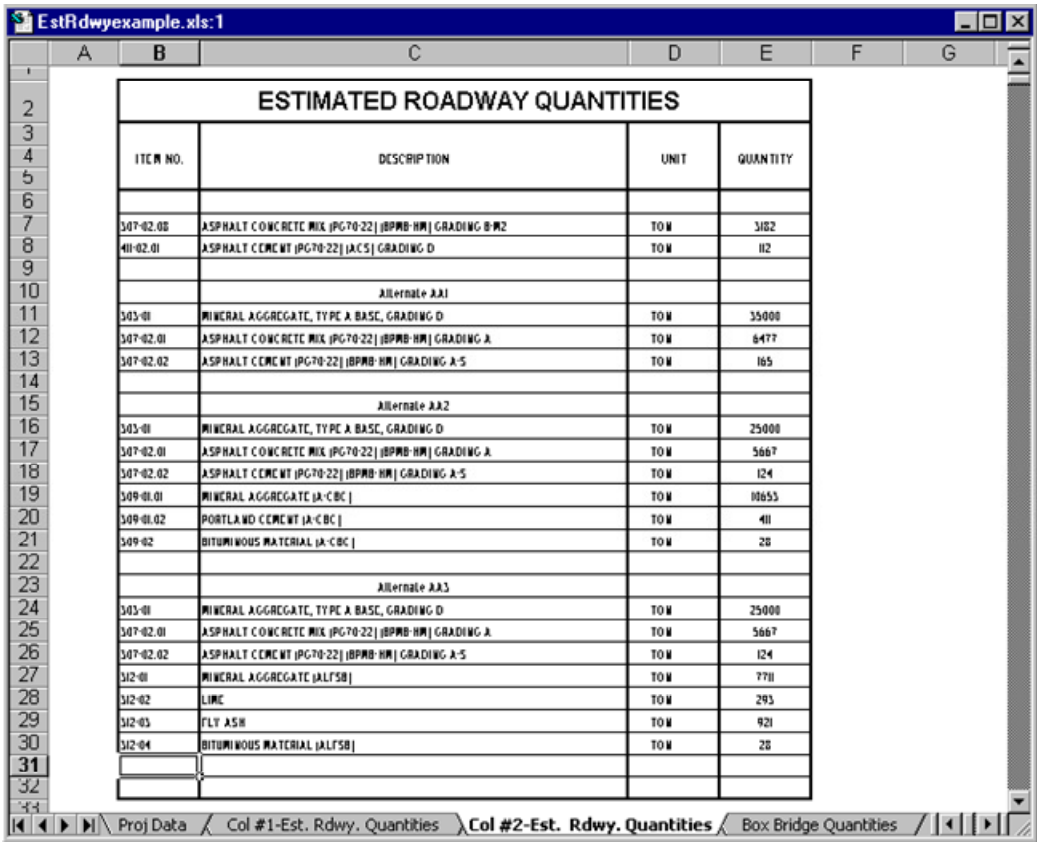
Refer to Section 3-400.15 for procedures to submit preliminary construction quantities estimates.



EstRdwyQuan1.xls

	A	B	C	D	E
1		Project No. 1 Data	Project No. 2 Data	Project No. 3 Data	
2	State Project Number				
3	Federal Project Number				
4	Non Participating	☐	☐	☐	
5	Project Description				
7	Letting Date				
9	Project Type of Work				
10	Unit (English or Metric):				
12	County				
13	Route				
14	Road Name				
15	Type of Road				
17	Project Length				
18	Beginning Station				
19	Ending Station				
20	Beginning Log Mile				
21	Ending Log Mile				
22	North Coordinate				
23	East Coordinate				
24	Longitude				
25	Latitude				
27	Roadway Designer				
28	Roadway CE Manager				
29	Date Turned In				
31	Bridge Required				
32	Bridge Designer				
33	Bridge CE Manager				

Proj Data | Col #1-Est. Rdwy. Quantities | Col #2-Est. Rdwy. Quantities | Box Bridge Quantities



EstRdwyexample.xls:1

ESTIMATED ROADWAY QUANTITIES

ITEM NO.	DESCRIPTION	UNIT	QUANTITY
307-02.08	ASPHALT CONCRETE MIX (PG70-22) (BPMB-HM) GRADING BM2	TON	3182
411-02.01	ASPHALT CEMENT (PG70-22) (ACS) GRADING D	TON	112
	Alternate AA1		
303-01	MINERAL AGGREGATE, TYPE A BASE, GRADING D	TON	35000
307-02.01	ASPHALT CONCRETE MIX (PG70-22) (BPMB-HM) GRADING A	TON	8477
307-02.02	ASPHALT CEMENT (PG70-22) (BPMB-HM) GRADING A-S	TON	165
	Alternate AA2		
303-01	MINERAL AGGREGATE, TYPE A BASE, GRADING D	TON	25000
307-02.01	ASPHALT CONCRETE MIX (PG70-22) (BPMB-HM) GRADING A	TON	5667
307-02.02	ASPHALT CEMENT (PG70-22) (BPMB-HM) GRADING A-S	TON	124
309-01.01	MINERAL AGGREGATE (A-CBC)	TON	10855
309-01.02	PORTLAND CEMENT (A-CBC)	TON	411
309-02	BITUMINOUS MATERIAL (A-CBC)	TON	28
	Alternate AA3		
303-01	MINERAL AGGREGATE, TYPE A BASE, GRADING D	TON	25000
307-02.01	ASPHALT CONCRETE MIX (PG70-22) (BPMB-HM) GRADING A	TON	5667
307-02.02	ASPHALT CEMENT (PG70-22) (BPMB-HM) GRADING A-S	TON	124
312-01	MINERAL AGGREGATE (ALF58)	TON	7711
312-02	LIME	TON	293
312-03	FLY ASH	TON	921
312-04	BITUMINOUS MATERIAL (ALF58)	TON	28

Proj Data | Col #1-Est. Rdwy. Quantities | Col #2-Est. Rdwy. Quantities | Box Bridge Quantities

Figure 4-10
Construction Quantities Estimate Data File Template

4-140.09 ESTIMATE CONFIDENTIALITY

The designer is hereby instructed to follow the TDOT guidelines regarding the handling of the construction cost estimates and unit bid prices as listed below.

1. Construction Cost Estimates: All designers are hereby instructed to keep the construction cost estimate confidential. These cost estimates shall never be made public and may only be revealed to the proper officials of TDOT. Should an inquiry be made by a person other than a TDOT official, refer the inquirer to a Manager in the Design Division. Secure the cost estimates at all times so that no unauthorized person may have access to them.

2. Unit Bid Prices: After a project is let for construction, but prior to awarding it, all designers are hereby instructed not to divulge any unit prices bid on a project to anyone. When a project bid is rejected and not awarded, the unit prices are never to be made public. Any inquiry made in regard to bid prices shall be referred to your Manager for proper handling.

4-145.00 FIELD REVIEW PROCEDURES (See 1-120.00, 2-315.00 and 2-315.05)

On interstate resurfacing and controlled access resurfacing projects with interchanges, the designer shall inspect guardrail on all ramps and crossroads, which are State Routes within the access control limit of the interchange, and upgrade guardrail to current standards.

4-150.00 CONSTRUCTION REVISIONS (See 1-220.00)

When a project has been awarded to construction, and a change becomes necessary anywhere on the project, a Construction Plans revision is required. The Design Manager responsible for the project will upload the revised plan set to Design FileNet (See Section 1-115.00) and submit an email notification to the appropriate personnel. The email will contain the revision letter and a pdf of the revised sheets only. In the event that the pdf is larger than the 15 MB email limit, then the pdf should be broken down into smaller files and additional emails sent.

Distribution of Construction Plans Revisions

Note: A Right-of-Way Revision may also be required.

TO:	EMAIL ADDRESS
Appropriate Regional Construction Supervisor	Use individual Email address*
CE Manager 2, Design Division	Use individual Email address*
Environmental Division	TDOT.EnvironmentalDoc@tn.gov Permits.Filenet.TDOT@tn.gov Ecology.Plans@tn.gov TDOT.Historians@tn.gov
Railroad Coordinator (if railroad involvement)	Use individual email address*
Design Division, File Room	TDOT.DesignFileRoom@tn.gov

* See Contact List at:
http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/DesGuide.htm

Construction Revision Distribution for projects with the following prefixes: **I, IM, ID, NH-1, STP-1, CM-1, MA-1, IXA-1, BR-1 and DPI;** also must send the following:

- FHWA Division, Projects Management Engineer W/1 set prints (half size) & 4 copies of the letter

The email subject line shall include the Region, County, State Route Number or Route Name, PIN, “Construction-Revision”

CHAPTER 2 - EARTHWORK

4-202.00 REMOVAL OF STRUCTURE

When the proposed structure is a girder bridge, the removal items for the existing structure(s) shall be placed on the Estimated Structure Quantities sheet and numbered in sequence beginning with Item No. 202-04.01 and continuing through Item No. 202-04.49, as required.

When the proposed structure is a box bridge, the removal item for the existing structure(s) shall be placed on the Estimated Roadway Quantities sheet (in the Box Bridge block). When the proposed structure is a box culvert, the removal item for the existing structure(s) shall be placed on the Estimated Roadway Quantities sheet (in the Roadway block). The removal items shall be numbered in sequence beginning with Item No. 202-04.50 and continuing through Item No. 202-04.99, as required.

The removal items shall be footnoted as to whether the salvage shall become the property of the contractor, city, county or state.

4-202.01 REMOVAL OF STRUCTURES AND OBSTRUCTIONS

When Item No. 202-01, Removal of Structures and Obstructions, Lump Sum, or Item No. 202-01.50, Removal of Structures and Obstructions, Each, is used on a project, the designer shall add a footnote detailing exactly what major items are included in the item (this includes, but is not limited to catch basins, manholes, junction boxes, etc.). This is done so the Department's estimators and contractors bidding on a project will be able to more accurately estimate the cost of this item.

Generally, all removals that belong with Item Nos. 202-06.01 through 202-06.99 shall be listed as such and shall not be included in Item No. 202-01 or 202-01.50.

4-202.10 REMOVAL OF BUILDINGS AND OBSTRUCTIONS

All existing buildings and/or obstructions to be removed within the project limits are to be paid for under the bid price for Item No. 202-06.01, Removal of Buildings (Tract No. ___) through Item No. 202-06.99, Removal of Buildings (Tract No. ____) per lump sum. All buildings and obstructions to be removed under these item numbers shall be so designated by the Regional Right-of-Way Office. The pay items in the Estimated Roadway Quantities Block shall be footnoted as follows:

> "Bid price includes all salvage value of material. See tabulated quantities sheet No. 2___ for removal of buildings and obstructions description block."

An example of a Removal of Buildings and Obstructions Description Block is shown in Figure 4-11.

REMOVAL OF BUILDINGS AND OBSTRUCTIONS DESCRIPTION BLOCK		
PAY ITEM	TRACT NO.	DESCRIPTION

NO ADDITIONAL COMPENSATION WILL BE MADE FOR THESE REMOVALS.

Figure 4-11
Removal of Buildings and Obstructions Description Block

4-202.13 ABANDONMENT OF WATER WELLS (See 4-625.00)

Item No. 202-13, Water Well Abandonment per Each, shall be used any time a water well is abandoned. This will cover all items necessary for the sealing of the well, except for grout. Item No. 604-15.01, Portland Cement Grout per cubic yard, shall be used to seal wells, and, for estimating purposes, shall be computed as shown below:

1. Wells with a diameter of 1 foot or less

   The grout fill material shall extend from the bottom of the well to within 5 feet of the final surface, where the well is in a roadway cut, or to within 5 feet of the existing ground surface, where the well is located under roadway embankment or where the well is located outside of the construction limits.

2. Wells with a diameter greater than 1 foot

   The bottom 5 feet of the well, or a depth equal to the depth of the water, whichever is greater, shall be filled with cement grout.

   Information necessary to make these computations shall be requested when coordinating with the Tennessee Water Management Division, in accordance with Section 3-130.00 of these guidelines.

4-203.00 EXCAVATION AND UNDERCUTTING

Undercutting is the process of removing and disposing of unsatisfactory material below grade. The Special Provision for Section 203 allows the use of Item No. 203-05, Undercutting, per Cubic Yard, as a pay item if the amount of undercutting needed, as specified in the soil report, is approximately 10% or more of Item No. 203-01, Road and Drainage Excavation (Unclassified).

All information regarding undercutting shall be clearly shown on the plans for the Construction Field Review. The decision to use the undercutting item shall be made on the Construction Field Review by the Design Division.

4-203.02 DEFINITION OF TERMS USED FOR EARTHWORK GRADING CALCULATIONS

The geotechnical report and geotechnical related drawings should be consulted by the roadway designer to determine what type of materials will be encountered during excavation and embankment construction for a project. The geotechnical report should provide enough information to determine the type materials described below and to determine appropriate shrink or swell factors. Some geotechnical reports may provide project specific recommendations for shrink and swell factors. It is recommended that the designer contact the Geotechnical Engineering Section as needed to clarify any questions arising regarding the nature of materials to be encountered and accounted for in the grading tabulations and bid quantities.

The following terms and definitions will be used by all TDOT Divisions so that a consistent definition is used in all phases of project development and in contract documents. Guidance to designers as to the material breakdown to be shown on the plans and cross-sections should be found in the geotechnical report.

A. SOIL MATERIAL Soil material is material that is predominantly made up of naturally occurring mineral particles which are fairly readily separated into relatively small pieces, and in which the mass may contain air, water, or organic materials. This material may contain rock pieces in the form of disconnected slabs, lenses, or boulders of less than approximately 0.5 cubic yards. The main soil groups consist of clay, silt, sand, gravel, cobbles, boulders (less than 0.5 cubic yard volume) or a combination of any of the constituents. For construction purposes, this material would typically be considered to be excavatable by conventional excavation machinery such as pans, track hoes, or front end excavators/loaders. This material would have a shrink factor as given in the shrink factors shown in Section 2-145.10 of the Design Guidelines or as recommended by the Geotechnical Engineering Section of the Materials and Tests Division.

B. SOLID ROCK MATERIAL Solid rock material is that naturally occurring material composed of mineral particles so firmly bonded together that relatively great effort is required to separate the particles (i.e. blasting or heavy crushing forces). For construction purposes, this material would typically have to be blasted to separate into pieces small enough to load and transport on earth moving trucks and which when subjected to proper pre-split and production blasting would result in a uniform stable rock cut face. Note that this material would not by definition necessarily be a proven source of any rock type aggregate such as solid rock, graded solid rock, rip rap, or other rock aggregate construction products. This material would have a significant swell factor as given in swell factors shown in Section 2-145.10 of the Design Guidelines or as recommended by the Geotechnical Engineering Section of the Materials and Tests Division.

C. SOFT ROCK OR DEGRADABLE ROCK This material is that naturally occurring material composed of mineral particles that are so firmly bonded such that they are not fairly readily separated into small pieces yet has such relatively low bonding strength that would allow for separating into small pieces through moderate to heavy crushing forces. For construction purposes this material would have to be subjected to ripping type equipment, hoe rams, or rugged use of a large bulldozer in order to separate the material such that it can be readily loaded into earth moving trucks. These materials would typically be shales, claystones, siltstones, weathered sandstones, weathered schist and weathered gneiss. This material would have a relatively small shrink or swell factor depending on the type material and the degree of weathering, disintegration, or degradation.

D. TRANSISTIONAL MATERIALS This material is that material comprised of a combination of soil and rock (Materials A, B, and C as defined in section 4-203.02) occurring in either non-uniform interbedded layers of the above materials (i.e. shale material with relatively thin layers of solid rock such as hard limestone) or erratic localized changes of material types both laterally and with depth (such as a geologic formation resulting in pinnacled rock columns, floating boulders or lenses intercalated with clay soil, a common occurrence in certain regions of Tennessee). For construction purposes, this material may have to be excavated using a combination of excavation methods such as blasting of rock pinnacles, layers or boulders along with a ripping of weathered rock and excavating of soil with track hoes or loaders all within a localized area. This material would not be suitable for the use of excavating pan type equipment.

COMMON EXCAVATION Common excavation is that sum of materials excavated from a project inclusive of all those materials described in **A, C,** and **D** above. The grouping of these materials is to generally define those materials that would not generally be acceptable to permanently place on a pre-split, blasted face and also to define those materials that would not be considered a source of a defined fill material such as solid rock fill, graded solid rock, rip rap or other rock type aggregates. Typically the materials in this grouping would have either a shrink factor or a relatively low swell factor as compared to solid rock material described in B above.

UNCLASSIFIED EXCAVATION Unclassified excavation is that sum of materials excavated from a project inclusive of all those items described in **A, B, C,** and **D** above. On most projects, road and drainage excavation will be listed as unclassified and is to be bid as one item regardless of the type material encountered. See section 203.02(a) of the Standard Specifications for Road and Bridge Construction.

Generally, all earthwork for a roadway project will be paid for under Item 203-01, Road and Drainage Excavation (Unclassified), C.Y., except in situations where special or unique conditions exist that would warrant bidding earthwork as either separate bid items or embankment in place bid items. For projects which earthwork items other than Road and Drainage Excavation (Unclassified) may be appropriate, the Design Manager will consult with both the Geotechnical Section and the Headquarters Construction Division to determine if other pay items are appropriate and what material type breakdown will be shown on the grading tabulation and earthwork balances in the plans.

See Section 6-200.00 for notes which shall be added to the plans as Special Notes on **ALL** projects for which a Geotechnical Report is prepared unless otherwise directed by the Design Manager after consultation with the Soils and Geology Section of the Materials and Tests Division and the Headquarters Construction Division. All grading quantities on the Estimated Roadway Quantities Sheet should also be footnoted “Refer to Special Notes.”

4-203.05 SHRINKAGE AND SWELL FACTORS (See 2-145.10)

4-203.10 GRADING LINE THROUGH SOLID ROCK

Do not show a solid rock grading line on the typical sections. Specifications for excavation of rock at the subgrade, and where rock slopes are to be seeded, are covered in the Standard Specifications.

4-203.15 PRESPLITTING OF ROCK EXCAVATION

On all projects having rock excavation, a quantity shall be included for pre-splitting the rock at the outside limits of the cut areas containing the rock.

Pre-splitting shall not be required on slopes flatter than 1:1 as per Section 203 of the Standard Specifications.

The quantity of pre-splitting shall be computed from the roadway cross-sections.

4-203.20 GRADED SOLID ROCK BORROW

On all projects requiring graded (sized) solid rock borrow for rock buttresses, revetment, etc, the unit of payment shall be per ton instead of per cubic yard. This item shall be paid for as follows:

Item No. 203-02.01 - Borrow Excavation (Graded Solid Rock) - Ton

Use a factor of 1.7636 tons per cubic yard for estimating quantities.

4-203.25 ROADWAY APPROACHES

On bridge replacement projects with a minimal amount of roadway work on the approaches, the designer shall consider using Item No. 203-30.01, Roadway Approaches. This is a lump sum pay item to construct bridge approaches that have quantities that are too small to be accurately measured in the field. This item has been developed to replace those items, which, because of the small quantities, are uneconomical to measure and document for payment under present procedures.

Item No. 203-30.01 may include: road and drainage excavation, borrow excavation, channel and culvert excavation on box bridges, clearing and grubbing, topsoil, seeding, sodding and water. The required quantities need to be calculated and shown in a tabulated block for purposes of cost estimating and bidding. Other items may be included in this item, if appropriate, but shall be discussed and approved during the construction field review before inclusion.

As a guideline, it is recommended that Item No. 203-30.01 be considered anytime that the total excavation is approximately 1500 C.Y. or less. However, other items and factors may influence the decision to use this item. Designers shall use their best judgment on a project by project basis to determine the need for Item No. 203-30.01.

Figure 4-12, shown below, shall be used to itemize the quantities included in Roadway Approaches. The note, "No change in compensation will be made for normal variations in estimated quantities." is required. For projects with more than one structure, each site shall be estimated, and an item per site used. Use the Roadway Approach Item No. 203-30.01 followed by 203-30.02, etc.

ALL COSTS OF THESE ESTIMATED QUANTITIES TO BE INCLUDED IN PRICE BID FOR ROADWAY APPROACHES ITEM NO. 203-30.01							
Road & Drain Exc. (Uncl.) C.Y.	Borrow Excavation (Uncl.) C.Y.	Water M.G.	Placing & Spreading Topsoil C.Y.	Channel Exc. C.Y.	Seeding w/Mulch Unit	Water Seeding & Sodding M.G.	Sodding (New Sod) S.Y.
1508	169	4	283	440	20	2	38

NO CHANGE IN COMPENSATION WILL BE MADE FOR NORMAL VARIATIONS IN ESTIMATED QUANTITIES.

Figure 4-12
Example of Estimated Quantities for Roadway Approaches Block

4-203.30 TOPSOIL COMPUTATION (See 3-315.05)

4-203.40 COMPUTATIONS FOR ITEM NO. 203-06 WATER

Embankment:

$$\frac{\text{Earth embankment (C.Y.) x 2.525 Gal/C.Y.}}{\text{1000 Gal/M.G.}} = \text{M.G.}$$

Base material and granular backfill:

$$\frac{\text{Compacted volume (C.Y.) x 15.150 Gal/C.Y.}}{\text{1000 Gal/M.G.}} = \text{M.G.}$$

Foundation preparation (Item No. 204-10.01 through 204-10.16):

$$\frac{\text{Width of subgrade (Ft) x 0.5 Ft x Length of project (ft) x 4 Gal/C.Y.}}{\text{27 C.F./C.Y. x 1000 Gal/M.G.}} = \text{M.G.}$$

Subgrade treatment (lime) (Item Nos. 302-01.01):

$$\frac{\text{Subgrade treatment volume (C.Y.) x 40.400 Gal/C.Y.}}{\text{1000 Gal/M.G.}} = \text{M.G.}$$

Soil-cement base (Item Nos. 304-01.02):

$$\frac{\text{Volume of base (C.Y.) x 15.150 Gal/C.Y.}}{\text{1000 Gal/M.G.}} = \text{M.G.}$$

Aggregate-cement base (Item Nos. 309-01.01 and 309-01.02):

$$\frac{\text{Volume of base (C.Y.) x 15.150 Gal/C.Y.}}{\text{1000 Gal/M.G.}} = \text{M.G.}$$

Lime fly-ash base (Item Nos. 312-01, 312-02, and 312-03):

$$\frac{\text{Volume of base (C.Y.) x 30.77 Gal/C.Y.}}{\text{1000 Gal/M.G.}} = \text{M.G.}$$

NOTE: For urban-type projects, which require an unusually large amount of water for dust control, use a quantity of water six times the amount calculated.

4-203.45 EARTHWORK BALANCES ON WIDENING OF EXISTING ROADWAYS

When balancing the earthwork on a project that involves a grade change on the existing roadway, attention needs to be paid to the construction sequencing. It is not possible to maintain traffic on the existing roadway and, at the same time, use material from that roadway to lower the grade, or conversely, to add material to raise the grade of the existing roadway.

When the designer considers the need to stockpile material, detour traffic, or maintain traffic by other means, this shall be detailed in the traffic control plans, earthwork balances, or elsewhere as deemed appropriate.

4-203.50 SUBMISSION OF GRADING QUANTITIES SHEETS FOR CONSTRUCTION

(See 2-145.07 and 3-315.20)

4-203.55 USE OF ESTIMATED GRADING QUANTITIES BLOCK FOR ROAD AND DRAINAGE EXCAVATION (UNCLASSIFIED)

On all projects using Item No. 203-01, Road and Drainage Excavation (Unclassified), it is to be referred to as unclassified excavation. When the designed has received the Soils and Geology Report stating approximately what portion is common and what portion is solid rock, the designer is to use a block as shown in Figure 4-13a. If the designer does not know the composition of the material being excavated, the designer is to use a block as shown in Figure 4-13b.

ESTIMATED GRADING QUANTITIES						
STATION TO STATION	ROAD & DRAINAGE EXC. (UNCL.)		BORROW EXCAVATION		CHANNEL EXC.	EXCESS EXC. WASTE	EMB.
	COMMON - C.Y.	S. ROCK - C.Y.	UNCL. - C.Y.	S. ROCK - C.Y.	C.Y.	C.Y.	C.Y.

Figure 4-13a
Estimated Grading Quantities Block (Materials Composition Known)

ESTIMATED GRADING QUANTITIES						
STATION TO STATION	ROAD & DRAINAGE EXC. (UNCL.)	BORROW EXCAVATION		CHANNEL EXC.	EXCESS EXC. WASTE	EMB.
	C.Y.	UNCL. - C.Y.	S. ROCK - C.Y.	C.Y.	C.Y.	C.Y.

Figure 4-13b
Estimated Grading Quantities Block (Materials Composition Unknown)

4-204.00 PIPE CULVERT EXCAVATION AND BEDDING

The cost of excavation for the installation of pipe culverts, sewers, conduits, all other culverts, all minor structures of any type and description are not to be measured and paid for directly, but will be included in the price bid per linear foot of pipe.

Designers shall include both standard drawings D-PB-1 and D-PB-2 in plans on projects allowing HDPE as a pipe alternate. Designers are to refer to the Design Division Drainage Manual, Chapter 6, Section 6.04.2.2 and Table 6A-1, for pipe selection criteria and allowed alternates for roadway classes and fill heights.

Designers should note that bedding material shall be included in the cost of the proposed pipe culvert.

See Standard Drawing No. D-PB-1 and D-PB-2 for additional details.

4-204.05 EXCAVATION FOR CONCRETE BOX AND SLAB TYPE CULVERTS AND BRIDGES (See 4-203.35)

All excavation required to place a box culvert or slab bridge will be considered culvert excavation. Compute quantities of **culvert excavation** (Figure 4-14) for these structures only if directed to do so. If culvert excavation is not computed for these structures, include the following note in the plans:

> "Culvert excavation for concrete box or slab type culverts or bridges will not be measured and paid for directly, but the cost will be included in the cost of other items."

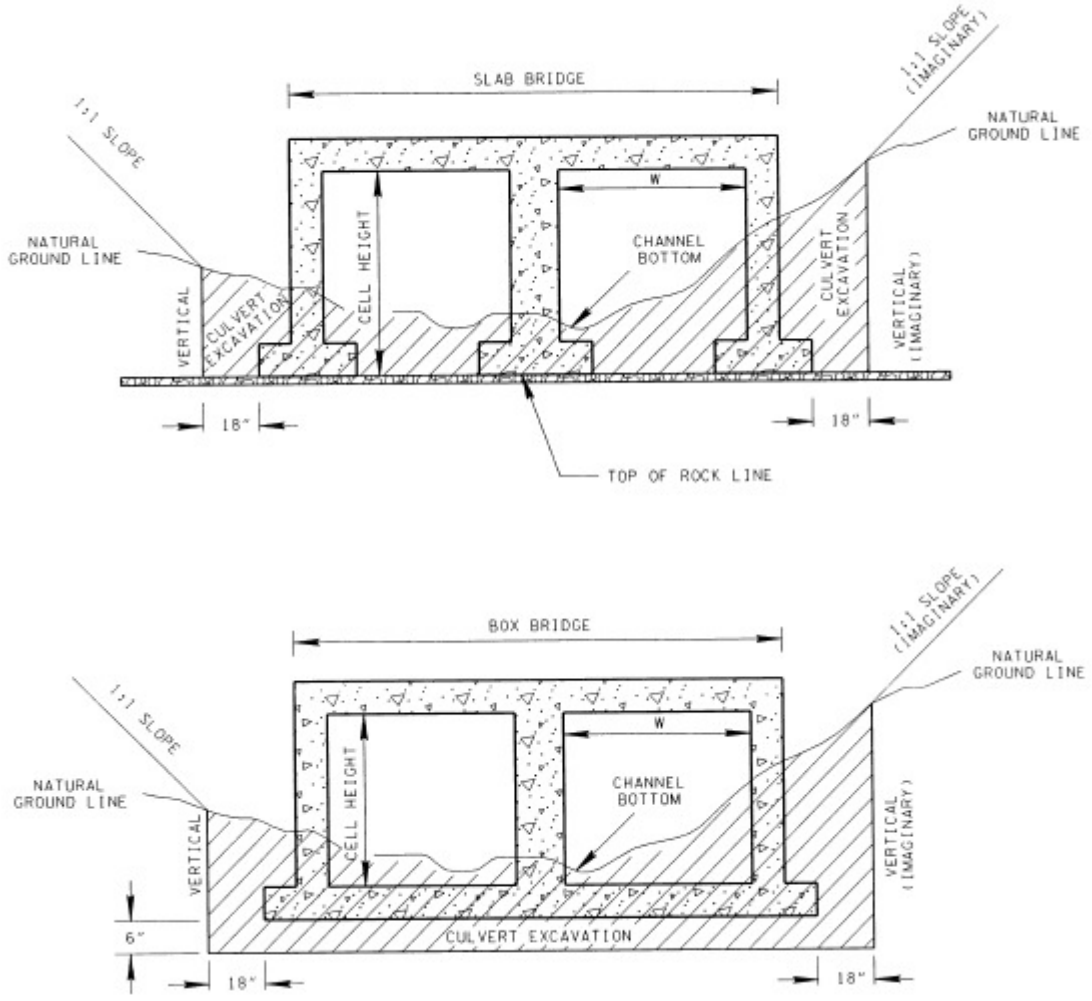


Figure 4-14
Quantities of Channel Excavation for Slab Type and Box Culverts and Bridges

4-209.00 EROSION PREVENTION AND SEDIMENT CONTROL (EPSC) FOOTNOTE

The designer shall **footnote** all applicable erosion prevention and sediment control (EPSC) pay items with the following notes:

"See Subsection 209.07 of the Standard Specifications for Maintenance Replacement"

“All quantities are to be used as directed by the Engineer”

4-209.01 COMPUTATIONS OF EROSION PREVENTION AND SEDIMENT CONTROL (EPSC) QUANTITIES

See Chapter 10 of the Drainage Manual.

4-209.05 EXCAVATION OR PLACEMENT OF RIP-RAP IN THE DRY

See Section 6-290.01 for a “Special Note” which shall be added to all plans with multi-barrel culverts or bridge structures.

CHAPTER 3 - BASES AND SUBGRADE TREATMENT

4-300.00 CRITERIA FOR USE OF PERFORMANCE GRADE ASPHALT ON STATE RESURFACING AND CONSTRUCTION PROJECTS

The type of performance grade asphalt used on all state resurfacing and construction projects shall adhere to the following criteria:

Performance Grade PG64-22 Asphalt is to be used on all state resurfacing projects and construction projects with current ADT less than 10,000.

Performance Grade PG70-22 Asphalt is to be used on all state resurfacing projects and construction projects with current ADT greater than 10,000, and on the NHS system on SR-15 (US-64), SR-5 (US-45W), SR-43 (US-45E), and SR-22 regardless of their traffic volume.

Performance Grade PG76-22 Asphalt is to be used on all interstate resurfacing projects and construction projects. It may also be used on state resurfacing and construction projects in cases of heavy truck traffic or severe rutting. However, in order to be used on these projects, prior approval by the Director of Materials and Tests must be given.

Performance Grade PG82-22 Asphalt is to be used on selected urban interstate projects with extremely high volumes. These projects will always be designated by the Pavement Design Section.

On all construction projects where the pavement design has been supplied by the Pavement Design Section, the designer shall check the pavement design to ensure that it concurs with this policy. This will be particularly critical on older projects when the pavement design has been supplied some time ago. If the designer finds a deviation between the pavement design and this policy, they are to contact the Pavement Design Section to clarify the problem and, if necessary, to get the pavement design modified.

4-301.00 COMPUTATION OF SUBGRADE TREATMENT (GRANULAR)

Item No. 301-01 Aggregate for Subgrade Treatment

Compacted volume (C.Y.) x 2.03 Tons/C.Y. = Tons

4-302.00 COMPUTATION OF SUBGRADE TREATMENT (LIME)

Item No. 302-01.01 Hydrated Lime

$$\frac{\text{Subgrade treatment volume (C.Y.)} \times \text{*Weight (Lb./C.Y.)} \times \text{* \%}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$

* Weight to be supplied by the Pavement Design Section in Lb./C.Y.
* % to be supplied by the Pavement Design Section to be used in decimal form (for example, 5% = 0.05).

NOTE: To be used only when specifically recommended.

Item No. 302-02 Bituminous Material (S. T. Lime)

$$\frac{\text{Surface area (Sq. Yd.) x 0.20 Gal./Sq. Yd.}}{\text{231 Gal./ Ton}} = \text{Tons}$$

INFORMATIONAL: Subsection 302.08 of the Standard Specifications requires slurry application unless otherwise shown on plans. If dry application is specified by the Pavement Design Section, it shall be necessary to footnote pay items.

4-303.00 COMPUTATIONS FOR MINERAL AGGREGATE BASE

Item Nos. 303-01, *303-01.08, *303-01.09 and 303-02

Loose weight of material = 2,900 Lb./C.Y.

$$\frac{\text{2,900 Lb./C.Y. x 1.4}}{\text{2,000 Lb./ Ton}} = \text{2.03 Tons/C.Y.}$$

Compacted volume (C.Y.) x 2.03 Tons/C.Y. = Tons

* To be used normally when the blending of two or more materials (for example, gravel and chert, etc.) is specified.

Item No. 303-01.01 Granular Backfill (Roadway)

Compacted volume (C.Y.) x 1.75 Tons/C.Y. = Tons

Item No. 303-01.03 Granular Backfill (Retaining Walls)

Compacted volume (C.Y.) x 1.75 Tons/C.Y. = Tons

Item No. 502-05 Calcium Chloride Type 1

Total aggregate (Tons) x 0.06 Bag/ Ton = Bags

Item No. 303-10.01 Mineral Aggregate (Size 57)

Loose weight of material = 2,619 Lbs./C.Y.

$$\frac{\text{2,619 Lb./C.Y. x 1.02}}{\text{2,000 Lb./ Ton}} = \text{1.34 Tons/C.Y.}$$

Uncompacted volume (C.Y.) x 1.34 Tons/C.Y. = *Tons

* To be used for fill material between concrete median barriers at areas requiring bridge pier protection in the median (See Standard Drawing No. S-SSMB-4).

$$\frac{\text{2,619 Lb./C.Y. x 1.14}}{\text{2,000 Lb./ Ton}} = \text{1.49 Tons/C.Y.}$$

Compacted volume (C.Y.) x 1.49 Tons/C.Y. = **Tons

** To be used when called for with erosion prevention and sediment control structures.

Item No. 303-10.03 through 303-10.06 Mineral Aggregate (Specify Size)

Compacted volume (C.Y.) x 1.75 Tons/C.Y. = Tons

4-303.05 GRANULAR BACKFILL FOR STRUCTURES

Item Nos. 303-01.01, Granular Backfill (Roadway) and 303-01.03, Granular Backfill (Retaining Walls), will be used for backfilling structures that are included on the Estimated Roadway Quantities sheet only (such as box and slab type culverts and bridges, gravity type retaining walls, etc.). If there is a separate Box Bridge Quantity Block, do not list the item in that block.

For backfilling of structures, where the structure quantities are included in estimated structure items, Item No. 303-01.02, Granular Backfill (Bridges) will be used, and it will be listed on the Estimated Structures Quantity sheet only. It cannot be used in the roadway quantities.

4-304.00 COMPUTATIONS FOR SOIL-CEMENT BASE

Item No. 304-01.02 Cement (Soil-Cement Base)

Volume of New Material x 1.300 (Shrinkage Factor) = Volume of Select Material (C.Y.)

$$\frac{94 \text{ Lb./C.F.} \times 27 \text{ C.F./C.Y.}}{2{,}000 \text{ Lb./Ton}} = 1.269 \text{ Tons/C.Y.}$$

$$\text{Total Volume C.Y.} \times 1.269 \text{ Tons/C.Y.} \times \frac{9\text{\% (Volume of Select Material)}}{12\text{\% (In-place Soil)}} = \text{Tons}$$

Item No. 304-02 Bituminous Material (Soil-Cement Base)

$$\frac{\text{Surface area (Sq.Yd.)} \times 0.2 \text{ Gal./ Sq. Yd.}}{231 \text{ Gal./ Ton}} = \text{Tons}$$

4-307.00 COMPUTATIONS FOR BITUMINOUS PLANT MIX BASE (HOT MIX)

PG64-22 Base Mixes (Grading “A”)

$$\frac{\text{Compacted volume (C.Y.)} \times 4{,}140 \text{ Lb./C.Y.}}{2{,}000 \text{ Lb./ Ton}} = \text{Tons} \quad \text{Item 307-01.01}$$

NOTE: 1 inch per square yard weighs 115 ± pounds

PG64-22 Base Mixes (Grading "A-S")

$$\frac{\text{Compacted volume (C.Y.) x 3,240 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$

x 0.0325 = Tons Item 307-01.02
x 0.9675 = Tons Item 307-01.03

NOTE: One inch per square yard weighs 90 ± pounds

PG64-22 Base Mixes (Grading "A-CRL")

$$\frac{\text{Compacted volume (C.Y.) x 3,240 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$

x 0.0325 = Tons Item 307-01.04
x 0.9675 = Tons Item 307-01.05

NOTE: One inch per square yard weighs 90 ± pounds

PG64-22 Base Mixes (Grading "B")

$$\frac{\text{Compacted volume (C.Y.) x 4,068 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 307-01.06

NOTE: 1 inch per square yard weighs 113 ± pounds

PG64-22 Base Mixes (Grading "B-M")

$$\frac{\text{Compacted volume (C.Y.) x 4,068 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 307-01.07

NOTE: 1 inch per square yard weighs 113 ± pounds

PG64-22 Base Mixes (Grading "B-M2")

$$\frac{\text{Compacted volume (C.Y.) x 4,068 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 307-01.08

NOTE: 1 inch per square yard weighs 113 ± pounds

PG64-22 Base Mixes (Grading "C")

$$\frac{\text{Compacted volume (C.Y.) x 3,960 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 307-01.09

NOTE: 1 inch per square yard weighs 110 ± pounds

PG64-22 Base Mixes (Grading "C-W")

$$\frac{\text{Compacted volume (C.Y.) x 3,960 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 307-01.10

NOTE: 1 inch per square yard weighs 110 ± pounds

PG64-22 Base Mixes (Grading "CS")

$$\frac{\text{Compacted volume (C.Y.) x 4,140 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons} \quad \text{Item 307-01.15}$$

NOTE: Application rate of 40 pounds (depth of 0.35") per square yard shall be used unless otherwise specified.

NOTE: 1 inch per square yard weighs 115 ± pounds

PG64-22 Base Mixes (For 0.75" Superpave Mix)

$$\frac{\text{Compacted volume (C.Y.) x 3,816 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons} \quad \text{Item 307-01.13}$$

NOTE: 1 inch per square yard weighs 106 ± pound

PG64-22 Base Mixes (For 1" Superpave Mix)

$$\frac{\text{Compacted volume (C.Y.) x 4,068 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons} \quad \text{Item 307-01.14}$$

NOTE: 1 inch per square yard weighs 113 ± pounds

PG70-22 Base Mixes (Grading "A")

$$\frac{\text{Compacted volume (C.Y.) x 4,140 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons} \quad \text{Item 307-02.01}$$

NOTE: 1 inch per square yard weighs 115 ± pounds

PG70-22 Base Mixes (Grading "A-S")

$$\frac{\text{Compacted volume (C.Y.) x 3,240 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons} \quad \begin{array}{l} \text{x 0.0325 = Tons} \quad \text{Item 307-02.02} \\ \text{x 0.9675 = Tons} \quad \text{Item 307-02.03} \end{array}$$

NOTE: One inch per square yard weighs 90 ± pounds

PG70-22 Base Mixes (Grading "A-CRL")

$$\frac{\text{Compacted volume (C.Y.) x 3,240 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons} \quad \begin{array}{l} \text{x 0.0325 = Tons} \quad \text{Item 307-02.04} \\ \text{x 0.9675 = Tons} \quad \text{Item 307-02.05} \end{array}$$

NOTE: One inch per square yard weighs 90 ± pounds

PG70-22 Base Mixes (Grading "B")

$$\frac{\text{Compacted volume (C.Y.) x 4,068 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 307-02.06

NOTE: 1 inch per square yard weighs 113 ± pounds

PG70-22 Base Mixes (Grading "B-M")

$$\frac{\text{Compacted volume (C.Y.) x 4,068 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 307-02.07

NOTE: 1 inch per square yard weighs 113 ± pounds

PG70-22 Base Mixes (Grading "B-M2")

$$\frac{\text{Compacted volume (C.Y.) x 4,068 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 307-02.08

NOTE: 1 inch per square yard weighs 113 ± pounds

PG70-22 Base Mixes (For 0.75" Superpave Mix)

$$\frac{\text{Compacted volume (C.Y.) x 3,816 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 307.02.13

NOTE: 1 inch per square yard weighs 106 ± pounds

PG70-22 Base Mixes (For 1" Superpave Mix)

$$\frac{\text{Compacted volume (C.Y.) x 4,068 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 307-02.14

NOTE: 1 inch per square yard weighs 113 ± pounds

PG76-22 Base Mixes (Grading "A")

$$\frac{\text{Compacted volume (C.Y.) x 4,140 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 307-03.01

NOTE: 1 inch per square yard weighs 115 ± pounds

PG76-22 Base Mixes (Grading "A-S")

$$\frac{\text{Compacted volume (C.Y.) x 3,240 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ x 0.0325 = Tons Item 307-03.02
x 0.9675 = Tons Item 307-03.03

NOTE: One inch per square yard weighs 90 ± pounds

PG76-22 Base Mixes (Grading "A-CRL")

$$\frac{\text{Compacted volume (C.Y.) x 3,240 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$

x 0.0325 = Tons Item 307-03.04
x 0.9675 = Tons Item 307-03.05

NOTE: One inch per square yard weighs 90 ± pounds

PG76-22 Base Mixes (Grading "B")

$$\frac{\text{Compacted volume (C.Y.) x 4,068 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 307-03.06

NOTE: 1 inch per square yard weighs 113 ± pounds

PG76-22 Base Mixes (Grading "B-M")

$$\frac{\text{Compacted volume (C.Y.) x 4,068 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 307-03.07

NOTE: 1 inch per square yard weighs 113 ± pounds

PG76-22 Base Mixes (Grading "B-M2")

$$\frac{\text{Compacted volume (C.Y.) x 4,068 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 307-03.08

NOTE: 1 inch per square yard weighs 113 ± pounds

PG76-22 Base Mixes (Grading "C")

$$\frac{\text{Compacted volume (C.Y.) x 3,960 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 307-03.09

NOTE: 1 inch per square yard weighs 110 ± pounds

PG76-22 Base Mixes (For 0.75" Superpave Mix)

$$\frac{\text{Compacted volume (C.Y.) x 3,816 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 307.03.13

NOTE: 1 inch per square yard weighs 106 ± pounds

PG76-22 Base Mixes (For 1" Superpave Mix)

$$\frac{\text{Compacted volume (C.Y.) x 4,068 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 307-03.14

NOTE: 1 inch per square yard weighs 113 ± pounds

PG82-22 Base Mixes (Grading "B-M2")

$$\frac{\text{Compacted volume (C.Y.) x 4,068 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons} \quad \text{Item 307-04.08}$$

NOTE: 1 inch per square yard weighs 113 ± pounds

Crumb Rubber Mod. Base Mixes (GAP Grading Mix)

$$\frac{\text{Compacted volume (C.Y.) x 4,140 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons} \quad \text{Item 307-20.01}$$

NOTE: 1 inch per square yard weighs 115 ± pounds

4-308.00 COMPUTATIONS FOR BITUMINOUS COATED AGGREGATE BASE (PLANT MIX)

Item Nos. 308-01 (Mix No. 1) and 308-02 (Mix No. 2) Cold Mixes

$$\frac{\text{Compacted volume (C.Y.) x 3240 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$

x 0.965 = Tons — Item 308-01.01, Item 308-02.01

x 0.035 = Tons — Item 308-01.02, Item 308-02.02

NOTE: 1 inch per square yard weighs 90 ± pounds

Place a footnote under the quantity block referring to Item No. 308-01.01 reading as follows:

"Includes approximately 40 pounds per square yard of choker stone for each 3.5 inch layer"

Place a footnote under the quantity block referring to Item No. 308-02.01 reading as follows:

"Includes approximately 30 pounds per square yard of choker stone for each 2.5 inch layer"

Mix No. 1 shall be specified for layers 3 inch thick or more and Mix No. 2 for layers less than 3 inches.

4-309.00 COMPUTATIONS FOR AGGREGATE-CEMENT BASE COURSE - LIMESTONE

Item No. 309-01.01 Mineral Aggregate (A-CBC)

Compacted volume (C.Y.) x 1.9456 Tons/C.Y. = Tons

Item No. 309-01.02 Portland Cement (A-CBC)

Compacted volume (C.Y.) x 0.0751 Tons/C.Y. = Tons

Item No. 309-02 Bituminous Material (A-CBC)

$$\frac{\text{Surface area (Sq. Yd.) x 0.20 Gal./Sq. Yd.}}{\text{231 Gal./ Ton}} = \text{Tons}$$

4-309.01 COMPUTATIONS FOR AGGREGATE-CEMENT BASE COURSE - GRAVEL

Item No. 309-01.01 Mineral Aggregate (A-CBC)

Compacted volume (C.Y.) x 1.8145 Tons/C.Y. = Tons

Item No. 309-01.02 Portland Cement (A-CBC)

Compacted volume (C.Y.) x 0.0884 Tons/C.Y. = Tons

Item No. 309-02 Bituminous Material (A-CBC)

$$\frac{\text{Surface area (Sq. Yd.) x 0.20 Gal./Sq. Yd.}}{\text{231 Gal./ Ton}} = \text{Tons}$$

4-312.00 COMPUTATIONS FOR AGGREGATE-LIME-FLY ASH STABILIZED BASE COURSE

Item No. 312-01 Mineral Aggregate (ALFSB)

Compacted volume (C.Y.) x 1.690 Tons/C.Y. = Tons

Item No. 312-02 Lime

Compacted volume (C.Y.) x 0.0643 Tons/C.Y. = Tons

Item No. 312-03 Fly-Ash

Compacted volume (C.Y.) x 0.2019 Tons/C.Y. = Tons

Item No. 312-04 Bituminous Material (ALFSB)

$$\frac{\text{Surface area (Sq. Yd.) x 0.20 Gal./Sq. Yd.}}{\text{231 Gal./ Ton}}$$

CHAPTER 4 - FLEXIBLE SURFACES

4-400.00 PAVING POLICY - RESURFACING

This policy is for paving on intersections with public roads, private drives, field entrances and business entrances.

1. Public Roads (non-curbed and gutter)

   Public road intersections will be resurfaced a paver width through the intersection as a minimum. Should the pavement of the intersecting road be distressed, the resurfacing width may be increased to the normal right-of-way.

2. Public Roads (curb and gutter section)

   On curb and gutter sections, public road intersections will be resurfaced to the end of radius.

3. Private drives, field entrances and business entrances (no curb and gutter).

   Private driveways, field entrances, and business entrances will be resurfaced a paver width (lane width) as a minimum. A pavement taper to transition the new pavement shall be required, it shall be based on an additional 1 foot of width per 1 inch depth of pavement. If the shoulder is narrow enough that the sum of the shoulder and transition is less than a paver width (lane width), the transition shall occur within the paver width. If the sum of the shoulder and the transition is greater than a paver width (lane width), the transition shall occur outside of the paver width.

4. Private drives and business entrances (curb and gutter section).

   For urban typical sections (curb and gutter), a minimum width of material, not to exceed 1 foot, will be used to feather the pavement edge.

4-400.01 TOTAL LANE MILES PAVED FOR RESURFACING PROJECTS

The title sheet of **all resurfacing projects** shall include the length of the proposed lane miles to be paved. The length will be located under Project length information as "**Total Lane Miles Resurfaced**" and be shown to the nearest tenth of a mile.

The total lane mile length should include all traffic lanes and continuous turning lanes paved. Side roads, paved shoulders, private drives, field entrances, and business entrances, ramps, and turn lanes located at intersections less than 1000 ft. in length do not need to be included in the length.

4-400.03 PERFORMANCE GRADE MIX

When a Performance Grade Mix is called for on resurfacing plans, the Item Number on the Quantity Sheet shall be referenced with the following footnote:

"The contractor has the option of using the Performance Grade Mix or regular asphalt on the paving of driveways and business entrances."

4-400.05 HERBICIDE USE IN EMULSIFIED ASPHALT - RESURFACING

The following note shall be used on all State resurfacing projects (except those using any latex modified products) which have bituminous surface treatment on the shoulders.

"The contractor is to furnish the herbicide, PRIMATOL 25-E, and add it to the asphalt emulsion used in constructing the first course on bituminous surface treated shoulders. The Primatol shall be added at the rate of 15 gallons per 1,200 gallons of emulsion. Empty containers of herbicide are to be properly disposed of by the contractor outside the project site area. All costs associated with the addition of the herbicide shall be included in the cost of other items."

This note applies to double bituminous surface treatment and/or single bituminous surface treatment only. This note will not apply for the use of regular hot mix on the shoulders.

4-402.00 COMPUTATIONS FOR PRIME COAT

Item No. 402-01 Bituminous Material for Prime Coat (PC)

$$\frac{\text{Surface area (Sq. Yd.)} \times \text{*rate (Gal./Sq. Yd)}}{\text{**231 Gal./ Ton}} = \text{Tons}$$

* Rate 0.30 - .35 Gal./Sq. Yd.

** When Tar only is specified use 213 Gal./ Ton

Item No. 402-02 Aggregate for Cover Material (PC)

$$\frac{\text{Surface area (Sq. Yd.)} \times \text{*rate (Lb./ Sq. Yd.)}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$

* Rate 8 - 12 Lb./Sq. Yd.

4-403.00 COMPUTATIONS FOR TACK COAT

Item No. 403-01 Bituminous Material for Tack Coat (TC)

$$\frac{\text{Surface area (Sq. Yd.)} \times \text{*rate(Gal./Sq. Yd.)}}{\text{231 Gal./ Ton}} = \text{Tons}$$

*Rate = 0.07 Gal/Sq Yd (General Use)
*Rate = 0.10 Gal/Sq Yd (Milling – Cold Plane)

Item No. 403-02 Asphalt Cement for Tack Coat (TC)

$$\frac{\text{Surface area (Sq. Yd.)} \times 0.05\ \text{(Gal./Sq. Yd.)}}{\text{231 Gal./ Ton}} = \text{Tons}$$

4-404.00 COMPUTATIONS FOR DOUBLE BITUMINOUS SURFACE TREATMENT

Item No. 404-01.01 Bituminous Material for Double Bituminous Surface Treatment (DBST)

$$\frac{\text{Surface area (Sq. Yd.) x *rate (Gal./ Sq. Yd.)}}{\text{231 Gal./ Ton}} = \text{Tons}$$

* Rate 0.68 - 0.84 Gal./ Sq. Yd.

Item No. 404-01.02 Mineral Aggregate for Double Bituminous Surface Treatment (DBST)

$$\frac{\text{Surface area (Sq. Yd.) x *Rate (Lb./ Sq. Yd.)}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$

* Rate 40 - 58 Lb./ Sq. Yd.

4-405.00 COMPUTATIONS FOR BITUMINOUS SEAL COAT (CHIP SEAL)

Item No. 405-01.01 Bituminous Material for Bituminous Seal Coat (BSC)

$$\frac{\text{Surface area (Sq. Yd.) x *rate (Gal./ Sq. Yd.)}}{\text{231 Gal./ Ton}} = \text{Tons}$$

* Rate 0.26 - 0.36 Gal./ Sq. Yd. (GENERAL USE)
* Rate 0.10 - 0.25 Gal./ Sq. Yd. (MILLING - COLD PLANING)

Item No. 405-01.02 Mineral Aggregate for Bituminous Seal Coat (BSC)

$$\frac{\text{Surface area (Sq. Yd.) x *rate (Lb./Sq. Yd.)}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$

* Rate 16 - 26 Lb./Sq. Yd. (GENERAL USE)
* Rate 0 - 12 Lb./Sq. Yd. (MILLING - COLD PLANING)

On all projects where a bituminous seal coat is placed after milling of the existing surface, use rate as specified above unless otherwise advised in pavement design as submitted from the Special Design Section. After the bituminous seal coat is placed, a tack coat (see section 4-403.00, Item No. 403-01) is to be used prior to the placement of the first lift of proposed pavement.

4-405.01 USE OF BITUMINOUS SEAL COAT (CHIP SEAL) ALONG EDGE OF PAVED SHOULDER WHILE MAKING LANE SHIFTS DURING CONSTRUCTION

Application shall begin at point where the stone touches paved shoulder and extend outwardly from the paved shoulder to the point where the stone meets the subgrade. Application rate shall be computed based on 1.5 times the maximum application rate for general use shown in Section 4-405.00. This will allow a quantity large enough for contractor to reapply chip seal as needed during the course of the construction operations.

Chip seal to be paid for under Item Nos. 405-01.01, Bituminous Material for Bituminous Seal Coat (BSC) per Ton, and 405-01.02, Mineral Aggregate for Bituminous Seal Coat (BSC) per Ton. Pay items to be footnoted as follows:

"Includes quantity to be used along edge of paved shoulder while making lane shifts during the course of construction in order to reduce rutting along edge of shoulder."

4-406.00 COMPUTATIONS FOR BITUMINOUS SEAL COAT (SPLIT APPLICATION)

Item No.406-01.01 Bituminous Material for Bituminous Seal Coat, Split Application (BSC-SA)

$$\frac{\text{Surface area (Sq. Yd.)} \times \text{*rate (Gal./Sq. Yd.)}}{\text{231 Gal./ Ton}} = \text{Tons}$$

* Rate 0.46 - 0.54 Gal./ Sq. Yd.

Item No. 406-01.02 Aggregate for Bituminous Seal Coat, Split Application (BSC-SA)

$$\frac{\text{Surface area (Sq. Yd.)} \times \text{*rate (Lb./ Sq. Yd.)}}{\text{2,000/ Ton}} = \text{Tons}$$

* Rate 36 - 44 Lb./ Sq. Yd.

4-411.00 COMPUTATIONS FOR ASPHALTIC CONCRETE SURFACE (HOT MIX)

Item No. 411-01 Grading "D" Surface (Performance Grade PG64-22)

$$\frac{\text{Compacted volume (C.Y.)} \times \text{3,816 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 411-01.10

NOTE: 1 inch per square yard weighs 106 ± pounds

Item No. 411-01 Superpave Surface (Performance Grade PG64-22)

$$\frac{\text{Compacted volume (C.Y.)} \times \text{3,816 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$

x 0.06 = Tons Item 411-01.03
x 0.94 = Tons Item 411-01.04

NOTE: 1 inch per square yard weighs 106 ± pounds

Item No. 411-01 Grading "E" Surface (Performance Grade PG64-22)

$$\frac{\text{Compacted volume (C.Y.)} \times \text{3,870 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 411-01.11

NOTE: 1 inch per square yard weighs 107.5 ± pounds

Item No. 411-01 Grading "E" Shoulders (Performance Grade PG64-22)

$$\frac{\text{Compacted volume (C.Y.) x 3,708 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 411-01.07

NOTE: 1 inch per square yard weighs 103 ± pounds

Item No. 411-02 Grading "D" Surface (Performance Grade PG70-22)

$$\frac{\text{Compacted volume (C.Y.) x 3,816 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 411-02.10

NOTE: 1 inch per square yard weighs 106 ± pounds

Item No. 411-02 Superpave Surface (Performance Grade PG70-22)

$$\frac{\text{Compacted volume (C.Y.) x 3,816 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ x 0.06 = Tons Item 411-02.03
x 0.94 = Tons Item 411-02.04

NOTE: 1 inch per square yard weighs 106 ± pounds

Item No. 411-02 Grading "E" Surface (Performance Grade PG70-22)

$$\frac{\text{Compacted volume (C.Y.) x 3,870 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 411-02.11

NOTE: 1 inch per square yard weighs 107.5 ± pounds

Item No. 411-03 Grading "D" Surface (Performance Grade PG76-22)

$$\frac{\text{Compacted volume (C.Y.) x 3,816 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 411-03.10

NOTE: 1 inch per square yard weighs 106 ± pounds

Item No. 411-03 Superpave Surface (Performance Grade PG76-22)

$$\frac{\text{Compacted volume (C.Y.) x 3,816 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ x 0.06 = Tons Item 411-03.03
x 0.94 = Tons Item 411-03.04

NOTE: 1 inch per square yard weighs 106 ± pounds

Item No. 411-04 Grading "D" Surface (Performance Grade PG82-22)

$$\frac{\text{Compacted volume (C.Y.) x 3,816 Lb./C.Y.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$ Item 411-04.10

NOTE: 1 inch per square yard weighs 106 ± pounds

4-411.02 RAISED BITUMINOUS RUMBLE STRIPS

Raised bituminous rumble strips are a traffic warning device. Raised bituminous rumble strips will require a detail to be furnished in the plans. This type of rumble strip is to be used for warning or unexpected stop conditions and shall not be used routinely as a shoulder treatment. At approaches to narrow bridges, where the shoulder width is less than the normal roadway shoulder width, the raised bituminous rumble strip may be used to warn the motoring public of this roadway condition.

4-411.03 RUMBLE STRIPS

Scored rumble strips are a traffic warning device, and when required, shall be constructed in accordance with Standard Drawings RP-CS-1, RP-CS-2, T-M-15, T-M-15A or as shown on the plans. Raised bituminous rumble strips and scored rumble strips are the two types of rumble strips normally used in Tennessee.

Scored rumble strips and scored rumble stripes provide an audible warning to vehicles leaving the travel lane. Unlike a scored rumble stripe which is placed at the edge line location, a scored rumble strip is placed on the shoulder adjacent to the travel lane and edge line.

Refer to Section 4-716.15 for guidelines for placement of rumble strips on shoulders. Scored shoulders will be constructed on asphalt or concrete shoulders. Asphalt shoulders must have a minimum depth of pavement of one and one-half inches. Scored shoulders should also be omitted adjacent to ramps, acceleration and deceleration lanes including tapers and along the radius of side road approaches, entrances and median crossovers.

Rumble strips shall be specified on all new construction and resurfacing projects on the Interstate System and access controlled state routes. Both the inside and the outside shoulders shall be scored. The scored rumble strip shall be constructed in accordance with Standard Drawing T-M-15. Rumble strips are to be paid for under Item No. 411-12.01, Scoring Shoulders (Continuous) (16 inch Width), L.M. For estimating purposes, the item will be measured longitudinally along the edge of each shoulder and will usually be four (4) times the project length less deductions for entrance and exit ramps, public roads, and bridges. When concrete shoulders are present rumble strips are to be constructed in accordance with Standard Drawing RP-CS-1 or RP-CS-2. Rumble strips on concrete shoulders shall be paid for under Item No. 501-03.10, Concrete Shoulder Rumble Strips, L.F., and the item will be measured as the actual length of pavement scored along each shoulder.

Refer to Section 4-716.15 for guidelines for placement of rumble strips on non-access controlled state routes. When rumble strips are placed on non-access controlled routes, paved shoulders should be 8ft. or wider. A 30 foot rumble will be followed by a 10 foot gap in the rumble to allow for bicycles to cross without having to traverse the rumble strip. Rumble strips should normally only be placed on rural routes with posted speeds of 45 mph or greater. Rumble strips may be used on urban routes where accident history or other factors warrant the placement. When placed on urban routes, designers should give consideration to expected bicycle traffic and noise generated. The scored rumble strip shall be constructed in accordance with Standard Drawing T-M-15A. Rumble strips are to be paid for under Item No. 411-12.02, Scoring Shoulders (Non-continuous) (16 inch Width), L.M. The item will be measured and paid as the actual length of pavement scored along each shoulder.

4-411.04 RUMBLE STRIPES

Rumble stripes are a traffic warning device, and when required, shall be constructed in accordance with Standard Drawing T-M-16. A scored rumble stripe is a scored rumble placed along the outside edge line of the travel lane.

Refer to Section 4-716.15 for guidelines for the placement of rumble stripes. Rumble strips should normally only be placed on rural routes with posted speeds of 40 mph or greater. The rumble stripe shall consist of a 30 foot scored rumble followed by a 10 gap to allow for bicycles to cross without having to traverse the rumble. Rumble stripes may be used on urban routes where accident history or other factors warrant the placement. When placed on urban routes, designers should give consideration to expected bicycle traffic and noise generated. Rumble stripes may be omitted from locations recommended by the TDOT bicycle coordinator.

Scored rumble stripes are to be paid for under Item No. 411-12.03, Scoring for Rumble Stripe (Non-Continuous) (8 inch Width), L.M. or Item No. 411-12.04, Scoring for Rumble Stripe (Non-Continuous (4 inch Width), L.M. The item will be measured and paid as the actual length of pavement scored along each shoulder.

When rumble stripes are specified, pavement markings shall be Spray Thermoplastic (60 mil). Enhanced Flatline Thermoplastic Markings shall not be used. Striping is to be paid for under the appropriate pavement marking item number.

4-411.05 RIDEABILITY SPECIFICATIONS

For all projects having asphaltic concrete surface Grading "D", a determination shall be made as to whether or not the rideability specification shall be included in the contract. This determination will be made by the State Construction Office after the plans have been submitted.

4-414.05 COMPUTATIONS FOR MICRO-SURFACING

Item No. 414-03.01 Emulsified Asphalt for Micro-Surfacing

0.12 x Below aggregate quantity = Tons

NOTE: Application rate based on 12 percent of the dry weight of the aggregate.

Item No. 414-03.02 Aggregate for Micro-Surfacing

$$\frac{\text{Surface area (Sq. Yd.)} \times \textbf{XX} \text{ Lb./ Sq. Yd.}}{\text{2,000 Lb./ Ton}} = \text{Tons}$$

NOTE: Application rate of 32 pounds (approximate depth 0.375”) per square yard shall be used if plans require a leveling mixture (14 pounds per square yard) and a surface mixture (18 pounds per square yard) to be placed, or 22 pounds (approximate depth 0.275”) per square yard if only a surface mixture is to be placed, unless otherwise specified.

Item No. 403-01.01 Bituminous Material for Tack Coat (TC) to be used with Micro-Surfacing

$$\frac{\text{Surface area (Sq. Yd.) x *rate (Gal./ Sq. Yd.)}}{\text{231 Gal./ Sq. Yd.}} = \frac{\text{------}}{4} \text{ Tons}$$

* Rate 0.10 - 0.15 (Gal./Sq. Yd.) of the diluted emulsion

NOTE: The tack coat shall consist of 1 part emulsion and 3 parts water. The quantity for the emulsion payment, Item No. 403-01, should be 1/4 of the estimated application rate.

4-415.00 COLD PLANING OF BITUMINOUS PAVEMENT

On projects having 2,000 Tons or more of cold planed material, it shall be paid for by the Ton. This shall be calculated using 105 Lb./S.Y/Inch of estimated depth to be cold planed, converted to Tons.

This shall be measured and paid for under Item No. 415-01.01, Cold Planing of Bituminous Pavement per Ton.

On projects where the required depth of cold planing is known and the quantity is less than 2,000 Tons, it may be paid for by the square yard. The Regional Construction Office shall be consulted prior to using this unit of measure. Depth of Cold Planing must be specified on the plans.

This shall be measured and paid for under Item No. 415-01.02 Cold Planing of Bituminous Pavement per Square Yard.

On projects having less than 2,000 Tons of cold planed material, and where no scales are readily available (check with the Regional Construction Office), and the required depth is not known, it shall be paid for by the cubic yard.

This shall be measured and paid for under Item No. 415-01.03, Cold Planing of Bituminous Pavement per Cubic Yard.

CHAPTER 5 - RIGID PAVEMENT

4-501.00 PORTLAND CEMENT CONCRETE PAVEMENT (See 4-905.00)

4-502.00 COMPUTATIONS FOR UNDERSEALING CONCRETE PAVEMENT

NOTE: The quantities are listed in the order of computation procedure.

Item No. 502-02 Holes

$$\frac{\text{Length of project (ft) x number of lanes x 4 holes/slab}}{\text{Length of slabs}} = \text{Each}$$

Item No. 502-10 Cement-Fly Ash Grout

(a) Cubic feet/hole x number of holes = Cubic Feet

(b) Use one of the following values as directed on the Construction Field Review:

1. Concrete pavement in worse than average condition.
   0.4 - 0.5 cubic feet/hole

2. Concrete pavement in average condition.
   0.4 cubic feet/hole

3. Concrete pavement in better than average condition.
   0.3 - 0.4 cubic feet/hole

NOTE: Pavement with cement-treated bases shall fall within the better than average range.

CHAPTER 6 - STRUCTURES

4-604.00 TYPE DESIGNATION FOR CONCRETE BOX AND SLAB TYPE CULVERTS AND BRIDGES

The plans must clearly indicate for each culvert or bridge, the type (box or slab) on which the quantities are based. This should be accomplished by showing a column in the tabulation block for culverts or bridges, indicating the type.

The current Standard Drawings for box or slab type culverts or bridges are found in the Standard Structure Drawings. Special or new designs may be requested through the proper channels from the Structures Division.

For all projects having either concrete box and/or slab culverts or bridges that began preliminary engineering prior to October 2010, the Standard Drawing Index Sheet shall include the following:

Standard Drawing numbers STD-15-1 through STD-15-6, STD-15-8, STD-15-9, STD-15-12 through STD-15-15, STD-15-19, STD-15-20, and STD-15-25 through STD-15-29 will be used on all structures.

Standard Drawing STD-15-10 will be used when the structure is on 90 or 75 degree skew.

Standard Drawing STD-15-11 will be used when the structure is on 60 or 45 degree skew.

Standard Drawing STD-15-24 will be used for all skews other than 90 degrees.

In addition to these drawings, the designer will use the appropriate STD-15 series of drawings showing the particular structures that apply to the project.

For all projects having either concrete box and/or slab culverts or bridges projects that began preliminary engineering **after October 2010** and for specific projects as requested by the Structures Division, the Standard Drawing Index Sheet shall include the following:

Standard Drawing numbers STD-17-1 through STD-17-7, STD-17-9, STD-17-10, STD-17-15 through STD-17-18, STD-17-23, STD-17-24, and STD-17-29 will be used on all structures.

Standard Drawing STD-17-11 will be used when the structure is on 90 degree skew.

Standard Drawing STD-17-12 will be used when the structure is on 75 degree skew.

Standard Drawing STD-17-13 will be used when the structure is on 60 degree skew.

Standard Drawing STD-17-14 will be used when the structure is on 45 degree skew.

Standard Drawing STD-17-28 will be used for all skews other than 90 degrees.

In addition to these drawings, the designer will use the appropriate STD-17 series of drawings showing the particular structures that apply to the project.

4-604.05 PRECAST, PRESTRESSED BRIDGE DECK PANELS

Precast, pre-stressed bridge deck panels will not be allowed to be used on concrete box or slab type culverts.

4-604.10 PAVED APRON FOR BOX CULVERT AND BRIDGE OUTLETS

A paved apron may be used on concrete box culverts and bridges in selected locations as determined by the Design Manager if requested by the Structures or Construction Division. For projects which started preliminary engineering prior to October 2010 standard drawing STD-15-16 should be used. For projects which began preliminary engineering after October 2010 STD-17-19 should be used. The Structures Division may request standard drawing series STD-17 be used on specific project that began preliminary engineering prior to October 2010.

The quantities shall be added to the concrete and steel quantities for the box culvert or bridge. Footnote these quantities to show the amount of concrete and steel bar reinforcement included for the paved aprons. The steel bar reinforcement may be computed using a weight of 58 pounds per 100 square feet of apron, plus the weight of the A-400 bars.

4-604.20 CONCRETE BOX AND SLAB TYPE CULVERTS AND BRIDGES IN SHALLOW FILLS

On concrete box and slab type culverts and bridges where there is little or no fill to be placed on top of the structure and/or there are significant effects on construction due to grades, superelevation or curvature, the designer shall place information on the plans as follows:

A. Where the horizontal curvature of the roadway, as opposed to the normally straight nature of the inlet and outlet, is sufficient that the guardrail may encroach on the shoulder and/or roadway (Figure 4-15), the designer shall investigate the need to have the inlet and outlet constructed on a curve parallel to the centerline of the roadway.

   If curved inlets and/or outlets are required, a note similar to the one below shall be placed on the culvert section.

   "The inlet and outlet ends of the box culvert at Sta. ____ shall be curved parallel to the centerline of the roadway."

B. Where grades and/or superelevation cause significant effects on construction, the designer shall show the following additional details and elevations on the culvert drainage section as shown in Figure 4-16:

   1. Add detail of box showing flow line, top of wall and top of slab adjacent to vertical walls on both inlet and outlet ends.

   2. Show elevations of top of curb and top of wingwalls to suit roadway grades and superelevation. The height of curb may vary; but shall not exceed a height of 2.5 feet above the top of the box. In the event this occurs, the designer will contact the Structures Division (Hydraulics Section) to work out the problem.

3. Provide a cross-section of the roadway on top of the box showing the asphalt paving needed on the box to obtain the roadway grade and proper pavement cross slope. See Figure 4-17.

4. Show crown or superelevation when the concrete top slab is to be the riding surface.

C. On box and slab type culverts and bridges with less than 1 foot of fill (with fill defined as embankment, base and pavement), the designer will be responsible for computing all concrete and reinforcing steel quantities accordingly. The correction factor for the adjustment of reinforcing steel quantities, based on the modifications of vertical height by the designer, is included in Table 4-1 (See associated Figure 4-18). The Structures Division will assist the designer in these calculations, if he or she requires assistance.

D. If the top slab is to be used as the riding surface, and the Design Speed is less than 40 mph, the following note shall be added to the plans.

> "Bridge deck finish to be burlap drag in accordance with method "A" as specified in Subsection 604.23 of the *Tennessee Department of Transportation Standard Specifications."*

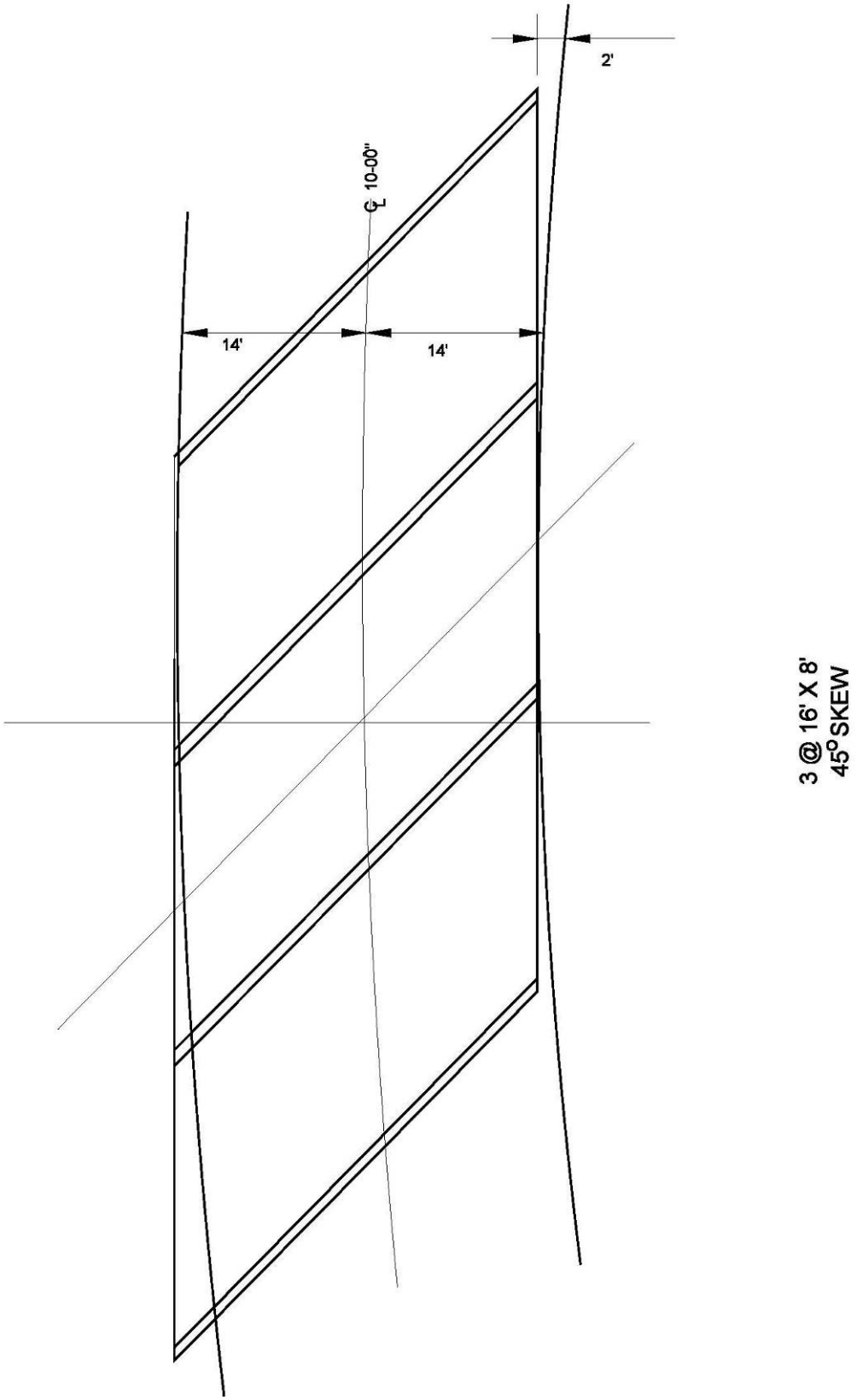


Figure 4-15
Potential Guardrail Encroachment

BOX BRIDGE OR CULVERT ELEVATIONS

℄ STATION	TOP OF CURB ELEV.				TOP OF SLAB ELEV.				FLOW LINE ELEV.				TOP OF WING ELEV.			
	ELEV. A-1	ELEV. A-2	ELEV. A-3	ELEV. A-4	ELEV. B-1	ELEV. B-2	ELEV. B-3	ELEV. B-4	ELEV. C-1	ELEV. C-2	ELEV. C-3	ELEV. C-4	ELEV. D-1	ELEV. D-2	ELEV. D-3	ELEV. D-4

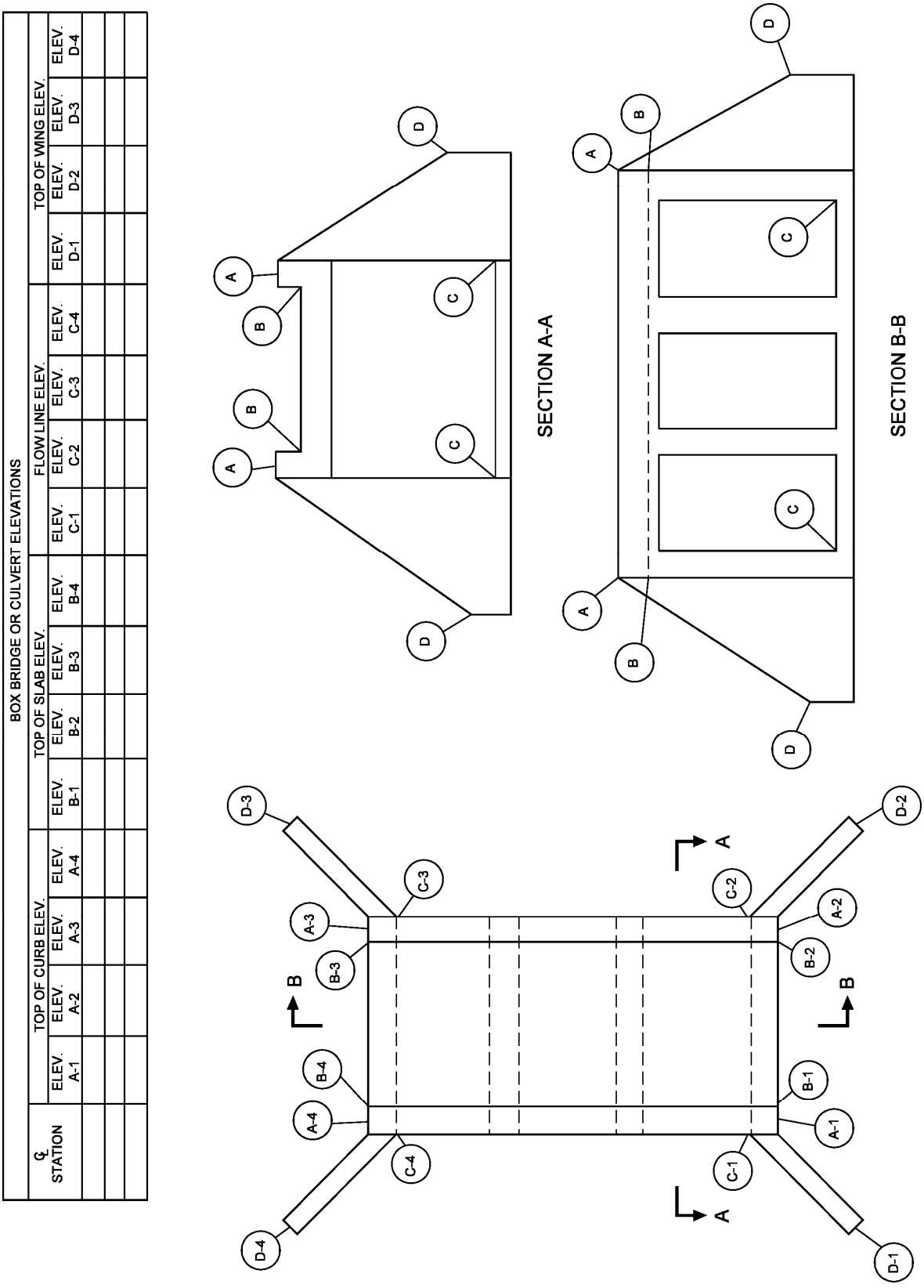


Figure 4-16
Box Bridge or Culvert Elevation Details

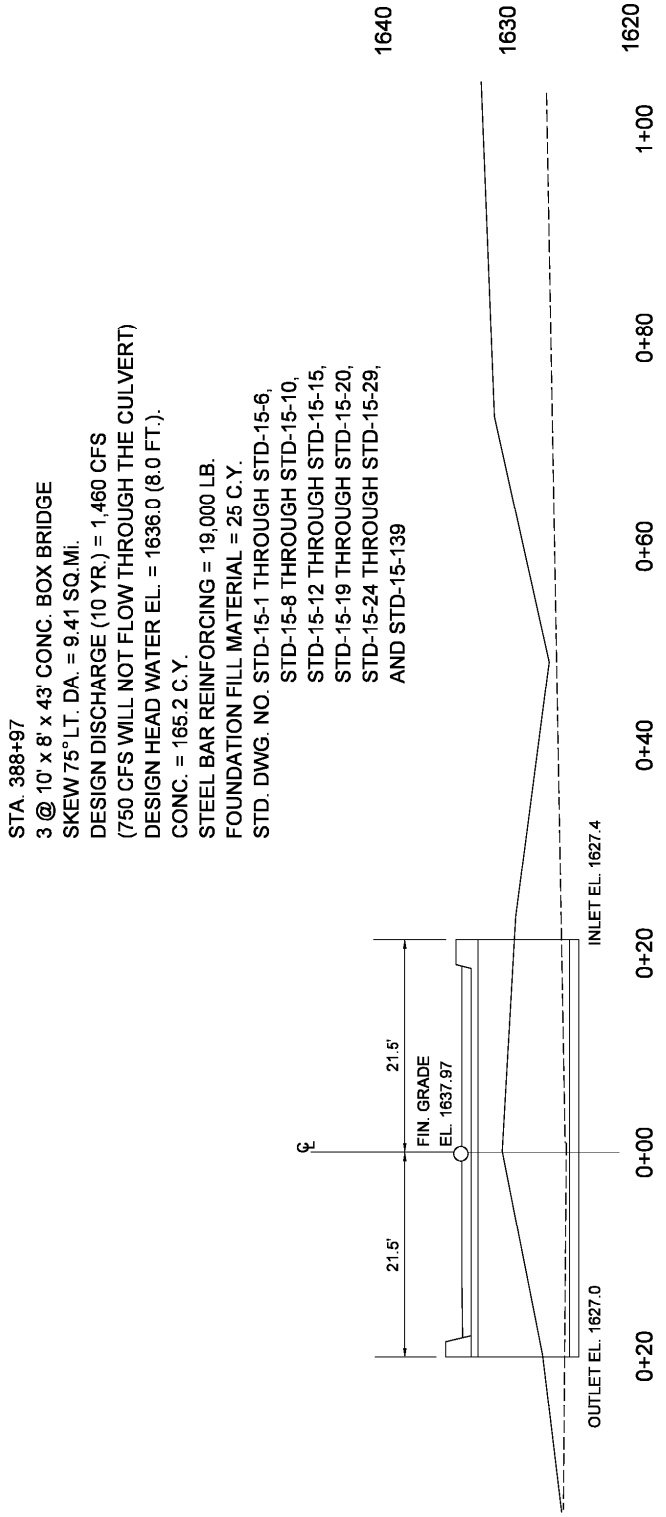


Figure 4-17
Typical Cross-Section Information for Box and Slab Type Culverts and Bridges

ADJUSTMENT FACTOR FOR ESTIMATING ADDITIONAL REINFORCING STEEL QUANTITIES IN THE VERTICAL WALLS OF CONCRETE BOX OR SLAB TYPE CULVERTS OR BRIDGES		
SPAN WIDTH IN FEET	***EXTERIOR WALL IN LB./L.F./V.F.**	***INTERIOR WALL IN LB./L.F./V.F.**
8	2.27	1.33
10	2.45	1.50
12	2.94	1.71
14	3.94	2.17
16	3.94	2.17
18	3.94	2.17

* ADDITIONAL POUNDS OF REINFORCING STEEL IN VERTICAL WALLS BASED ON POUNDS PER LINEAR FOOT ONE FOOT IN HEIGHT FOR ANY NUMBER OF BARRELS ON ANY SKEW. THIS TABLE IS GOOD FOR AN INCREASE IN WALL HEIGHT NOT EXCEEDING TWO FEET AND FILL HEIGHTS NOT EXCEEDING TWO FEET.

Table 4-1
Adjustment Factor for Estimating Additional Reinforcing Steel Quantities in the Vertical Walls of Concrete Box or Slab Type Culverts or Bridges

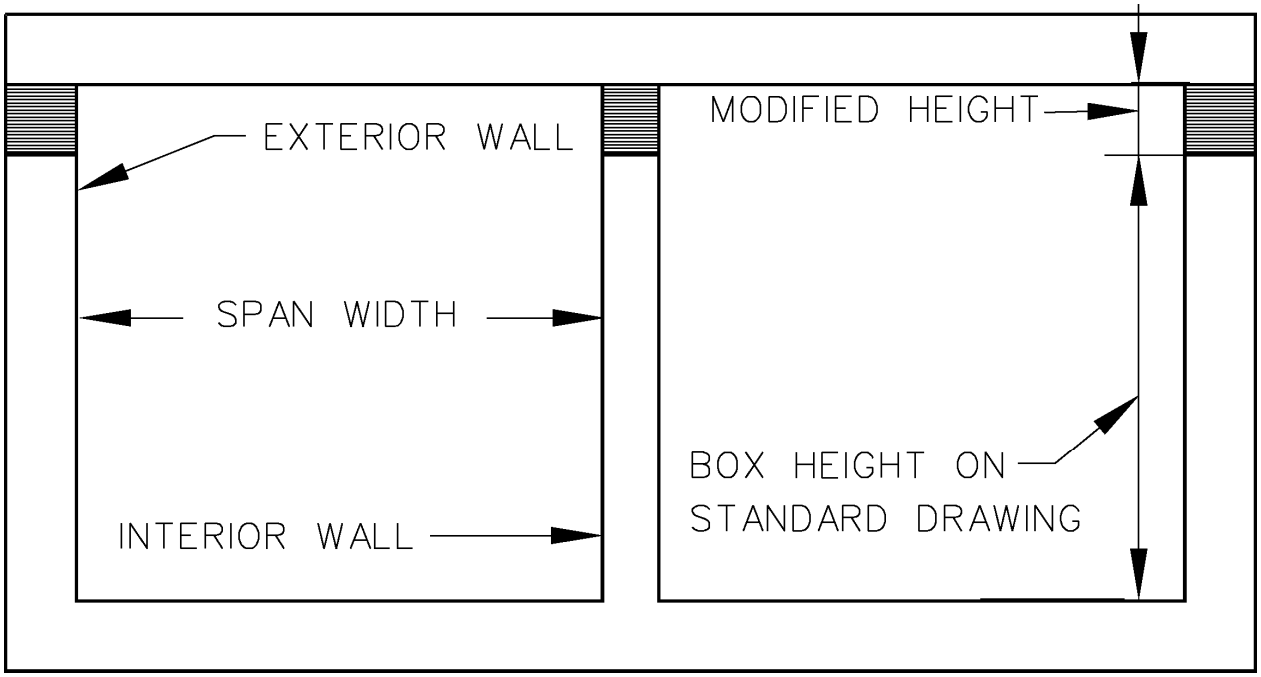


Figure 4-18
Typical Concrete Box or Slab Type Culvert or Bridge Modification

4-604.25 STEEL BAR REINFORCEMENT (ROADWAY)

On all projects which include reinforced concrete box or slab type culverts or bridges, Standard Drawing No. STD-9-1, Standard Reinforcing Bar Support Details for Concrete Slabs, shall be listed on the appropriate culvert sheets and in the index.

If the top slab used on concrete box or slab type culverts or bridges is to be used as a riding surface or has less than 1 foot of fill over it, then epoxy-coated reinforcing steel is to be used in the top mat of the top slab and curbs, including tie bars for curbs and corner bars of the exterior walls. All other steel is to be in the form of black bars. The unit cost bid for Item No. 604-02.02, Steel Bar Reinforcement (Box Bridges), is to include any additional cost for epoxy-coated steel as noted on plans details or Standard Drawings.

If the project has a reinforced concrete deck bridge, this drawing will appear in the bridge index and it will not be necessary to list it again in the roadway index.

4-604.30 CULVERT EXCAVATION FOR BOX OR SLAB TYPE CULVERTS OR BRIDGES

(See 4-203.35 and 4-204.05)

4-604.40 STOCK PASSES (See 3-240.00)

4-611.00 CHECKING OF DRAINAGE PLANS PRIOR TO CONSTRUCTION

Before finalizing drainage plans, the designer is to ensure that the drainage portion of their Construction Plans is consistent with current standard drawings. This will consist of making sure that the invert elevations shown on the proposed plan sheets facilitate the use of standard small drainage structures. The designer is to use the same invert drop across the structures that are used on the standard drawings. This check must be completed prior to submitting the Construction Plans. It is necessary to make this adjustment in order to eliminate costly construction changes to the catch basins, manholes, junction boxes, etc.

Invert elevations are to be shown in the plans for all pipes entering and leaving these small drainage structures. The grate elevation is to be shown for all catch basins. The top of lid elevation is to be shown for all manholes. The top of slab elevation is to be shown for all junction boxes. The proper tabulation of these structures is shown in section 3-200.00.

4-611.05 BRIDGE END DRAINS

When bridge end drains are included on a project, the designer will only have to calculate quantities for **drain pipe** and **end treatment**. The Structures Division Standard Drawings STD-1-6 through STD-1-9 show bridge end drain for structures, which have concrete approach slabs and Standard Drawings STD-1-10 through STD-1-13 show bridge end drain for structures without concrete approach slabs. The designer shall check the preliminary structures layout sheet to see which drawings are included. On some structures, such as those having open bridge railing, bridge end drains will not be used. If there are questions about these drawings or the type of bridge end drain to use, check with the appropriate Structures Division personnel.

The length of the outlet pipe is to be measured from the outside limits of the bridge end drain pipe, which is included in the cost of the bridge drain box (as shown on Standard Drawings STD-1-7 or STD-1-11), down the slope to the end of the outlet pipe. Actual length for payment will come from measurement taken from the appropriate sheet in the Roadway Plans. It shall be paid for as Item No. 610-07.03, 18-inch Pipe Drain (Bridge Drain) per linear foot. The cost of the bridge drain outlet pipe endwall shall be paid for as Item No. 709-01.01, Rubble-Stone Rip-Rap per cubic yard. These pay items in the Estimated Roadway Quantities Block shall be footnoted as follows:

> "Standard Drawing STD-1-7 (or STD-1-11) is to be used for burial of the outlet pipe and for end treatment details."

The designer shall reference only the appropriate Standard Drawing in the above note. Standard Drawing STD-1-7 will be used in the note when the structure has a concrete approach slab. Standard Drawing STD-1-11 will be used in the note when the structure does not have a concrete approach slab.

When bridge-end drains are not required, the shoulder shall be paved full width for a distance of 25 feet past the end of the parapet, and rip-rap shall be hand placed around the guardrail for an equal distance.

4-617.00 BRIDGE DECK SEALANT

When calculating the quantity of bridge deck sealant, include a two foot transition length beyond each end of the bridge. Do not use sealant on approach pavement.

The following is the procedure for using bridge deck sealant:

1. Bare concrete decks considered sealable shall be sealed using a "sandwich seal", system "A" or "B", as follows:

\\ <-- 1.25" (Specified topping on contract plans)
// <-- 1" E
========== <-- System "A" or "B"
// <-- 1" E
****************************** <-- Concrete Deck

2. Concrete decks with existing asphalt overlays shall be sealed using a "sandwich seal", System "A" or "B".

   A. For State projects the existing asphalt will be sealed as follows:

\\ <-- 1.25" (Specified topping on contract plans)
// <-- 1" E
========== <-- System "A" or "B"
|||||||||||||||||||| <-- 403-01 Bituminous Material (Tack Coat)
#################### <-- Existing Asphalt

   Existing asphalt overlays are not to be removed unless the bridge deck has deteriorated to the point that the overlay is unstable.

   B. On State projects, if the deck survey indicates the existing asphalt is too rough to seal, a 1-inch layer of "E" mix will be substituted for the tack coat. Since the membrane must be installed on a uniform surface, leveling ("C" mix), or additional "E" mix may be necessary to bring the deck surface to a true plane.

NOTE: When overlaying existing bridges, the Structures Division will furnish expansion joint adjustment details upon request by the designer if expansion joints exist.

NOTE: On construction projects where "E" mix is not specified, but "D" mix is specified, "D" mix may be substituted for "E" mix.

NOTE: On construction projects where "C-W" mix is specified in lieu of "D" or "E" mix for surface course, "C-W" mix shall be used as follows:

1. Bottom layer below System "A" or "B" = 1.25 inches thick
2. Top layer above System "A" or "B" = 1.75 inches thick

The bridge deck sealant and the wearing surface over the sealant will continue to be roadway items with the Structures Division furnishing the quantity of deck sealant as part of the bridge design.

Unless otherwise directed, the appropriate pay item for bridge deck sealant is:

Item No. 617-01 Bridge Deck Sealant per square yard

4-621.00 TEMPORARY STRUCTURES

On all construction projects having detours requiring temporary drainage structures, the designer shall use Item Nos. 621-01.01 through 621-01.10, Temporary Structures (Description-STA) per lump sum, as opposed to using the specific item numbers for each type of structure (pipe, box culvert, etc.). Item Nos. 621-01.01 through 621-01.10 shall be footnoted as follows:

> "Quantity is based on minimum calculated length. Actual length required will be determined based on field conditions encountered. The bidder is responsible for verifying estimated lengths prior to submitting their bid. Additional length, if any, required by actual field measurements will be installed at no additional cost. All costs shall be included in the bid price for these items."

This footnote is for Item Nos. 621-01.01 through 621-01.10, which have been identified by the Structures Division or as needed by the design. The above footnote does not apply to any temporary structure used for a channel change or erosion prevention and sediment control.

4-625.00 ABANDONMENT OF WATER WELLS (See 4-202.13)

Item No. 625-01.01, Well Abandonment per Lump Sum, will no longer be used.

4-705.00 GUARDRAIL INSTALLATION ACROSS BOX OR SLAB TYPE CULVERTS AND CONCRETE DECK BRIDGES

The designer of the roadway plans will calculate and show estimated quantities of all W-beam guardrail across the subject structures. Some coordination may be required with the Structures Division to find out if the culvert rail is concrete parapet or W-beam guardrail.

Concrete Box or Slab Type Culverts and Bridges

If the embankment depth at the point where the guardrail post is driven is greater than or equal to 3.67 feet, use Item No. 705-02.02, “Single Guardrail (Type 2)”.

If the top of the concrete slab is used as the riding surface, use Item No. 705-01.04, “Metal Beam Guard Fence”, with the post bolted to the slab per Standard Drawing S-GR-22.

If the embankment depth at the point where the guardrail would normally be driven is less than 42 inches, use Item No. 705-01.04, “Metal Beam Guard Fence”, with the post bolted to the top of the slab.

Note that post spacing of 3 feet-1-1/2 inches is required for Item No. 705-01.04, and that the pay length will be the sum of the number of posts bolted plus one multiplied by 3 feet-1-1/2 inches.

See Standard Drawing S-GR-22 for details of bolting post to the bridge deck or top slab.

Concrete Deck Bridges

If a concrete deck bridge has a concrete parapet wall, it shall be connected to the metal approach guardrail with Item No. 705-01.01, “Guardrail at Bridge Ends”, shown on Standard Drawing S-GR-23.

If the designer has a project that has an existing concrete slope face end post as detailed on Standard Drawing SBR-2-131 and SBR-2-132, the metal rail shall be attached with Item No. 705-10.30, Guardrail Attachment to Slope Face Endpost, L.F., or an existing concrete vertical face endpost, as detailed on SBR-2-133 and SBR-2-134. The metal rail shall be attached with Item No. 705-10.31 Guardrail Attachment to Vertical Face Endpost, L.F.

If a concrete deck bridge has metal guardrail, it shall be Item No. 705-01.04, “Metal Beam Guard Fence”, as shown on Standard Drawing S-GR-22.

4-706.00 END TREATMENTS

4-706.10 ANCHORAGES (RESERVED)

4-706.20 GUARDRAIL END TERMINALS

On the designated state highway system, when using gating type approach end terminals, it is required to specify an end terminal that meets NCHRP 350 crash criteria. Tangential Energy Absorbing Guardrail End Terminals shall be used per Standard Drawing S-GR-43 and S-GR-44, Item No. 705-04.07.

The most desirable approach end terminal continues to be buried in backslope, Guardrail End Terminal (Type 12), Item No. 705-04.02. When it is not applicable to use this type of end terminal, a gating type, tangential energy absorbing guardrail end terminal (type 38) shall be used.

On all other roads not on the designated state highway system, including side roads to state and U.S. highways, when the current design speed exceeds 40 miles per hour, the same type of terminals meeting the NCHRP 350 crash criteria are required as stated above.

On all low speed roads not on the designated state highway system, including side roads to State and U.S. routes, when the current design speed is 40 miles per hour or less, the Slotted Rail Terminal - SRT 75 (Type 21) terminal anchor, or equal, shall be used. Payment is to be made under Item No. 705-04.04 Guardrail Terminal (Type 21).

On all low speed, low volume local bridge replacement projects, standard drawing S-GR-23A should be used. The standard details the guardrail attachment at bridge ends and the minimum length of installation for low volume (current ADT ≤ 400) local roads with speeds of 40 mph or less. The use of the earth pad as shown on standard drawing S-GR-39 is not required for this installation.

4-706.30 DESIGN AND SELECTION CRITERIA FOR CRASH CUSHIONS

4-706.31 GENERAL DESIGN PRINCIPLES

Crash cushions (impact attenuators) are used to shield fixed roadside objects located within the clear zone such as bridge piers, overhead sign supports, ends of retaining walls, concrete median barriers, bridge abutments, and bridge railings. Crash cushions operate on the basis of energy absorption or energy transfer by either decelerating a vehicle to a controlled stop after a frontal impact, or by redirecting a vehicle away from a fixed object after a side impact. Where a fixed roadside object is identified, the designer should first consider removing, relocating, making the object breakaway, or shielding the fixed object with a longitudinal barrier. Where this is impractical, the use of an approved crash cushion system should be considered.

All crash cushions specified on TDOT projects must be accepted as crashworthy by the FHWA in accordance with either NCHRP Report 350 or the AASHTO Manual for Assessing Safety Hardware (MASH) for Test Level 3 (TL-3). This requirement shall apply to all temporary work zone and permanent installations.

4-706.32 WORK ENERGY PRINCIPLE (NON-GATING, RE-DIRECTIVE SYSTEMS)

Crash cushion design based on the work energy principle involves the reduction of an impacting vehicle's kinetic energy to zero. Assuming that a vehicle will be stopped after an impact, then the "work" done on a vehicle equals the initial kinetic energy of the vehicle. An impact to a crash cushion will result in some damage to a vehicle; however, under the work energy principle, the potential for serious injury to the vehicle occupants is reduced.

Crash cushions that operate under the work energy principle utilize "crushable" or "deformable" material to convert the kinetic energy of a vehicle into other forms of energy including mechanical, potential, heat, and sound energy. Crash cushions of this type, referred to as compression crash cushions require a rigid support back-up structure or foundation to resist the impact force of the vehicle utilizing the energy-absorbing material. These types of crash cushions are considered non-gating, re-directive systems, in that they are not intended to capture the vehicle upon impact (unless frontal impact occurs); but rather, redirect the vehicle after collision. Various systems are available that offer re-directive capabilities on one or both sides of the system.

Table 4-2 summarizes the three types of non-gating/re-directive crash cushion systems considered acceptable for use on TDOT projects.

Non-Gating Crash Cushion Classification	Roadway Location Characteristics			
	ADT	Impact Frequency per Year	Distance (D) from Travel Way (feet)	Repair Considerations
Sacrificial	<25,000	N/A[1]	D>10	Requires entire system replacement when hit
Reusable	<25,000	1-2	D>10	Many reusable components, Unlimited repair time
Low Maintenance/Self Restoring	≥25,000	3 or more	D≤10	Time and work space limitations, Multiple hits before repairs needed

[1] Low history or expectation of impacts occurring over lifetime of crash cushion.

Table 4-2
Non-Gating Re-directive Crash Cushion Classification

4-706.33 CONSERVATION OF MOMENTUM PRINCIPLE (GATING SYSTEMS)

The conservation of momentum principle for crash cushion design involves the transfer of the vehicle's momentum to an expandable mass of material located in the vehicle's path. The conservation of momentum principle is involved with all crash cushion impacts, since some portion of a vehicle's kinetic energy is transferred to the cushion by accelerating and moving various components of the cushion during an impact. For gating systems, this expandable mass will normally consist of containers filled with sand. Sometimes referred to as inertial crash cushions, these types of systems require no rigid backup or support to resist a vehicle's impact force, and may be used for both temporary and permanent installations.

Gating systems are energy dissipation devices only, and rely on the conservation of momentum principle. They have no capability to re-direct an errant vehicle; but rather, will either capture a vehicle or allow it to pass through the system along the same general path. Use of a gating crash cushion should be limited to locations where the roadside object is not likely to be impacted at an angle on the side with any significant velocity, or when no other safety device product will fit the location (i.e. very wide hazards). Also, gating systems may be appropriate for use on low speed facilities and in temporary work zones with higher speeds where lane widths are constrained and the potential for a high angle impact is limited. Every gating system must be specifically designed for the fixed object that it is intended to shield.

For gating, non-redirective systems (i.e. sand-filled barrel arrays), the designer should verify that adequate clear run-out area is available behind the device. Barrel arrays should not be used where there is high potential for vehicles to impact the device in the reverse direction (e.g. a vehicle would hit the heaviest barrels placed directly adjacent to the fixed object being shielded).

4-706.34 CRASH CUSHION SELECTION GUIDELINES

The location of all crash cushions should be shown on the Proposed Layout Sheets along with the cushion type for each occurrence of a crash cushion on the project. In addition, the designer should provide the available reserve area (length and width after deducting for offsets - See Figure 4-19) for each location where a crash cushion is to be installed. Contractors will be required to determine the proper unit when they bid the project, so that it will fit the location shown on the plans. In some instances, it may be necessary to provide special details for a given location. When special details are required, they should be shown on the Detail Sheets within the final construction plans.

The criteria for selecting crash cushions should be based on crash history and ADT. For existing roadways, the crash history and roadway characteristics will provide the designer with important information for selecting the appropriate type of system. Average Daily Traffic should be used as the barometer for impact frequency on new installations and at sites where crash history is not available. Additionally, repair times, proximity to roadway, and gore areas should also be considered when selecting the appropriate crash cushion system.

Once a decision has been made that a roadside object should be shielded by a crash cushion, the designer should consider the following factors when selecting a system for a particular location:

- Site characteristics
- Structural and safety characteristics of the systems

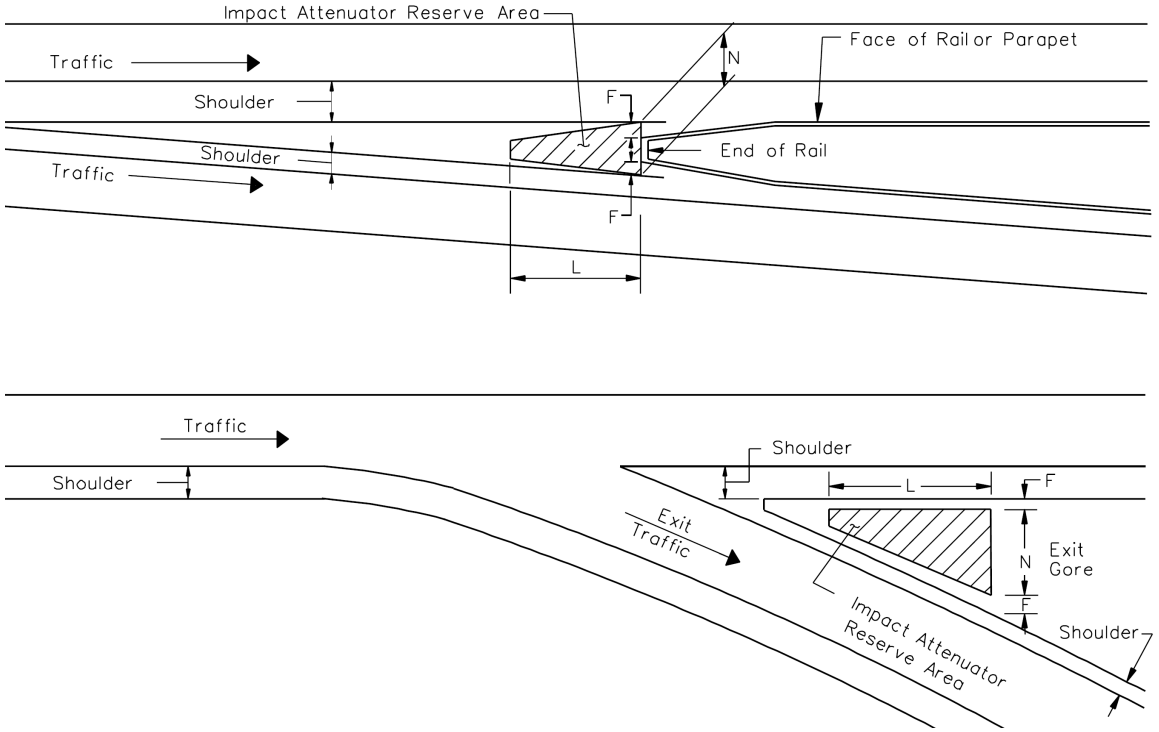
- System costs
- Maintenance characteristics

Each of these factors should be considered in the selection process and are further discussed in the following sections.

4-706.35 SITE CHARACTERISTICS

Provisions for providing adequate space (reserve area) for crash cushions to shield fixed objects should be made during the preliminary plan stage for new roadway construction projects and for the rehabilitation or reconstruction of existing roadways. Figure 4-18 suggests the minimum and desired reserve area dimensions that should be made available. Although a gore location is depicted in Figure 4-18, the recommendations in the table can be applied to other fixed objects that require shielding. The preferred condition represents the optimum and desirable values for any location. The unrestricted conditions represent the minimum dimensions for all locations. The restricted conditions shall be used only where it can be demonstrated that dimensions of the unrestricted condition are unattainable. The information in the table is for preliminary design purposes. Final design should be based on the crash cushion system selected and the manufacturer's specifications. Additionally, the table values are generic and may not apply to some proprietary systems.

For preliminary design purposes, the terms N and L in Figure 4-18 represent the assumed width (N) and length (L) of space necessary for the placement of a crash cushion. F is the maximum width of the fixed object that requires shielding. For concrete barriers (temporary or permanent), F is considered the widest width above the finished grade of the surface.



Design Speed on Mainline (mph)	Dimensions for Crash Cushion, Reserve Area (feet)								
	Minimum Dimensions						Preferred Conditions		
	Restricted Conditions			Unrestricted Conditions					
	N	L	F	N	L	F	N	L	F
30	6	8	2	8	11	3	12	17	4
50	6	17	2	8	25	3	12	33	4
70	6	28	2	8	45	3	12	55	4

Figure 4-19
Area Available for Crash Cushion Installation

The designer should be aware of the site conditions that might dictate the type of crash cushion needed; especially in terms of width. Where a fixed object's width (F) is less than 36 inches, the object can be shielded with a narrow crash cushion. Where F is greater than 16 feet, sand barrel arrays can effectively shield the obstacle. Sand barrel designs are usually more adaptable to wide obstacles and the redirective non-gating systems to narrow obstacles. In general, the width of any selected system should be as narrow as possible while still providing the appropriate level of attenuation for the fixed object.

To allow crash cushions to compress uniformly during an impact, systems should be installed on a hard, smooth, and generally flat surface of asphalt or concrete (preferred). All non-gating systems will require a foundation of this type. This can easily be accommodated for in new construction; however, at retrofit locations or major roadway rehabilitation sites, the designer should attempt to remove sloped surfaces as part of the project plans. Longitudinal and transverse slopes in excess of 5 percent should be avoided. Additionally, if the cross slope varies by more than 2 percent over the length of the system, the designer may need to make site alterations. For gating systems, the hard flat surface should be provided so as to provide a uniform foundation on which the barrel-array pattern may be installed and the design masses of the sand-filled barrels can be marked. These marked locations will aid in the proper reconstruction of the barrel system to its originally designed capacity and configuration after a vehicle impact.

On new construction projects, no curb, curb and gutter, or raised pavement should be designed in the area surrounding or occupied by the crash cushion. When retrofitting an existing location, existing curbs, curb and gutter, or raised pavement should be removed where possible. If an existing curb is to remain, it shall be no more than 4 inches in height. The designer should also verify that the existing curb has not previously contributed to poor crash performance.

The designer should verify if sight distance will be compromised by installing a crash cushion at some intersection locations (i.e. locations at the end of concrete median barriers located at at-grade intersections). Where this is a concern, the designer should choose a system that provides reduced overall height while still meeting the attenuation need at the location.

4-706.36 STRUCTURAL AND SAFETY CHARACTERISTICS

Often times more than one approved system will fit a specific location. The designer should evaluate the structural and safety characteristics of each crash cushion system to including impact deceleration, re-directive capabilities, anchorage, backup structure needs, and the amount of debris that could be produced when a vehicle impacts the system.

Systems approved for TL-3 criteria have the capability to decelerate an impacting vehicle within tolerable levels or to re-direct or contain (capture) vehicles impacting the sides of the crash cushion system. TL-3 criteria shall be met for all permanent or temporary crash cushion systems specified on TDOT projects.

The necessity or need for redirective capabilities of the system should be evaluated during the plan development process. Non-gating systems provide redirective capabilities to a vehicle impacting downstream of the nose of the unit. Gating systems have no capability to re-direct an errant vehicle in a side impact; and thus, should be limited to locations where the hazard is not likely to be impacted at an angle or where rear corner impacts are not likely to occur.

Non-gating, redirective systems will require rigid backup and anchorage for the system to function properly. This may be specifically designed backup or the obstacle itself may serve as the backup. Transitions between the non-gating crash cushion system and the shielded object should be smoothly shaped to reduce the possibility of vehicular snagging.

Roadway joints, especially bridge expansion joints or deflection joints in deep superstructures within the crash cushion area may require special design accommodations pertaining to ground anchorage.

While gating crash cushion systems can be designed to shield obstructions of practically any width, the potential to generate considerable debris when hit is relatively high. Gating systems should not be used where flying debris (sand, lids, etc.) could pose a danger to pedestrians or other motorists.

4-706.37 SYSTEM COSTS

The cost of the various crash cushion systems should be considered during the selection process. Cost considerations should include site preparation cost, initial material and installation cost, maintenance costs, and repair or replacement costs. Life cycle cost for repairing or replacing a crash cushion system could be a significant factor in the selection process, especially at locations where frequent hits are expected. Consideration for each available system is as follows:

Sacrificial Crash Cushions - In terms of cost, non-gating crash cushions considered sacrificial (replaceable) are generally designed for a single impact. These systems offer low initial costs and may be cost effective if used at locations where the designer expects infrequent crashes to occur, where the existing crash history is low, and the ADT is less than 25,000. Full replacement or substantial field repairs may be required following an impact.

Reusable Crash Cushions - Reusable (resettable) crash cushions generally have some parts that will need to be replaced after a hit to make the unit crashworthy again; however, major components of the non-gating system may survive an impact. Reusable products are generally more expensive than the sacrificial systems; however, these systems are appropriate in locations where the ADT<25,000, frequent crashes (1 to 2 per year) may occur, or where the crash history is unknown (e.g. a new design location). Generally, these systems are field repairable within moderate parts cost and time constraints.

Low Maintenance/Self Restoring Crash Cushions - Crash cushions categorized as low maintenance/self-restoring systems are premium non-gating systems designed for high traffic areas and locations where vehicular impacts can be expected frequently. The long term maintenance and repair cost savings obtained by using a self-restoring system may offset the initial higher cost. These systems are generally installed on high-speed, high volume roadways (ADT>25,000), ramps, or medians where a high frequency (3 or more per year) of impacts may be expected or is occurring. Many available systems can sustain multiple hits before repairs are needed.

Gating Crash Cushions – Gating systems such as sand barrel arrays are systems that generally have a lower initial cost compared to non-gating systems, but have relatively high maintenance costs, and should be considered for locations well off the roadway where frequent hits are not expected or locations where no other safety device product will fit the location (i.e. very wide obstructions). See additional requirements for allowable use.

4-706.38 MAINTENANCE CHARACTERISTICS

Future inspection and maintenance should be considered by the designer when selecting the appropriate crash cushion system. The designer should be aware that periodic

maintenance and inspection will be necessary to confirm that the installed system remains fully functional as intended. The frequency and expected difficulty (or ease) to perform inspection and/or maintenance on the system should be factored into the final selection of the crash cushion. Maintenance characteristics can be classified as either:

- Regular/Routine Maintenance - systems requiring minimal routine maintenance
- Crash Maintenance - required on system as a result of a vehicular impact
- Material Inventory Needs

The use of a low maintenance/self-restoring system should be considered at locations with a history of frequent hits (3 or more per year) or where lateral clearance restrictions make maintenance activities difficult, problematic, or will cause significant traffic delays and traffic exposure risk to maintenance personnel. Where nuisance hits are relatively common, a crash cushion with re-directive capabilities should be considered to reduce the effort required for minor repairs or partial replacement of a system. Crash cushions that utilize a hex-foam cartridge may require periodic inspection to verify that the cartridges have not deteriorated.

For sand-barrel array systems, the plastic barrels may degrade over time due to exposure to ultraviolet light, and therefore requires periodic inspection and possible replacement of barrels due to cracking; especially at locations that have been in service for 10 or more years. Additionally, the barrel lids should be inspected periodically to insure they are securely fastened to the barrels.

Ideally, permanent repairs should be made quickly; therefore, the type and amount of spare parts kept on hand, or that are quickly attainable should be considered. The availability of parts required to restore any system to its original design capacity is closely associated with repair time and cost. The ability of the Maintenance Division to place a damaged system back into service quickly should be a major consideration in the design and selection process.

4-706.39 TEMPORARY WORK ZONES

For temporary work or construction zones, the designer should select a crash cushion system consistent with the expected time and site conditions that may be present at the given location. All crash cushions installed in temporary work zones shall meet Test Level 3 criteria, and each system must be accepted by FHWA as listed on the Qualified Products List. Temporary systems shall be selected, designed, and installed based on the same guidance provided for permanent applications.

Both non-gating and gating systems are approved for use in temporary work zones on TDOT project. Non-gating, redirective systems are available in narrow widths; and thus, have the ability to satisfy attenuation requirements where working conditions are constrained; provided that a paved surface is available for proper anchorage. Where lane widths are constrained, gating systems designed to protect the ends of temporary concrete barrier or other fixed object are acceptable due to the reduced potential for angled impacts. Additionally, some gating systems do not require a paved surface for short-term temporary installation. Water filled gating systems should be used for temporary work zones only as approved by FHWA.

With all temporary applications, the selected system should provide adequate separation distance between the installed system and the actual area where work is being performed due to the possibility of flying debris during an impact. Additionally, sight distance at

intersecting roadways or points of ingress/egress to the work zone should be considered and checked during the selection process.

4-707.00 ROW STOCK FENCE

On projects where right-of-way stock fence is required use standard drawing S-F-10. Standard drawing S-F-10C is approved for use on ROW Fence for Bridge and Culverts and S-F-10D is approved for use on ROW Fence Locations at Interchanges.

4-709.05 RIP-RAP

For estimating purposes, multiply cubic yards by 1.75 to convert to tons.

Machined Rip-Rap (Class A-1, A-2, A-3, B, and C) will be measured by the ton (1.75 Tons/C.Y.) as designed and completed in place (unless revised by the sequence of construction, which may require reconstruction and re-measurement.)

Computed Quantity (C.Y.) x 1.75 Tons/C.Y. = Total (Tons)

Classifications of machined rip-rap and their pay item nos. are as follows:

709-05.05	Machined Rip-Rap (Class A-3)
709-05.06	Machined Rip-Rap (Class A-1)
709-05.07	Machined Rip-Rap (Class A-2)
709-05.08	Machined Rip-Rap (Class B)
709-05.09	Machined Rip-Rap (Class C)

These classifications are detailed in Subsection 709.03 of the Standard Specifications.

If a gradation of machined rip-rap other than these is required, use Item No. 709-05.10 through 709-05.13, Machined Rip-Rap (Description), and use the rip-rap notes in Section VI, General Notes and Special Notes.

All machined rip-rap quantities are to be shown in the Estimated Roadway Quantities Block. Those quantities supplied by the Structures Division shall be added to any roadway quantities for the same item number, and they shall be footnoted. Footnote each structure separately identifying all quantities and the structures with which they are used.

4-710.00 UNDERDRAINS

The designer will use underdrains, with or without filter cloth, as detailed on Standard Drawings RD-UD-3 and RD-UD-4, on all new paving projects and rehabilitation projects as directed by the Pavement Design Section.

The designer will need only to show the underdrain on the roadway typical section and refer to it as "Detail_____" using the proper detail identification letter shown on Standard Drawing RD-UD-3.

4-712.00 TRAFFIC CONTROL IN CONSTRUCTION ZONES

As a result of statewide reviews of traffic control in construction zones conducted by the Department and the FHWA, the following guidelines are suggested for consideration in the development of traffic control plans.

For compliance with Title 23 Code of Federal Regulations, Part 630, Subpart J – Work Zone Safety and Mobility, all federally funded projects must have a Traffic Management Plan, which, at the minimum must include a temporary traffic control plan. Further, the temporary traffic control plan shall either be a project specific temporary traffic control plan, approved TDOT standard drawings or a reference to specific temporary traffic control elements in the MUTCD.

Construction plans for any federally funded project developed without a project specific temporary traffic control plan (such as a resurfacing project), shall include the following special note to ensure compliance with the 23 CFR 630 Subpart J requirements.

"The Contractor shall comply with Section 712 of the Standard Specifications for Road and Bridge Construction regarding Temporary Traffic Control and the current Edition of the Manual on Uniform Traffic Control Devices."

CONSTRUCTION SIGNING

The use of advisory speed plates shall be limited to locations where the traffic control design warrants a 10 mile per hour or more reduction in speed, such as an approach into a median crossover on a divided highway. The designer shall make every effort to achieve a traffic control design that would avoid the use of these plates.

Detour signs shall be used only when traffic is rerouted onto another road and not used for diversions (runarounds), lane shifts, etc. on the road under construction. A Road Work Next XX sign shall be used on road work more than 1 mile in length and shall be rounded to the next mile up (example: 5.4 miles in road work shall be shown as 6 miles on the Road Work Next XX sign).

To enhance safety for both the motoring public and construction personnel, the Department has established guidelines and procedures for the reduction of work zone speed limits as warranted by the Guidelines for Establishing Work Zone Speed Limits. The intent is to allow a reduction of the legal speed limit for the shortest period warranted in the area of active construction work. These procedures include an evaluation of the work zone in question, a review of the guidelines to determine if the reduction in speed is warranted, a written request, and approval by the State Traffic Engineer. Additional detail can be found in the Construction Division Circular Letter 712.04.01.

To comply with the above approved Departmental guidelines and procedures, **regulatory speed limit reduction signs shall not be placed in the Traffic Control Plans**. Any exception shall comply with the Guidelines for Establishing Work Zone Speed Limits, Construction Division Circular Letter 712.04.01, and be approved by both the Design Division Director and the State Traffic Engineer. Requests for the inclusion of regulatory speed limit signs in the Traffic Control Plans solely based on requests or comments made at field reviews will not be accepted as justification for placement of signs in the plans.

The use of advisory speed plates used in conjunction with construction signs is allowable on Traffic Control Plans provided the advisory speed is appropriate for the roadway geometry.

BARRICADES AND DRUMS

Plastic drums shall be used in lieu of Type II barricades due to better performance in terms of durability and target value.

LIGHTING DEVICES

1. Where plastic drums are used, there are certain situations where additional delineation provided by lighting devices is not necessary. Type C (steady burn) lamps are not recommended for use with plastic drums along tangent sections following a lane closure taper or along a line of drums delineating the edge of the traveled way. The large target area of reflective sheeting on drums has been shown to provide adequate delineation for these conditions. However, the use of Type C lamps is still recommended for use with drums on tapers. Also, Type C lamps on drums, including tangent sections, might be considered when climatic conditions (for example fog) dictate the need for additional delineation.

2. Where portable concrete barrier rails are used, vertical panels are recommended in lieu of Type C lamps. These devices have provided adequate delineation at a much lower cost, while requiring much less maintenance effort as compared to Type C lamps.

3. High intensity (Type B) lamps, the use of which is optional according to the *MUTCD*, are frequently attached to the initial set of road work signs in advance of the work zone (Road Work Ahead, Road Work ½ Mile, etc.). These lamps do not add any significant degree of attention to these signs. Furthermore, they are costly to provide and maintain. The use of Type B lamps shall be limited to just those situations where a "spot" hazard is anticipated and additional delineation of a channelizing device is considered necessary.

MARKINGS

1. Wide (8 inch) solid lane lines are recommended for use as temporary marking at lane transitions and lane shifts. Wide lines provide better guidance through changes in alignment, especially where conflicting traces of removed marking may remain.

2. Wide-edge line marking is also recommended for use next to portable concrete barrier rail.

TEMPORARY RAISED PAVEMENT MARKERS

Raised pavement markers should be placed on lane lines for lane shifts on divided highways and freeways and 2-lane two-way diversion (run-arounds), as shown on the T-WZ-series Standard Drawings.

Temporary raised pavement markers should also be considered for use through construction projects on major facilities and locations where the lane visibility is an issue. The use of temporary raised pavement markers should be addressed at the construction field review on projects involving major facilities.

Designers should ensure that the appropriate 716 series of pay items are included in the construction plans for temporary raised pavement markers.

VERTICAL PANELS

1. The designer shall use the pay Item No. 712-06.01, vertical panels per square foot, when using vertical panels on a project.

2. Vertical panels are covered in Section 6F-5 of the MUTCD.

3. When developing a Traffic Control Plan for a project, the designer shall make a preliminary decision whether to use drums, barricades or vertical panels, depending on the length of time they need to remain in place. A final determination as to which shall be used will be made at the Construction Field Review.

4. It shall be necessary to specify the size of the panels and how many square feet are "right" panels and how many are "left" panels.

5. Vertical panels on “U” posts shall be used adjacent to the outside shoulders of divided highways when shifting traffic to the outside onto the shoulders (resulting in a reduced outside shoulder). Spacing of these panels shall be 200 feet maximum.

PORTABLE BARRIER RAIL

Taper rates shall be 10:1 or flatter for designs where posted speeds are less than or equal to 40 mph, and 15:1 or flatter for designs where posted speeds are greater than 40 mph. The approach ends of the portable barrier rail shall be located outside the clear zone or be shielded with a portable energy absorbing terminal. The energy absorbing terminals shall be paid for under Item No. 705-08.51, Portable Impact Attenuator NCHRP350 TL-3 per each, and footnoted as follows:

> “This item shall be a portable energy absorbing terminal meeting the requirements of NCHRP 350 for Test Level 3. Examples would be a Quad-Guard, a React 350 or a TRACC. The pay item will include furnishing and installing all components as shown on the manufacturer’s drawing.”

BARRIER RAIL DELINEATORS

Barrier rail delineators (item no. 705-04.50) shall be used on portable barrier rail in accordance with the T-WZ-Series standard drawings and Section 4-716.11 of these guidelines. Barrier rail delineators should meet the following specifications:

1. Portable barrier rail delineator reflective sheeting shall meet ASTM D4956, Type V specifications.

2. Delineator should have 4" x 3" dimensions. Delineators with dimensions other than 4" x 3" may be used if the product is on the approved products list. The variations in delineator dimension should not exceed ±10%.

3. Different types of barrier rail delineators should not be mixed in the same line.

4. Portable Barrier Rail Delineators shall be high impact, UV-stabilized, engineered thermoplastic or polycarbonate substrate.

The TDOT approved qualified product list will be used to identify acceptable products.

FREEWAY WORK ZONE CAPACITY

Guidance will be added at a later date regarding freeway work zone capacity.

4-712.05 RECORD-A-COMMENT SIGN

The **"Record-A-Comment"** sign shall be used on all interstate and freeway projects with a current ADT of 30,000 vehicles/day or greater. Signs should be located, in each direction, approximately 1000 feet beyond the "End of Road Work" sign. The signs will be paid for under item 712-06, Signs Construction, S.F.

The "Record-A-Comment" sign should be footnoted in the tabulated block as follows: 96"X48" (Blue Background with White Copy) 0.100" sheet aluminum.

The sign is included in the Tennessee Supplement to the MUTCD as TN-55a.

4-712.10 DIFFERENCES IN ELEVATION BETWEEN ADJACENT ROADWAY ELEMENTS

To minimize the hazard to traffic where differences in elevations between adjacent roadway elements exist, the following procedures shall apply, unless otherwise shown on the Plans or directed by the Engineer. **The designer is advised that the following procedures be presented in the form of traffic control notes shown on the traffic control sheets and not the general notes sheet. In addition, the designer is to show only those notes that apply to the specific phase of traffic control shown on the sheet on which the note appears.**

A. Differences in elevation between adjacent traffic lanes or traffic lane and shoulder where the traffic lane is being used by traffic, caused by base, paving or resurfacing:

    1. Differences in elevation between adjacent roadway elements greater than 0.75 inch and not exceeding 2 inches:

a. Warning signs, UNEVEN PAVEMENT (W8-11) and/or SHOULDER DROP-OFF (W8-9a), shall be placed in advance of and throughout the exposed area. Maximum spacing between signs shall be 2,000 feet with a minimum of 2 signs per exposed area. Where uneven pavement is encountered, signs shall be placed on each side of the roadway.

b. Differences in elevation between adjacent traffic lanes being utilized by traffic caused by added pavement shall be eliminated within three workdays.

c. Differences in elevation between adjacent traffic lanes being utilized by traffic caused by cold planing shall be eliminated within three workdays.

d. When the difference in elevation is between the traffic lane being utilized by traffic and shoulder, the difference in elevation shall be eliminated within seven workdays after the condition is created.

2. Differences in elevation between adjacent roadway elements greater than 2 inches and not exceeding 6 inches, traffic is not to be allowed to traverse this difference in elevation:

a. Separation shall be accomplished by drums, barricades or other approved devices in accordance with the following:

(1) Where posted speeds are 50 mph or greater, spacing of the protective devices shall not exceed 100 feet.

(2) Where posted speeds are less than 50 mph, the maximum spacing of the protective devices in feet shall not exceed twice the posted speed in miles per hour or 50 feet, whichever spacing is greater.

b. If the difference in elevation is eliminated or decreased to 2 inches or less by the end of each workday, cones may be used during daylight hours in lieu of drums, barricades or other approved protective devices mentioned in Paragraph A, provided warning signs are erected. Warning signs (uneven pavement and/or low shoulder) shall be placed in advance of and throughout the exposed area. Maximum spacing between signs shall be 2,000 feet with a minimum of two signs per exposed area. Where uneven pavement is encountered, signs shall be placed on each side of the roadway.

c. When the difference in elevation is between the through traffic lane and the shoulder, and the elevation difference is less than 3.5 inches, the Contractor may use warning signs and/or protective devices as applicable and approved by the Engineer. See Paragraph A regarding use of drums, barricades or other approved protective devices. Warning signs (uneven pavement and/or low shoulder) will

be placed in advance of and throughout the exposed area. Maximum spacing between signs shall be 2,000 feet with a minimum of 2 signs per exposed area. Where uneven pavement is encountered, signs shall be placed on each side of the roadway.

In these situations the Contractor shall limit his operations to one work zone not exceeding 2 miles in length unless otherwise noted on the plans or approved by the Engineer. Once the Contractor begins work in a work zone, a continuous operation shall be maintained until the difference in elevation is eliminated. Simultaneous work on separate roadways of divided highways will be considered independently in regard to restriction of work zone activity.

3. Differences in elevation between adjacent roadway elements greater than 6 inches, but not exceeding 18 inches, the Contractor, with the Engineer's approval, may utilize one of the following:

    a. The Contractor shall accomplish separation by drums, barricades or other approved devices in accordance with the following:

        (1) Where posted speeds are 50 mph or greater, spacing of the protective devices shall not exceed 100 feet.

        (2) Where posted speeds are less than 50 mph, the maximum spacing of the protective devices in feet shall not exceed twice the posted speed in miles per hour or 50 feet, whichever spacing is greater.

    In order to use this method, the contractor must reduce the difference in elevation to 6 inches or less by the end of the work day that the condition is created.

    b. The Contractor shall provide drums, barricades or other approved separation devices as specified in Paragraph A, and construct a stone wedge with a 4:1 slope, or flatter, to eliminate the vertical offset if the lower elevation is at or below subgrade at the end of each day.

    c. The Contractor shall provide drums, barricades or other approved separation devices as specified in Paragraph A, and if the lower elevation is base stone or asphalt pavement, placement of subsequent layers of pavement must begin the next work day and progress continuously until the difference in elevation is eliminated or reduced to 6 inches or less.

    d. The Contractor shall provide separation by portable barrier rail.

    For preceding conditions a, b, and c, the Contractor shall use the shoulder drop-off warning sign (W8-9a). It shall be placed in advance of and throughout the exposed area. Maximum spacing between signs shall be 2,000 feet with a minimum of 2 signs per exposed area. In these situations the Contractor shall limit his operations to one work zone not exceeding 1

mile in length, unless otherwise noted on the Plans or approved by the Engineer. Once the Contractor begins work in a work zone, a continuous operation shall be maintained until the difference is eliminated. Simultaneous work on separate roadways of divided highways will be considered independently in regard to restriction of work zone activity.

4. For differences in elevation between adjacent roadway elements greater than 18 inches:

   Separation will be provided by the use of portable barrier rail.

   In this situation the Contractor shall limit his operations to one work zone not exceeding 1 mile in length unless otherwise noted on the Plans or approved by the Engineer. Once the Contractor begins work in a work zone a continuous operation shall be maintained until the difference in elevation is eliminated. Simultaneous work on separate roadways of divided highways will be considered independently in regard to restriction of work zone activity.

B. If the difference in elevation is within 30 feet of the nearest traffic lane being used by traffic caused by grading, excavation for utilities, drainage structures, undercutting, etc:

   1. If the difference in elevation is within 8 feet of the nearest traffic lane with difference in elevation greater than 3/4 inch and not exceeding 2 inches:

      Warning signs (uneven pavement and/or low shoulder) shall be placed in advance of and throughout the exposed area. Maximum spacing between signs shall be 2,000 feet with a minimum of 2 signs per exposed area. Where uneven pavement is encountered, signs shall be placed on each side of the roadway.

   2. If the difference in elevation is within 8 feet of the nearest traffic lane with difference in elevation greater than 2 inches and not exceeding 6 inches:

      a. Separation shall be accomplished by drums, barricades or other approved devices in accordance with the following:

         (1) Where posted speeds are 50 mph or greater, spacing of the protective devices shall not exceed 100 feet.

         (2) Where posted speeds are less than 50 mph, the maximum spacing of the protective devices in feet shall not exceed twice the posted speed in miles per hour or 50 feet, whichever spacing is greater.

   3. If the difference in elevation is within 8 feet of the nearest traffic lane with difference in elevation greater than 6 inches:

      a. Separation shall be accomplished by drums, barricades or other approved devices in accordance with the following:

(1) Where posted speeds are 50 mph or greater, spacing of the protective devices shall not exceed 100 feet.

(2) Where posted speeds are less than 50 mph, the maximum spacing of the protective devices in feet shall not exceed twice the posted speed in miles per hour or 50 feet, whichever spacing is greater.

b. Eliminate vertical offset by constructing a stone wedge or grading to a 4:1 slope, or flatter, or use portable barrier rail.

The Contractor shall schedule the work so as to minimize the time traffic is exposed to an elevation difference. Once the Contractor begins an activity that creates an elevation difference within 8 feet of a traffic lane, the activity shall be pursued as a continuous operation until the elevation difference is eliminated.

C. If the difference in elevation is farther than 8 feet from the nearest traffic lane but not more than 30 feet from the nearest traffic lane:

Separation shall be accomplished by drums, barricades or other approved devices in accordance with the following:

1. Where posted speeds are 50 mph or greater, spacing of the protective devices shall not exceed 100 feet.

2. Where posted speeds are less than 50 mph, the maximum spacing of the protective devices in feet shall not exceed twice the posted speed in miles per hour or 50 feet, whichever spacing is greater.

The contractor shall schedule the work so as to minimize the time traffic is exposed to an elevation difference. Once the contractor begins an activity that creates an elevation difference, the activity shall be pursued as a continuous operation until the elevation difference is eliminated.

4-712.15 SPECIAL CONSTRUCTION SIGNS (See 4-712.10)

"WORKERS PRESENT" SIGN

A pay item for the "Workers Present" (TN-44) sign is to be used on all Interstate construction projects in the event that reduced speed limits for the construction zone are approved for use as defined in section 4-712.00. This sign is to be placed 1,000 feet in advance of the reduced speed limit sign, which is to be located at the beginning of the active construction work zone. These signs shall be located on the right side and on the median side of the roadway (except on the concrete median barrier wall sections). The signs shall be located only on the right side downstream of each interchange on-ramp within the active construction work zone.

The "Workers Present" sign will be paid for under Item No. 712-06.16, Signs (Construction) (Reduced Speed Warning) per each. This item will be footnoted as follows:

"Item to be used only when the contractor establishes a reduced speed limit within the project construction work zone limits. Item includes sign face, supports, and two type "B" flashers per the standard specifications. The contractor shall be responsible for turning on the type "B" flashers when workers are in the construction work zone and turning them off when workers are no longer in the construction work zone."

4-712.25 USE OF LANE CLOSURE WITH LEFT HAND MERGE

Controlled access projects which utilize lane closure details shall be reviewed for the inclusion of Merge Left. Interstate construction or maintenance projects where traffic is reduced to one lane of traffic through the work zone are the primary candidates.

The following criteria will be used for determining Merge Left use:

- Projects on rural interstates should include Merge Left
- Projects on urban interstates will be reviewed for Merge Left considering factors such as number of lanes, interchange spacing, and proximity to major splits
- Other controlled access facilities will be considered on a case-by-case basis

The Assistant Director, Design Division, shall be notified in writing for any interstate or controlled access facility with lane closures not utilizing Merge Left prior to finalizing the traffic control. The memorandum shall contain the reasons left merge would be inappropriate.

Standard Drawing T-WZ-21 details Merge Left. The layout and signage may require modification depending on site and field conditions.

The designer will provide quantities for a uniformed police officer which will be paid for under Item No. 712-08.06 Uniformed Police Officer per hour. The Region Construction Supervisor is to be contacted in order to establish the number of hours to be shown in the plans on a case-to-case basis by the Design Manager.

4-713.00 FLEXIBLE DELINEATIONS

On all interstate and access controlled highways flexible delineators will be installed. Flexible delineators may also be used on other routes. On resurfacing projects (4R, etc.), the Designer will be responsible for computing the quantity of flexible delineators and shall refer to Standard Drawing T-S-11 to calculate quantities.

On interstate and access controlled highway resurfacing projects the designer shall replace delineators along the ramps as well as along the main line.

The designer does not need to show the location of the proposed delineators, but must make sure Standard Drawing T-S-11 is included in the contract plans so the proper location can be determined by the engineer and contractor.

On projects, which the ITS, Traffic, and Standards Office will be developing the marking and signing plans, the location of the flexible delineators maybe shown on the marking and signing plan sheets.

4-713.05 ROADWAY SIGNING ON INTERSTATE AND FULL ACCESS CONTROL ROADWAYS (See 3-330.00)

4-713.10 ROADWAY SIGNING EXCEPT INTERSTATE AND FULL-ACCESS CONTROL ROADWAYS

When there is signing on a project, the designer shall send an email notification to the ITS, Traffic, and Standards Office at the beginning of the construction plans development. A copy of the email shall be placed in the project folder to document the submittal.

On non-access controlled highways, when the proposed signing is located on the designer's proposed layout sheets or on the designer's pavement marking sheets, the ITS, Traffic, and Standards Office will not be responsible for applying the proposed signing to these sheets.

The ITS, Traffic, and Standards Office will provide a marked-up set of the plans to the TDOT Design Manager for their review of the proposed signing. The designer will then be responsible for placing the proposed signing on the appropriate sheets. An updated "Signing Cell Library" will be furnished if needed.

The ITS, Traffic, and Standards Office will furnish the sign schedule sheets, quantities, recommended standard drawings and general notes for the proposed signing plan.

4-713.15 ROADWAY SIGNING

On projects (resurfacing, bridge replacement, etc.) requiring no more than three different types of permanent signs, the designer will use Standard Drawing T-S-20 in the Index of Standard Drawings.

The designer will need to show the proposed location and designate the type of sign (R1-1, R1-2, TN-5, etc.) on the plans. These signs will be paid for per each under Item No. 713-16.20 through 713-16.29. Appropriate General Notes and Standard Drawings will also need to be included.

If any particular sign needed for a project is not included on Standard Drawing T-S-20, or if there are any questions, contact the ITS, Traffic, and Standards Office.

See Traffic Design Manual, Chapter 6, Signing and Pavement Marking.

4-713.20 ADVANCE GUIDE SIGNS AND EXIT DIRECTIONAL SIGNS ON TRAFFIC CONTROL PLANS

The designer shall include advance guide signs and exit directional signs (green and white signs) on all phases of the traffic control plan for projects on access controlled highways including interchange cross streets. Advance guide signs and exit directional signs should also be shown on the traffic control plan on access controlled resurfacing projects when the traffic control phasing requires the placement of temporary pavement markings which conflict with directional signs or requires directional signs to be relocated or adjusted. It will be the designer's responsibility to prepare any required traffic control base sheets for all phases showing the layout and location of all directional and guide signs. Supplemental signing is not required to be shown.

Existing signs should be used as part of the traffic control plan for as long as possible throughout the different construction phases provided signs are located in accordance with MUTCD and does not provide inaccurate information. The most common conflict of existing signing with new construction occurs when overhead guide signs with down arrows or diagrammatic signs displaying lane lines are over lanes that are closed during certain construction phases. Once existing signs cannot be used at the original location, the designer should attempt to relocate the existing sign or place the permanent sign. If relocation or placement of the permanent sign is not feasible, a new temporary advance guide sign or exit directional sign shall be shown on the traffic control plan for the affected construction phase and for any other construction phase the sign is needed. Sign location shall conform to the MUTCD. Sign size should be the same as the sign removed if feasible. There shall be at least one temporary advance directional and temporary exit directional for each exit on the project.

For signs located on overhead structures, the designer should contact the ITS, Traffic, and Standards Office for additional guidance.

The following guidance should be used when it is necessary to install temporary exit directional signs or temporary advanced guide signs. The designer should contact the ITS, Traffic, and Standards Office for any additional technical questions or guidance required.

1. In the event it is not feasible to replace an exit directional sign with the existing sign size, the new sign shall be 48” x 96”, 0.100” sheet aluminum. The letters will be minimum 8 inch “D” (all capital) letters and there will be a ¾” border with a 2” radius. The color will be a reflective green background with a reflective white copy. The supports will be included in the sq. ft. of the sign face as it is with other construction signs.

2. The information on exit directional signs should be the same as the information on the existing signs that were removed. There shall be no more than four lines of copy on these signs. The layout of these signs should look as close to the existing as possible.

3. On advanced guide signs; the first line shall be the exit number for the interchange (i.e. EXIT 234), the second line will be the first destination (i.e. OLD HICKORY BLVD), the third line will be the second (i.e. MADISON), the fourth line will be NEXT RIGHT (Center all lines of copy). These signs should be located no closer than one half mile from the exit directional sign.

4. The exit directional sign shall have the same exit number and destinations as the advance guide but in lieu of NEXT RIGHT there will be a type “B” arrow at a 45 degree angle to the right. (Center all lines of copy.) These signs should be located at the beginning of the taper for the appropriate exit ramp.

5. If an interchange has a TN. (TN-6a -TN-6d) or U.S. (M1-4) route shield on the directional signing, then a shield and if needed a cardinal direction (M3-1 –M3-4) shield, will be show mounted to the left support under both the advance and exit directional signs.

6. If more lines of copy are needed, then the designer can add a 24" x 96" or another 48"x 96" sheet of aluminum to the bottom of the first sign but the size shall not be larger than a total of 96"x96".

7. Removal of existing signs shall be paid for under item number 713-15, Removal of Signs, Posts, and Footings, Lump Sum. New signs shall be paid for under item number 712-06.10, New Signs (Construction), per S.F. Design Managers should contact the construction office to have item numbers assigned when the traffic control plan involves relocating existing signs.

Traffic control plans shall be emailed to the ITS, Traffic, and Standards Office a minimum of twelve weeks prior to the construction field review for review when advance guide signs or exit directional signs are included in the traffic control plan. For resurfacing projects, plans should be sent as soon as possible. **No other traffic control plans shall be sent for review.**

See Section 6-170.00 for notes to be placed in the general notes on all access controlled and interstate projects and on access controlled and interstate resurfacing projects when the traffic control phasing requires placement of temporary pavement markings which conflict with directional signs or requires directional signs to be relocated or adjusted.

For all traffic control plan reviews, an email should be sent to the ITS, Traffic, and Standards Office. The proposed traffic control plan shall be attached to the email as a single pdf file that contains only the traffic control sheets. A copy of the email shall be placed in the project folder to document the submittal of traffic control plans for review.

The naming convention for the traffic control plan pdf will include the PIN and the Region #, XXXXXX-XX-TrafficControlReview-RegX.pdf. If there are modifications, including submitting additional information, then the naming convention will be XXXXXX-XX-TrafficControlReview-RegX-Rev-00-00-00.pdf. Revised traffic control plan review request will contain the all traffic control sheets.

Example: 123456-00-TrafficControlReview-Reg1.pdf

When assembling the pdf file, select small file size of default file size in Adobe Acrobat Standard in order to keep the proposed traffic control plans under the 15MB email limit. If the file exceeds 15 MB, the designer should split the packet into multiple emails and add Part 1, Part 2, etc. to the naming convention.

Example: 123456-00-TrafficControlReview-Reg1-Part1.pdf

For the Roadway Plans prepared by consultants, the proposed traffic control plans should be prepared as described above and emailed to the Roadway Design Manager for review. Upon acceptance, the design manager will forward the plans to the Design, ITS, Signals, Lighting, and Signing Office.

The proposed traffic control plans should be resubmitted whenever major design revisions are made that could affect the traffic control plan as determined by the Design Manager.

4-713.25 NOTE ALLOWING TRAFFIC TO TEMPORARILY DRIVE ON MILLED SURFACE TO BE PLACED IN INTERSTATE RESURFACING PLANS

See Section 6-250.02 for a note to be added to interstate resurfacing plans for all projects which include cold planing items. The note should be added as a Special Note.

Designers should also include the motorcycle warning sign (TN-64) on interstate resurfacing projects. Two (2) signs should be placed on the interstate in advance of the cold planed section. A motorcycle warning sign should also be placed on entrance ramps located within the limits of a cold planed section.

4-714.00 ROADWAY LIGHTING (See 2-315.05)

See Traffic Design Manual, Chapter 7, Roadway Lighting.

4-716.00 CHANNELIZATION STRIPING

For all channelization markings detailed on Standard Drawing T-M-7, the following pay items and methods of measurement shall be used:

A. 716-02.04, Plastic Pavement Marking (Channelization Striping) - Sq. Yd.
716-05.04, Painted Pavement Marking (Channelization Striping) - Sq. Yd.

The unit of payment is per square yard of striping material applied including the boundary lines of the channelized area. This is applicable for 8 inch wide border lines only. All other border lines (edge lines and double yellow centerline) are paid for under their respective pay items and measured by the linear foot. This is used on medians, pavement transitions, obstruction approaches and traffic islands with areas greater than 400 Sq. ft.

B. 716-04.04, Plastic Pavement Marking (Transverse Shoulder) - Linear Feet

The unit of payment is per linear foot of diagonal marking. The 4 inch edge line is paid for under a "Pavement Marking (Line)" item.

C. 716-02.07, Plastic Pavement Marking (24-inch Barrier Line) - Linear Feet
716-05.07, Painted Pavement Marking (24-inch Barrier Line) - Linear Feet

The unit of payment is per linear foot of boundary line (with no diagonal marking used).

Note that the unit of payment for Item No. 716-08.04, Removal of Pavement Marking (Channelization Striping), has been changed from per linear foot to per square yard of striping material removed.

4-716.05 PAVEMENT MARKING GUIDELINES

These guidelines are general in nature for average-type projects. It is not intended that these guidelines supersede the exercise of good engineering judgment in the development of a

good pavement marking plan for a project. Special problem areas may require special treatment, which shall be determined on the Construction Field Review.

Traffic volumes may be found in the Project Planning Division's latest Traffic Flow Maps book. The information is available at:

http://www.tdot.state.tn.us/projectplanning/adt.asp

Generally, centerlines and edge lines shall be placed on all pavements with a minimum total width of 16 feet.

If there are no centerline pavement markings on the existing roadway before the proposed construction or resurfacing project begins, no temporary centerline pavement markings will be required on the roadway during construction. A centerline on the final surface may be required depending on the surface materials.

If surface materials other than hot plant mix asphalt (such as cold mix asphalt, DBST, etc.) are applied, no temporary or permanent centerline markings will be required, since these surface materials would be incapable of retaining the pavement markings.

See the sections 4-716.10 through 4-716.36 for guidance for temporary and permanent pavement marking and section 6-145.00 for pavement marking general notes.

See Traffic Design Manual, Chapter 6, Signing and Pavement Marking.

4-716.10 TEMPORARY PAVEMENT MARKINGS

Temporary pavement markings on the intermediate layers of pavement open to traffic will be installed to permanent standards daily with reflective tape or reflectorized paint.

No temporary striping is required on the final surface if preformed plastic (716-10.01 or 716-10.15) or reflectorized paint (716-05.01) is the permanent marking material, since these permanent markings are to be installed daily as the final surface paving operations proceed.

If the permanent marking material is thermoplastic, the contractor may elect to mark the final layer of pavement with reflectorized paint to permanent standards daily and wait until the paving operation has been completed before the permanent markings are installed. In this case, the temporary markings for the final layer will not be measured and paid for directly, but the costs are to be included in the price bid for the permanent markings.

4-716.11 TEMPORARY PAVEMENT MARKING FOR USE ON PAVEMENT SURFACE OTHER THAN FINAL

1. ON ALL INTERSTATES AND EXPRESSWAYS (Duration of Marking>1 month)

A. On Non-Transition Sections:

a. **Lane lines** – use 8" painted white skip lines and white raised pavement markers on 40' spacing.

b. **Left edge lines** (yellow) – Use 8" painted solid yellow lines and yellow

raised pavement markers on 20' spacing.

c. Right edge lines (white) – **Allow as equals:**

(1) Use 8" solid white wet-reflective temporary tape (according to manufacturer's specifications).

(2) Use 8" painted solid white lines with an approved white barrier rail delineator on top of barrier rail on 20' spacing,

OR

Use 8" painted solid white lines only or with white flexible delineators at outside edge of shoulder on 20' spacing when no barrier rail is present.

B. On Transition Sections:

a. Lane lines – Use 8" painted solid white lines and white raised pavement markers on 20' spacing.

b. Left edge lines (yellow) – Use 8" painted solid yellow lines and yellow raised pavement markers on 20' spacing.

c. Right edge lines (white) – Allow as equals:

(1) Use 8" solid white wet-reflective temporary tape (according to manufacturer's specifications)

(2) Use 8" painted solid white lines with an approved white barrier rail delineator on top of barrier rail on 20' spacing.

OR

Use 8" painted solid white lines only or with white flexible delineators at outside edge of shoulder on 20' spacing when no barrier rail is present.

NOTES:

(1) Raised pavement markers are to be placed in a single row, not staggered**,** under all applications.

(2) If Project Engineer has specific recommendations they should be discussed at the Construction Field Review.

(3) Missing raised pavement markers shall be replaced:
a) at least monthly or,
b) at the instruction of the engineer

(4) All raised pavement markers shall be removed before placement of the final pavement surface. The cost of removal shall be included in the price bid for raised pavement markers.

2. STATE ROUTES WITH 4 OR MORE LANES (Unlit During Construction)

A. Lane Lines – Use white painted skip lines, 2" wider than prescribed permanent lines, and raised pavement markers on 80' spacing.

B. Edge and center lines – Use solid lines (yellow or white, as appropriate) 2" wider than prescribed permanent lines. Raised pavement markers (yellow or white, as appropriate) may be specified for use on a case-by-case basis, as determined at the Construction Field Review. Raised pavement markers should not be used on right edge line. When raised pavement markers are used for the left edge line, spacing shall be 20 feet.

NOTES:

(1) Raised pavement markers are to be placed in a single row, not staggered**,** under all applications.

(2) If Project Engineer has specific recommendations they should be discussed at the Construction Field Review.

(3) Missing raised pavement markers shall be replaced:
a) at least monthly or,
b) at the instruction of the engineer

(4) All raised pavement markers shall be removed before placement of the final pavement surface. The cost of removal shall be included in the price bid for raised pavement markers.

3. ALL OTHER STATE ROUTES

All Lines – Use regular 4" marking lines. Centerline yellow raised pavement markers may be considered on a case-by-case basis. Discuss need at Construction Field Review.

NOTES:

(1) Raised pavement markers are to be placed in a single row, not staggered**,** under all applications.

(2) If Project Engineer has specific recommendations they should be discussed at the Construction Field Review.

(3) Missing raised pavement markers shall be replaced:
a) at least monthly or,
b) at the instruction of the engineer.

(4) All raised pavement markers shall be removed before placement of the final pavement surface. The cost of removal shall be included in the price bid for raised pavement markers.

4-716.13 PAVEMENT MARKING PLANS ON INTERSTATE AND FULL-ACCESS CONTROL ROADWAYS (See 3-330.00)

4-716.15 PERMANENT PAVEMENT MARKINGS (See 4-411.03 and 4-411.04)

Designers should refer to Table 4-3 for pavement marking guidelines for all interstate and state routes. In addition to pavement marking guidelines, Table 4-3 provides guidance for the placement of rumble strips and rumble stripes. This guidance shall be used on all new, reconstruction, and resurfacing projects except in areas which require special treatment as determined on the Construction Field Review and approved by the Director of the Design Division.

Items numbers for pavement markings are available on the TDOT web site at:

http://www.tdot.state.tn.us/RoadItemLists/roaditemslist.htm

For projects using an Open-Graded Friction Corse (OGFC) for the surface layer, only Enhanced Flat Line Thermoplastic (Item No 716-12.01 or 716-12.02) may be used for the edge, center, skip and lane lines. Use the width of line specified in table 4-3. The designer shall footnote the Enhanced Flat Line Thermoplastic Quantity with the following note:
“Contractor shall use the ribbon method for application.”

Permanent Pavement Markings, Raised Pavement Markers, Rumble Strip and Rumble Stripe Guidelines

Roadway Classification	**Interstate and Full Access Controlled Roadways (Includes Ramps)**
Current ADT	**All ADT's**
Pavement Type	Asphalt and Concrete

Width of Outside Paved Shoulder	Edge Lines	Centerline / Skip Lines / Lane Lines	Rumble Strip / Rumble Stripe	Notes
All shoulder Widths	**6" Enhanced Flatline Thermoplastic** Item No. 716-12.02, Enhanced Flatline Thermo Pvmt Mrkng (6 In Line), L.M.	**6" Enhanced Flatline Thermoplastic with Snowplowable Raised Pavement Markers (SRPM's)** Item No. 716-12.02, Enhanced Flatline Thermo Pvmt Mrkng (6 In Line), L.M. and Item No. 716-01.22, Snwplwble Pvmt Mrkrs (Mono-Dir) (1 Color), Each.	**Continuous 16" Rumble Strip** on Inside and Outside Shoulder. **Dwg. T-M-15.** Item No. 411-12.01, Scoring Shoulders (Continuous) (16 In Width), L.M. See notes 7 & 9.	**1, 2, 5, 7, 9**

Roadway Classification	**Multilane State Routes (Four or More Lanes)**
Current ADT	**All ADT's**
Pavement Type	Asphalt and Concrete

Width of Outside Paved Shoulder	Edge Lines	Centerline / Skip Lines / Lane Lines	Rumble Strip / Rumble Stripe	Notes
Less than 2'	**4" Enhanced Flatline Thermoplastic** Item No. 716-12.01, Enhanced Flatline Thermo Pvmt Mrkng (4 In Line), L.M.	**4" Enhanced Flatline Thermoplastic with Snowplowable Raised Pavement Markers (SRPM's)** Item No, 716-12.01, Enhanced Flatline Thermo Pvmt Mrkng (4 In Line), L.M. See note 4 for raised pavement markers.	None	**1, 2, 4**
2' - 6'	**Use 4" Spray Thermoplastic (60 mil) when Rumble Stripes are specified.** Item No. 716-13.01, Spray Thermo Pvmt Mrkng (60 mil) (4 In Line), L.M.	**Use 4" Spray Thermoplastic (60 mil) with Snowplowable Raised Pavement Markers (SRPM's) when Rumble Stripes are Specified.** Item No. 716-13.01, Spray Thermo Pvmt Mrkng (60 mil) (4 In Line), L.M. See note4 for raised pavement markers.	8" Rumble Stripe on Shoulders (Rural Only). **Dwg. T-M-16.** Item No. 411-12.03, Scoring for Rumble Stripe (Non-Continuous) (8 In Width), L.M. See notes 7 & 9.	**1, 2, 4, 7, 8, 9**
8' or Wider	**4" Enhanced Flatline Thermoplastic** Item No. 716-12.01,- Enhanced Flatline Thermo Pvmt Mrkng (4 In Line), L.M.	**4" Enhanced Flatline Thermoplastic with Snowplowable Raised Pavement Markers (SRPM's)** Item No, 716-12.01, Enhanced Flatline Thermo Pvmt Mrkng (4 In Line), L.M. See note 4 for raised pavement markers.	16" Rumble Strip on Outside Shoulders (Rural Only). **Dwg. T-M-15A.** Item No. 411-12.03, Scoring for Rumble Stripe (Non-Continuous) (8 In Width), L.M. Continuous 16" Rumble Strip on Inside Shoulders (Rural Only) (If Present). **Dwg.T-M-15.** Item No. 411-12.01, Scoring Shoulders (Continuous) (16 In Width), L.M. See notes 7 & 9.	**1, 2, 4, 7, 9**

Table 4-3 (Sheet 1 of 4)

Roadway Classification	**Two and Three Lane State Routes**			
Current ADT	**12,000 or Greater**			
Pavement Type	Asphalt and Concrete			
Width of Outside Paved Shoulder	**Edge Lines**	**Centerline / Skip Lines / Lane Lines**	**Rumble Strip / Rumble Stripe**	**Notes**
Less than 2'	**4" Enhanced Flatline Thermoplastic** Item No. 716-12.01, Enhanced Flatline Thermo Pvmt Mrkng (4 In Line), L.M.	**4" Enhanced Flatline Thermoplastic with Snowplowable Raised Pavement Markers (SRPM's)** Item No, 716-12.01, Enhanced Flatline Thermo Pvmt Mrkng (4 In Line), L.M. See note 4 for raised pavement markers.	None	**1, 2, 4**
2'-6'	**Use 4" Spray Thermoplastic (60 mil) when Rumble Stripes are specified.** Item No. 716-13.01, Spray Thermo Pvmt Mrkng (60 mil) (4 In Line), L.M.	**Use 4" Spray Thermoplastic (60 mil) with Snowplowable Raised Pavement Markers (SRPM's) when Rumble Stripes are Specified.** Item No. 716-13.01, Spray Thermo Pvmt Mrkng (60 mil) (4 In Line), L.M. See note 4 for raised pavement markers.	8" Rumble Stripe on Shoulders (Rural Only). **Dwg. T-M-16.** Item No. 411-12.03, Scoring for Rumble Stripe (Non-Continuous) (8 In Width), L.M. See notes 7 & 9.	**1, 2, 4, 8, 9**
8' or Wider	**4" Enhanced Flatline Thermoplastic** Item No. 716-12.01, Enhanced Flatline Thermo Pvmt Mrkng (4 In Line), L.M.	**4" Enhanced Flatline Thermoplastic with Snowplowable Raised Pavement Markers (SRPM's).** Item No, 716-12.01, Enhanced Flatline Thermo Pvmt Mrkng (4 In Line), L.M. See note 4 for raised pavement markers.	16" Rumble Strip on Shoulders (Rural Only). **Dwg. T-M-15A.** Item No. 411-12.02, Scoring for Rumble Stripe (Non-Continuous) (16 In Width), L.M. See notes 7 & 9.	**1, 2, 4, 9**

Roadway Classification	**Two and Three Lane State Routes**			
Current ADT	**2,000 to 12,000**			
Pavement Type	Asphalt and Concrete			
Width of Outside Paved Shoulder	**Edge Lines**	**Centerline / Skip Lines / Lane Lines**	**Rumble Strip / Rumble Stripe**	**Notes**
Less than 2'	**4" Spray Thermoplastic (60 mil)**	**4" Spray Thermoplastic (60 mil) with Snowplowable Raised Pavement Markers (SRPM's)**	None	**1, 2, 4, 9**
2'-6'	Item No. 716-13.01, Spray Thermo Pvmt Mrkng (60 mil) (4 In Line), L.M.	Item No. 716-13.01, Spray Thermo Pvmt Mrkng (60 mil) (4 In Line), L.M. See note 4 for raised pavement markers.	8" Rumble Stripe on Shoulders (Rural Only). **Dwg. T-M-16.** Item No. 411-12.03, Scoring for Rumble Stripe (Non-Continuous) (8" Width), L.M. See notes 7 & 9.	
8' or Wider			8" Rumble Stripe on Shoulders (Rural Only). **Dwg. T-M-16.** Item No. 411-12.03, Scoring for Rumble Stripe (Non-Continuous) (8" Width), L.M. See notes 7 & 9.	

Table 4-3 (Sheet 2 of 4)

Roadway Classification	**Two and Three Lane State Routes**			
Current ADT	**Under 2,000**			
Pavement Type	Asphalt and Concrete			
Width of Outside Paved Shoulder	**Edge Lines**	**Centerline / Skip Lines / Lane Lines**	**Rumble Strip / Rumble Stripe**	**Notes**
Less than 2'	**4" Spray Thermoplastic (40 mil)** Item No. 716-13.06, Spray Thermo Pvmt Mrkng (40 mil) (4" Line), L.M.	**4" Spray Thermoplastic (40 mil) with Snowplowable Raised Pavement Markers (SRPM's)** Item No. 716-13.06, Spray Thermo Pvmt Mrkng (40 mil) (4 In Line), L.M. See note 4 for raised pavement markers.	None	**1, 2, 4**
2'-6'				
8' or Wider				

Roadway Classification	**Off-System Routes - Includes Off-System Bridge Replacement , Intersection, Signal, RSAR, and SIA**			
Current ADT	**1,000 or Greater**			
Pavement Type	Asphalt and Concrete			
Width of Outside Paved Shoulder	**Edge Lines**	**Centerline / Skip Lines / Lane Lines**	**Rumble Strip / Rumble Stripe**	**Notes**
All Shoulder Widths	**4" Spray Thermoplastic (40 mil)** Item No. 716-13.06, Spray Thermo Pvmt Mrkng (40 mil) (4 In Line), L.M.	**4" Spray Thermoplastic (40 mil)** Item No. 716-13.06, Spray Thermo Pvmt Mrkng (40 mil) (4 In Line), L.M.	None	**1, 2**

Roadway Classification	**Off-System Routes - Includes Off-System Bridge Replacement , Intersection, Signal, RSAR, and SIA**			
Current ADT	**Under 1,000**			
Pavement Type	Asphalt and Concrete			
Width of Outside Paved Shoulder	**Edge Lines**	**Centerline / Skip Lines / Lane Lines**	**Rumble Strip / Rumble Stripe**	**Notes**
All Shoulder Widths	**4" Paint** Item No. 716-05.01, Painted Pavement Marking (4" Line), L.M.	**4" Paint** Item No. 716-05.01, Painted Pavement Marking (4" Line), L.M.	None	**3**

Table 4-3 (Sheet 3 of 4)

Permanent Pavement Markings, Raised Pavement Markers, Rumble Strip and Rumble Stripe Guidelines Notes

1. The contractor may elect to use either thermoplastic or preformed plastic for specialty striping items. These items include stop lines, cross walks, arrows, words, channelization, and other specialty striping items except lines.

2. The following footnote shall be added to all Specialty Striping Items: **"The contractor may elect to substitute Preformed Plastic for Thermoplastic. Preformed Plastic shall be paid for at the same unit price as bid for Thermoplastic."**

3. Specialty striping items may be either paint or thermoplastic.

4. Bi-directional snowplowable raised pavement markers (reflector on both sides) shall be paid for under Item No. 716-01.21, Snwplwble Pvmt Mrkrs (Bi-Dir) (1 Color), Each. Mono-directional snowplowable raised pavement markers (reflector on one side only) shall be paid for under Item No. 716-01.22, Snwplwble Pvmt Mrkrs (Mono-Dir) (1 Color), Each. Refer to T-M-series standard drawings for details. Three lane and multilane roads with 2-way traffic will normally require both mono-directional and bi-directional snowplowable raised pavement markers. Two lane roads will normally require bi-directional snowplowable raised pavement markers.

5. Rumble strips are not required on ramps.

6. Note 6 deleted.

7. For concrete shoulders, the rumble strip is to be placed in accordance with standard drawings RP-CS-1 or RP-CS-2. Item No. 501-03.10, Concrete Shoulder Rumble Strips, L.F. The length of scoring shall be measured as the actual length of pavement scored.

8. When Rumble Stripes are not used Pavement Markings should be 4" Enhanced Flatline Pavement Markings. Item No. 716-12.01, Enhanced Flatline Thermo Pvmt Mrkng (4 In Line), L.M.

9. See 4-411.03 and 4-411.04 for additional guidance regarding rumble strip and rumble stripe placement.

Table 4-3 (Sheet 4 of 4)

4-716.16 STRIPING RAMPS ON RESURFACING PLANS

In the process of preparing plans for construction or resurfacing projects involving roadways that abut connecting ramps, consideration shall be given to striping these ramps. When work is not being done on the entire ramp, this ramp would not normally be re-striped beyond where the work is being done. The roadway designer shall contact the Regional Traffic Engineer to determine the need to re-stripe these ramps in their entirety. Stop bars, turn lane arrows and other pavement instructive markings may be included at the discretion of the Regional Traffic Engineer applying the appropriate standard drawings that shall be included in the plans. The decision to re-stripe shall be made based on the condition of the pavement markings and consideration may be given to compliance with the standards. If this striping is done, the ramps shall be marked using current standards for pavement markings as shown on Standard Drawings T-M-6 and T-M-9 and other appropriate standard drawings and marked up to the connecting roadway. Add the following to the plans:

"Ramps shall be marked up to where they connect to the intersecting roadway."

4-716.17 STRIPING ON MICRO SURFACE PAVEMENTS

Pavement markings on micro surface pavements should follow guidance provided in Table 4-3 for lane lines and edge lines.

4-716.20 PAVEMENT MARKING GENERAL NOTES FOR ROADWAY PLANS

See section 6-145.00 for General Pavement Marking Notes.

4-716.25 SPECIALTY PAVEMENT MARKINGS

Contractors will have the option of using either Thermoplastic or Preformed Plastic Pavement Markings specialty markings. For plan development and bidding purposes, designers will use the appropriate Thermoplastic Pavement Marking items numbers. All specialty pavement marking item numbers shall be footnoted:

"Contractor may elect to substitute Preformed Plastic for Thermoplastic. Preformed Plastic shall be paid for at the same unit price as bid for Thermoplastic."

On projects where plastic specialty pavement items are being used, the following items will be used:

1. Crosswalk with longitudinal lines as shown on Standard Drawing T-M-4 will use the following pay item:

   716-02.09, Plastic Pavement Marking (Longitudinal Cross-walk) per linear foot.

   The measurement for this marking is identical to that for standard crosswalk, for example, one measurement along the centerline of the crosswalk (perpendicular to curbs).

2. Dotted white line for vehicle double turn path delineation requires an 8-inch stripe. Pay item will be as follows:

   716-02.08, Plastic Pavement Marking (8" Dotted Line) per linear foot.

4-716.30 USE OF REMOVABLE PAVEMENT MARKING LINE

Item No. 712-09.01, Removable Pavement Marking Line per linear foot, shall be used as temporary marking for directional or separation of traffic during the traffic control phases of construction when these lines are used on a roadway surface that is to remain in place and undisturbed.

Item No. 716-05.01, Painted Pavement Marking (4" Line) per linear mile, shall be used as temporary marking for directional or separation of traffic during the traffic control phases of construction when these lines are used on a roadway surface that is to be paved, cold planed or otherwise removed.

4-716.35 SNOWPLOWABLE RAISED PAVEMENT MARKERS

Snowplowable raised pavement markers shall be included on all Interstate and full-access controlled roadways. See Table 4-3 for guidance.

On interstate and full-access control resurfacing projects, the designer shall be responsible for verifying the existence of snowplowable raised pavement markers and for computing the quantity of these markers for removal. The designer shall also compute the quantity for new snowplowable raised pavement markers to be installed for these projects.

On projects which the ITS, Traffic, and Standards Office will be developing the marking and signing plans, the snowplowable raised pavement markers will also be included in these plans.

4-716.36 SNOWPLOWABLE RAISED PAVEMENT MARKERS ON STATE ROUTES

Snowplowable raised pavement markers should be included on state routes. Reflective pavement markers are to be placed in accordance with the T-M- series standard drawings and the current edition of the MUTCD.

On resurfacing projects, the designer shall be responsible for verifying the existence of snowplowable raised pavement markers and for computing the quantity of these markers for removal. The designer shall also compute the quantity for new snowplowable raised pavement markers to be installed for these projects.

Spacing of raised pavement markers may be reduced or additional snowplowable raised pavement markers added in areas that require special treatment as determined by the design manager or on the construction field review. When additional snowplowable raised pavement markers are used, the markers shall be placed in accordance with the current edition of the MUTCD. Raised pavement markers may be omitted on urban roadways where roadway lighting is present. Raised pavement markers should not be used on the right edge line.

See Table 4-3 for guidance regarding type of markers to be used.

4-730.08 REPLACEMENT OF TRAFFIC SIGNAL DETECTION LOOPS

When there are existing traffic signals on a cold planing project, contact shall be made with the City or County to determine the presence and location of detection loops. If loops are present, and there is no way to avoid them in the cold planing process, then add Item Nos. 730-14.02, Saw Slot, and 730-14.03, Loop Wire, to the plans.

The designer will obtain as-built plans from the maintaining agency to utilize for quantity calculations. These plans shall then be forwarded to the Regional Construction Office for submission to the contractor at the Pre-construction Conference.

See Section 6-175.00 for notes which shall be added to all plans with the replacement of traffic signal detection loops.

Standard Drawings T-SG-2 and T-SG-3 shall be included.

The Designer shall be aware that other pavement rehabilitation and resurfacing projects may affect the detection loops, in which case procedures described above will be required. Another type of project is the resealing of concrete pavement joints when a signal is controlling interstate ramp terminals with a local street.

4-730.10 TRAFFIC SIGNALS (See 2-315.00)

See Traffic Design Manual, Chapter 4, Traffic Signal Design.

4-730.15 STRUCTURAL SUPPORTS FOR TRAFFIC SIGNALS

See Section 6-270.00 for a “Special Note” which shall be added to all plans with proposed signal poles, mast arms, strain poles, etc.

The ITS, Traffic, and Standards Office will forward all signal designs to the Structures Division for pole design. Design Managers should contact the ITS, Traffic, and Standards Office on projects the design consultant is performing signal design to coordinate this requirement.

4-730.20 TEMPORARY TRAFFIC SIGNAL SYSTEMS USED AT TWO-LANE BRIDGE RECONSTRUCTION SITES

When using Item No. 730-40, Temporary Traffic Signal System per each, to provide traffic control for one-lane alternating flow at two-lane bridge reconstruction sites, see Standard Drawing Nos. T-WZ-32, T-WZ-33, T-WZ-34, and T-WZ-35 details and general notes.

4-740.00 GEOTEXTILE FABRIC AND GEOMEMBRANE

See Chapter 10 of the Drainage Manual.

CHAPTER 8 - ROADSIDE DEVELOPMENT

4-801.00 SEEDING (WITH MULCH) (See 4-801.05)

Method for computation of seeding on right-of-way.

Area to be seeded (Sq. ft) / 1,000 Sq. ft/unit	X 1.25	= _____ units	Item No. 801-01 and/or Item No. 801-01.02

Method for computation of seeding on waste areas and borrow pits outside right-of-way.

Excess material to be wasted (C.Y.) / 500 C.Y./unit	= _____ units	Item No. 801-01 and/or Item No. 801-01.02
Borrow material (C.Y.) / 500 C.Y/unit	= _____ units	Item No. 801-01 and/or Item No. 801-01.02

4-801.05 CROWN VETCH MIXTURE (WITH MULCH)

See Section 4-801.00 for computations.

Item 801-01.02, Crown Vetch Mixture (with Mulch), shall be used on slopes 3:1 or steeper and other areas that are inaccessible for mowing.

Crown vetch mixture shall be used, unless otherwise directed on the Construction Field Review, in all areas of Tennessee except Region IV.

On any project requiring crown vetch, the following note shall be put in the general notes with the parentheses being replaced by the proper item.

"Item No. 801-01.02, Crown Vetch Mixture (with mulch), and description shall be used on slopes 3H:1V or steeper and other areas, as indicated in the plans, that are inaccessible for mowing."

4-801.07 TEMPORARY SEEDING (WITH MULCH)

The use of Temporary Seeding (with Mulch) is strongly recommended on projects.

Item No. 801-01.07 Temporary Seeding (With Mulch)

Item No. 801-02 Seeding (Without Mulch)

Temporary seeding (with mulch), and seeding (without mulch) will be measured by the Unit (1,000 Sq. Ft.) as designed and completed in place, unless revised by the sequence of construction, in which case complete replacement and re-measurement may be required.

$$\frac{\text{Total area of seeding (Sq. ft) x number of effective phases of the sequence of construction}}{\text{1,000 (Sq. ft) / unit}} = \text{Total seeding (UNITS)}$$

Exceptional locations where the slopes are flatter than 3H:1V, but where crown vetch is requested on the Construction Field Review, shall be outlined on the proposed layout sheet in a manner similar to Figure 4-20.

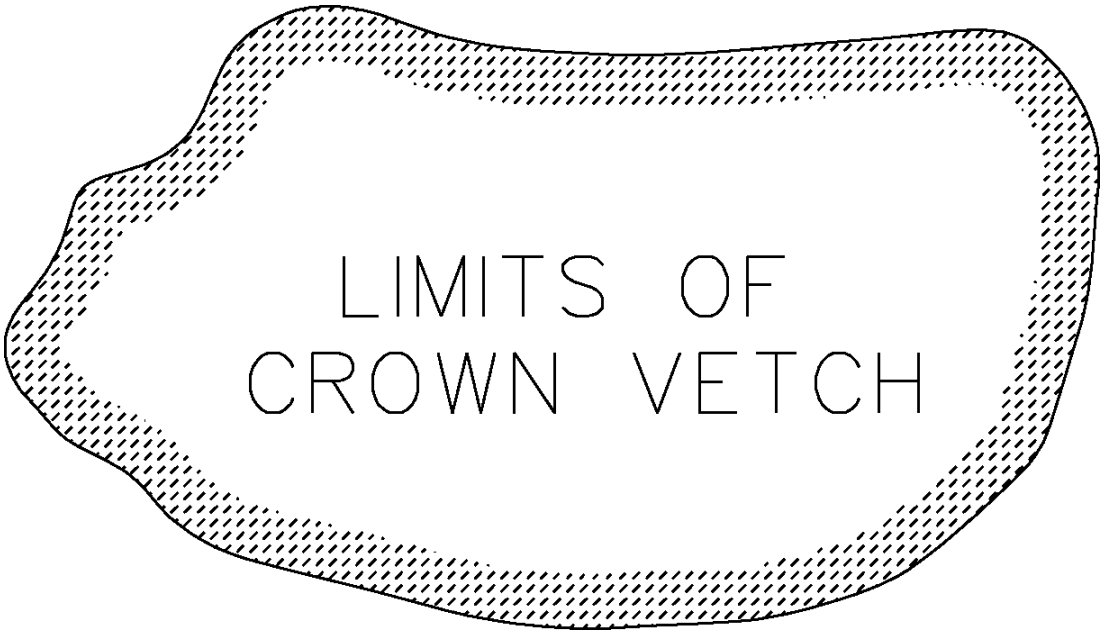


Figure 4-20
Typical Limits of Crown Vetch

4-801.10 WATER (SEEDING AND SODDING)

Item No. 801-03 Water (Seeding and Sodding)

Water for seeding, sodding, crown vetch mixture or sprigging (crown vetch):

Water will be measured by the thousand gallon (M.G.) as designed and completed in place, unless revised by the sequence of construction, in which case complete replacement and re-measurement may be required.

Seeding-
(all areas) $\frac{\text{Surface area (Sq. ft.) x 0.1 M.G. /unit}}{\text{1,000 Sq. ft./unit}}$ = _____ M. Gal. Item No. 801-03

Total seeding (units) x 0.1 M.G./ unit = Total Water (M.G.)

The designer shall **footnote** pay item as follows:

"Includes _____ thousand gallons for erosion prevention and sediment control."

Sodding $\frac{\text{Surface area (Sq. Yd.) x 10 Gal./Sq. Yd.}}{\text{1,000 Gal./M.G.}}$ = _____ M. Gal. Item No. 801-03

4-801.15 SEEDING (SUPPLEMENTAL APPLICATION)

10 pound Minimum Quantity

Units of 801-01 x 1.5 Lbs/Unit x 15% = _____ Lbs. Item No. 801-07

Units of 801-01.02 x 1.5 Lbs/Unit x 15% =_____ Lbs. Item No. 801-07.01

4-801.20 FERTILIZER (SUPPLEMENTAL APPLICATION)

1 Ton Minimum Quantity

Units of 801-01 and/or 801-01.02 x $\frac{\text{23 Lb./Unit x 15\%}}{\text{2,000 Lb./ Ton}}$ = _____ Tons Item No. 801-08

4-805.00 EROSION CONTROL BLANKET

See Chapter 10 of the Drainage Manual.

4-806.00 PROJECT MOWING CYCLE

Projects on State Routes with high traffic volumes and high visibility shall include Item No. 806-02.03, Project Mowing, Cycle, on their construction plans. This item is not intended for use on resurfacing projects.

For the purpose of determining applicable projects, designers will include Project Mowing on ***new construction projects, reconstruction projects*** (including widening) or ***on-system bridge replacement projects where one or more of the following apply:***

- Expected project duration is one year or greater
- Project is in a urban area (an urban area is defined as any city with a population of 5,000 or greater)
- The current Average Daily Traffic (ADT) is 20,000 or greater

The quantity to be set up for a project should be based on a minimum of 2 mowing cycles per year of construction. Since most projects fall into the 2 to 3 year range, a minimum of 4-6 cycles would be needed. The number of mowing cycles per year of construction may be increased based upon input received at the construction field review. Design Managers should check with the Construction Division to determine the length of the contract.

Item no. 806-02.03, Project Mowing, Cycl., shall include the following footnote: “Item includes litter and trash removal. This work will not be measured and paid for directly but will be included in the cost of Item No. 806-02.03, Project Mowing, Cycl.”

CHAPTER 9 - MATERIALS

4-905.00 SILICONE SEALANT

Silicone sealant shall be used on all new projects using Portland cement concrete pavement as a primary pavement for the main line or ramps, excluding rehabilitation of all old concrete pavement or joint repair. The silicone sealant is specified in Subsection 905.05 of the *Tennessee Department of Transportation Standard Specifications*.

SECTION V - LIST OF CURRENT STANDARD DRAWINGS

CHAPTER 1 – STANDARD ROADWAY DRAWINGS

ROADWAY DESIGN STANDARD DRAWINGS

ROADWAY DESIGN STANDARDS

DRAINAGE - CULVERTS AND ENDWALL

DRAINAGE - CATCH BASINS AND MANHOLES

DRAINAGE - NATURAL STREAM DESIGN

ROADWAY AND PAVEMENT APPURTENANCES

SAFETY APPURTENANCES AND FENCE

TRAFFIC CONTROL APPURTENANCES

EROSION PREVENTION AND SEDIMENT CONTROL

CHAPTER 2 – STANDARD STRUCTURE DRAWINGS

STRUCTURE DESIGN STANDARD DRAWINGS

BRIDGE APPURTENANCES ENGLISH (NEW STRUCTURES)

BRIDGE APPURTENANCES ENGLISH (BOX CULVERTS)

BRIDGE APPURTENANCES ENGLISH (LRFD BOX CULVERTS)

BRIDGE APPURTENANCES ENGLISH (BRIDGE REPAIRS)

SECTION V - LIST OF CURRENT STANDARD DRAWINGS

CHAPTER 1 – STANDARD ROADWAY DRAWINGS

ROADWAY DESIGN STANDARD DRAWINGS

ROADWAY DESIGN STANDARDS

RD-A-1	12-18-99	STANDARD ABBREVIATIONS
RD-L-1	10-26-94	STANDARD LEGEND
RD-L-2	09-05-01	STANDARD LEGEND FOR UTILITY INSTALLATIONS
RD-L-3	04-15-04	STANDARD LEGEND FOR SIGNALIZATION AND LIGHTING
RD-L-4	04-15-04	STANDARD LEGEND FOR SIGNALIZATION AND LIGHTING
RD-L-5	05-01-08	STANDARD LEGEND FOR EROSION PREVENTION AND SEDIMENT CONTROL
RD-L-6	03-30-10	STANDARD LEGEND FOR EROSION PREVENTION AND SEDIMENT CONTROL
RD-L-7		STANDARD LEGEND FOR EROSION PREVENTION AND SEDIMENT CONTROL
RD-L-8		STANDARD LEGEND FOR NATURAL STREAM DESIGN
RD-S-11	03-31-03	DESIGN AND CONSTRUCTION DETAILS FOR ROADSIDE SLOPE DEVELOPMENT
RD-S-11A	03-31-03	ROADSIDE DITCH DETAILS FOR DESIGN AND CONSTRUCTION
RD-SA-1	03-31-03	SAFETY APPROACH TO UNDERPASSES GRADING DESIGN AND SLOPE PROTECTION
RD-SE-2	10-26-95	URBAN SUPERELEVATION DETAILS
RD-SE-3	10-26-95	RURAL SUPERELEVATION DETAILS
RD-TS-1	03-31-03	DESIGN STANDARDS FOR LOCAL ROADS AND STREETS
RD-TS-2	03-31-03	DESIGN STANDARDS FOR COLLECTOR ROADS AND STREETS

RD-TS-2A	03-31-03	DESIGN STANDARDS FOR 4-6 LANE COLLECTOR HIGHWAYS WITH DEPRESSED MEDIANS
RD-TS-2B	03-31-03	DESIGN STANDARDS FOR 4-6 LANE COLLECTOR HIGHWAYS WITH FLUSH MEDIANS
RD-TS-3	03-31-03	DESIGN STANDARDS FOR 2-LANE ARTERIAL HIGHWAYS
RD-TS-3A	03-31-03	DESIGN STANDARDS 4-6 LANE ARTERIAL HIGHWAYS WITH DEPRESSED MEDIANS
RD-TS-3B	03-31-03	DESIGN STANDARDS 4-6 LANE ARTERIALS WITH INDEPENDENT ROADWAYS
RD-TS-3C	03-31-03	DESIGN STANDARDS 4-6 LANE ARTERIAL HIGHWAYS WITH FLUSH MEDIANS
RD-TS-4	03-31-03	DESIGN STANDARDS 1 & 2 LANE RAMPS
RD-TS-5	03-31-03	DESIGN STANDARDS FREEWAYS WITH DEPRESSED MEDIANS
RD-TS-5A	03-31-03	DESIGN STANDARDS FREEWAYS WITH INDEPENDENT ROADWAYS
RD-TS-5B	03-31-03	DESIGN STANDARDS FREEWAYS WITH MEDIAN BARRIER
RD-TS-6	03-31-03	TYPICAL CURB AND GUTTER SECTIONS WITH SHOULDER
RD-TS-6A	03-31-03	TYPICAL CURB AND GUTTER SECTIONS WITHOUT SHOULDER
RD-TS-7	03-31-03	DESIGN STANDARDS 2-LANE HIGHWAY WITH CONTINUOUS 2-WAY LEFT-TURN LANE
RD-TS-7A	03-31-03	DESIGN STANDARDS 2-LANE CURB & GUTTER WITH CONTINUOUS 2-WAY LEFT-TURN LANE
RD-TS-8		SHARED USE PATH TYPICAL SECTIONS
RD-TS-9	02-01-12	DESIGN STANDARDS FOR SINGLE LANE URBAN AND RURAL ROUNDABOUTS
RD-TS-10	02-01-12	DESIGN STANDARDS FOR MULTI-LANE URBAN AND RURAL ROUNDABOUTS
RD-UD-3	09-05-96	UNDERDRAIN DETAILS
RD-UD-4	05-27-01	UNDERDRAIN LATERAL DETAILS

RD-UD-6	12-18-94	LATERAL UNDERDRAIN ENDWALL DETAIL FOR 1:1 & 2:1 SLOPES
RD-UD-7	12-18-94	LATERAL UNDERDRAIN ENDWALL DETAIL FOR 3:1 & 4:1 SLOPES
RD-UD-8		LATERAL UNDERDRAIN ENDWALL DETAIL FOR 5:1 SLOPES
RD-UD-9	12-18-94	LATERAL UNDERDRAIN ENDWALL DETAIL FOR 6:1 SLOPES
RD01-S-11	04-04-03	DESIGN AND CONSTRUCTION DETAILS FOR ROADSIDE SLOPE DEVELOPMENT
RD01-S-11A	10-15-02	ROADSIDE DITCH DETAILS FOR DESIGN AND CONSTRUCTION
RD01-S-11B	10-15-02	DESIGN AND CONSTRUCTION DETAILS FOR ROCK CUT SLOPE AND CATCHMENT
RD01-S-12	08-01-09	CLEAR ZONE CRITERIA
RD01-SA-1	10-15-02	SAFETY APPROACH TO UNDERPASSES GRADING DESIGN AND SLOPE PROTECTION
RD01-SD-1		INTERSECTION SIGHT DISTANCE DESIGN AND GENERAL NOTES
RD01-SD-2		INTERSECTION SIGHT DISTANCE LANDSCAPE AND OBSTRUCTION
RD01-SD-3		INTERSECTION SIGHT DISTANCE 2-LANE ROADWAYS
RD01-SD-4		INTERSECTION SIGHT DISTANCE 5-LANE AND 4-LANE UNDIVIDED ROADWAYS
RD01-SD-5		INTERSECTION SIGHT DISTANCE 4-LANE DIVIDED HIGHWAYS
RD01-SD-6		INTERSECTION SIGHT DISTANCE 6-LANE DIVIDED HIGHWAYS
RD01-SD-7		INTERSECTION SIGHT DISTANCE FOR PASSIVE RAILROAD HIGHWAY GRADE CROSSINGS
RD01-SE-2	10-15-02	URBAN SUPERELEVATION DETAILS
RD01-SE-3	10-15-02	RURAL SUPERELEVATION DETAILS
RD01-TS-1	10-15-02	DESIGN STANDARDS FOR LOCAL ROADS AND STREETS

RD01-TS-1A		DESIGN STANDARDS FOR LOW-VOLUME LOCAL ROADS (ADT<=400)
RD01-TS-2	10-15-02	DESIGN STANDARDS FOR COLLECTOR ROADS AND STREETS
RD01-TS-2A	10-15-02	DESIGN STANDARDS 4 AND 6 LANE COLLECTOR HIGHWAYS WITH DEPRESSED MEDIANS
RD01-TS-2B	10-15-02	DESIGN STANDARDS 4 AND 6 LANE COLLECTOR HIGHWAYS WITH FLUSH MEDIANS
RD01-TS-3	10-15-02	DESIGN STANDARD FOR 2-LANE ARTERIAL HIGHWAYS
RD01-TS-3A	10-15-02	DESIGN STANDARDS 4 AND 6 LANE ARTERIAL HIGHWAYS WITH DEPRESSED MEDIANS
RD01-TS-3B	10-15-02	DESIGN STANDARDS 4 AND 6 LANE ARTERIALS WITH INDEPENDENT ROADWAYS
RD01-TS-3C	10-15-02	DESIGN STANDARDS 4 AND 6 LANE ARTERIAL HIGHWAYS WITH FLUSH MEDIANS
RD01-TS-4	10-15-02	DESIGN STANDARDS 1 AND 2 LANE RAMPS
RD01-TS-5	10-15-02	DESIGN STANDARDS FREEWAYS WITH DEPRESSED MEDIANS
RD01-TS-5A	10-15-02	DESIGN STANDARDS FREEWAYS WITH INDEPENDENT ROADWAYS
RD01-TS-5B	10-15-02	DESIGN STANDARDS FREEWAYS WITH MEDIAN BARRIER
RD01-TS-6	10-15-02	TYPICAL CURB AND GUTTER SECTIONS WITH SHOULDER
RD01-TS-6A	01-24-12	TYPICAL CURB AND GUTTER SECTIONS WITHOUT SHOULDER
RD01-TS-7	10-15-02	DESIGN STANDARDS 2-LANE HIGHWAY WITH CONTINUOUS 2-WAY LEFT-TURN LANE
RD01-TS-7A	10-15-02	DESIGN STANDARDS 2-LANE CURB AND GUTTER WITH CONTINUOUS 2-WAY LEFT-TURN LANE

DRAINAGE - CULVERTS AND ENDWALL

D-FLU-1		FLUME DETAILS
D-PB-1	04-15-07	STANDARD DETAILS, CLASS "B" BEDDING AND CULVERT EXCAVATION

D-PB-2	02-01-12	STANDARD DETAILS FOR PLASTIC PIPE INSTALLATION
D-PE-1	02-12-76	TYPE “A” CONCRETE ENDWALL (2:1 SLOPE. 36” TO 78”)
D-PE-3B(1)	07-17-07	CONCRETE ENDWALL TYPE “U” WITH STEEL PIPE GRATE (FOR 18” THRU 48” PIPE) (3:1 SLOPE)
D-PE-3B(2)	05-27-01	CONCRETE ENDWALL TYPE ”U” WITH STEEL PIPE GRATE (FOR 18” THRU 48” PIPE) (3:1 SLOPE)
D-PE-4	07-19-10	STRAIGHT “L” AND “U’ TYPE CONCRETE ENDWALL
D-PE-4B(1)	03-30-00	CONCRETE ENDWALL TYPE "U" WITH STEEL PIPE GRATE (FOR 18" THRU 48" PIPES) (4:1 SLOPE)
D-PE-4B(2)	07-17-07	CONCRETE ENDWALL TYPE "U" WITH STEEL PIPE GRATE (FOR 18" THRU 48" PIPES) (4:1 SLOPE)
D-PE-5	05-27-01	WINGWALLS HORIZONTAL OVAL CONCRETE PIPES
D-PE-6	05-27-01	STRAIGHT ENDWALLS VERTICAL OVAL CONCRETE PIPES
D-PE-6A	05-27-01	WINGWALLS VERTICAL OVAL CONCRETE PIPES
D-PE-6B(1)	03-30-00	CONCRETE ENDWALL TYPE "U" WITH STEEL PIPE GRATE (FOR 18" THRU 48" PIPES) (6:1 SLOPE)
D-PE-6B(2)	07-19-10	CONCRETE ENDWALL TYPE "U" WITH STEEL PIPE GRATE (FOR 18" THRU 48" PIPES) (6:1 SLOPE)
D-PE-7	05-27-01	STRAIGHT ENDWALLS FLATBASE CONCRETE PIPES
D-PE-7A	05-27-01	WINGWALLS FLATBASE CONCRETE PIPES
D-PE-8	01-19-97	DETAIL OF STANDARD PIPE AND PIPE-ARCH CULVERT WITH BEVELED ENDS AND RIP-RAP
D-PE-9	04-25-90	CONCRETE ENDWALLS TYPE "B" (FOR ROUND & SIDE TAPERED INLETS, PIPE SIZES 15" TO 78", ALL SKEWS, 2:1 AND 4:1 SLOPES) 1976
D-PE-9A	10-25-82	GENERAL DIMENSIONS QUANTITIES, ROUND PIPE CONCRETE ENDWALLS TYPE “B” (PIPE SIZES 15" TO 78", ALL SKEWS, 2:1 AND 4:1 SLOPES) 1976
D-PE-9B		GENERAL DIMENSIONS AND QUANTITIES, SIDE TAPER INLETS, CONCRETE ENDWALLS TYPE “B” (PIPE SIZES 15" TO 78", ALL SKEWS, 2:1 AND 4:1 SLOPES) 1976

D-PE-9C	BILL OF STEEL (SHEET 1 OF 4) CONCRETE ENDWALLS TYPE “B” (FOR CONCRETE ROUND AND SIDE TAPERED INLET, PIPE SIZES 15" TO 78", ALL SKEWS, 2:1 SLOPE) 1976
D-PE-9D	BILL OF STEEL (SHEET 2 OF 4) CONCRETE ENDWALLS TYPE “B” (FOR CONCRETE ROUND AND SIDE TAPERED INLET, PIPE SIZES 15" TO 78", ALL SKEWS, 4:1 SLOPE) 1976
D-PE-9E	BILL OF STEEL (SHEET 3 OF 4) CONCRETE ENDWALLS TYPE “B” (FOR STEEL ROUND AND SIDE TAPERED INLET, PIPE SIZES 15" TO 78", ALL SKEWS, 2:1 SLOPE) 1976
D-PE-9F	BILL OF STEEL (SHEET 4 OF 4) CONCRETE ENDWALLS TYPE “B” (FOR STEEL ROUND AND SIDE TAPERED INLET, PIPE SIZES 15" TO 78", ALL SKEWS, 4:1 SLOPE) 1976
D-PE-15A	15” CONCRETE ENDWALL CROSS DRAIN
D-PE-15B	15” CONCRETE ENDWALL CROSS DRAIN
D-PE-18A	18” CONCRETE ENDWALL CROSS DRAIN
D-PE-18B	18” CONCRETE ENDWALL CROSS DRAIN
D-PE-24A	24” CONCRETE ENDWALL CROSS DRAIN
D-PE-24B	24” CONCRETE ENDWALL CROSS DRAIN
D-PE-30A	30” CONCRETE ENDWALL CROSS DRAIN WITH STEEL PIPE GRATE
D-PE-30B	30” CONCRETE ENDWALL CROSS DRAIN WITH STEEL PIPE GRATE
D-PE-36A	36” CONCRETE ENDWALL CROSS DRAIN WITH STEEL PIPE GRATE
D-PE-36B	36” CONCRETE ENDWALL CROSS DRAIN WITH STEEL PIPE GRATE
D-PE-42A	42” CONCRETE ENDWALL CROSS DRAIN WITH STEEL PIPE GRATE
D-PE-42B	42” CONCRETE ENDWALL CROSS DRAIN WITH STEEL PIPE GRATE
D-PE-48A	48” CONCRETE ENDWALL CROSS DRAIN WITH STEEL PIPE GRATE

D-PE-48B		48” CONCRETE ENDWALL CROSS DRAIN WITH STEEL PIPE GRATE
D-PE-99		PIPE GRATE & SKEWED CONNECTION DETAILS FOR “U” ENDWALLS
D-PG-3	04-15-97	FERROUS AND ALUMINUM CORRUGATED METAL PIPE
D-PG-4	07-29-94	FERROUS AND ALUMINUM CORR. METAL PIPE-ARCHES
D-PO-1	05-27-01	OVAL & FLAT BASE CONCRETE CULVERT PIPE
D-PS-1	03-15-76	STRUTTING DETAILS FOR CORRUGATED METAL & STRUCTURAL PLATE ROUND PIPE
D-SEW-1A		SIDE DRAIN CONCRETE ENDWALL WITH STEEL PIPE GRATE
D-SEW-6DA	07-19-10	CONCRETE ENDWALL TYPE "SD" WITH STEEL PIPE GRATE (FOR 15" THRU 48" PIPES) (6:1 SLOPE)
D-SEW-6DB	10-26-92	CONCRETE ENDWALL TYPE "SD" WITH STEEL PIPE GRATE (FOR 15" THRU 48" PIPES) (6:1 SLOPE)
D-SEW-6DC	07-19-10	CONCRETE ENDWALL TYPE "SD" WITH STEEL PIPE GRATE (FOR 18" THRU 30" PIPES) (6:1 SLOPE)
D-SEW-6DD	04-15-05	CONCRETE ENDWALL TYPE "SD" WITH STEEL PIPE GRATE (FOR 18" THRU 30" PIPES) (6:1 SLOPE)
D-SEW-12D	04-20-12	CONCRETE ENDWALL TYPE “SD” WITH STEEL PIPE GRATE (FOR 15” AND 18” PIPES) (12:1 SLOPE)

DRAINAGE - CATCH BASINS AND MANHOLES

D-CB-10LPC	07-29-04	LOW PROFILE LOWERED CURB 32" X 26" RECTANGULAR CONCRETE NO. 10LPC CATCH BASIN
D-CB-10RA		STANDARD PRECAST 48" CIRCULAR NO. 10 CATCH BASIN (FOR USE WITH 6" NONMOUNTABLE CURB)
D-CB-10S	07-29-02	STANDARD RECTANGULAR CONCRETE N0. 10 CATCH BASIN
D-CB-10SB		STANDARD 4' X 4' SQUARE CONCRETE NO. 10 CATCH BASIN
D-CB-12B	07-29-02	STANDARD RECTANGULAR BRICK NO. 12 CATCH BASIN
D-CB-12LP	07-29-04	LOW PROFILE 32" X 32" SQUARE CONCRETE NO. 12LP CATCH BASIN

D-CB-12P	07-29-02	STANDARD PRECAST RECTANGULAR CONCRETE NO.12 CATCH BASIN
D-CB-12RA	05-27-01	STANDARD PRECAST 48" CIRCULAR NO. 12 CATCH BASIN (FOR USE WITH 6" NONMOUNTABLE CURB)
D-CB-12RB	05-27-01	STANDARD PRECAST 60" AND 72" CIRCULAR NO. 12 CATCH BASIN (FOR USE WITH 6" NONMOUNTABLE CURB)
D-CB-12RC	05-27-01	STANDARD PRECAST 84" THRU 120" CIRCULAR NO. 12 CATCH BASIN (FOR USE WITH 6" NONMOUNTABLE CURB)
D-CB-12S	07-29-02	STANDARD RECTANGULAR CONCRETE NO. 12 CATCH BASIN
D-CB-12SB	07-29-02	STANDARD 4' X 4' SQUARE CONCRETE NO. 12 CATCH BASIN
D-CB-12SC	09-11-02	STANDARD 5'2" X 5'2" SQUARE CONCRETE NO. 12 CATCH BASIN
D-CB-12SD	09-11-02	STANDARD 7' X 7' SQUARE CONCRETE NO. 12 CATCH BASIN
D-CB-12SE	05-05-05	STANDARD 9' X 9' SQUARE CONCRETE NO. 12 CATCH BASIN
D-CB-13B	07-29-02	STANDARD RECTANGULAR BRICK NO. 13 CATCH BASIN
D-CB-13P	07-29-02	STANDARD PRECAST RECTANGULAR CONCRETE NO. 13 CATCH BASIN
D-CB-13RA	05-27-01	STANDARD PRECAST 48" CIRCULAR NO. 13 CATCH BASIN (FOR USE WITH 6" NONMOUNTABLE CURB)
D-CB-13RB	05-27-01	STANDARD PRECAST 60" AND 72" CIRCULAR NO. 13 CATCH BASIN (FOR USE WITH 6" NONMOUNTABLE CURB)
D-CB-13RC	05-27-01	STANDARD PRECAST 84" THRU 120" CIRCULAR NO. 13 CATCH BASIN (FOR USE WITH 6" NONMOUNTABLE CURB)
D-CB-13S	07-29-02	STANDARD RECTANGULAR CONCRETE NO. 13 CATCH BASIN
D-CB-14B	07-29-02	STANDARD RECTANGULAR BRICK NO. 14 CATCH BASIN
D-CB-14P	07-29-02	STANDARD PRECAST RECTANGULAR CONCRETE NO. 14 CATCH BASIN
D-CB-14RB	05-27-01	STANDARD PRECAST CIRCULAR NO. 14RB CATCH BASIN
D-CB-14S	07-29-02	STANDARD RECTANGULAR CONCRETE NO. 14 CATCH BASIN

D-CB-14SE	05-05-05	STANDARD 9' X 9' SQUARE CONCRETE NO. 14 CATCH BASIN
D-CB-16B	07-29-02	STANDARD RECTANGULAR BRICK NO. 16 CATCH BASIN
D-CB-16S	07-29-02	STANDARD RECTANGULAR CONCRETE NO. 16 CATCH BASIN
D-CB-17S	07-29-02	STANDARD RECTANGULAR CONCRETE NO. 17 CATCH BASIN
D-CB-25B	07-29-02	STANDARD RECTANGULAR BRICK NO. 25 CATCH BASIN (FOR USE WITH 6" MOUNTABLE CURB)
D-CB-25LP	07-29-04	STANDARD LOW PROFILE 32" X 32" SQUARE CONCRETE NO. 25LP CATCH BASIN (FOR USE WITH 6" MOUNTABLE CURB)
D-CB-25P	07-29-02	STANDARD PRECAST RECTANGULAR CONCRETE NO. 25 CATCH BASIN (FOR USE WITH 6" MOUNTABLE CURB)
D-CB-25RA	05-27-01	STANDARD PRECAST 48" CIRCULAR NO. 25 CATCH BASIN (FOR USE WITH 6" MOUNTABLE CURB)
D-CB-25RB	05-27-01	STANDARD PRECAST CIRCULAR NO. 25 CATCH BASIN (FOR USE WITH 6" MOUNTABLE CURB)
D-CB-25S	07-29-02	STANDARD RECTANGULAR CONCRETE NO. 25 CATCH BASIN (FOR USE WITH 6" MOUNTABLE CURB)
D-CB-25SB	07-29-02	STANDARD 4' X 4' SQUARE CONCRETE NO. 25 CATCH BASIN (FOR USE WITH 6" MOUNTABLE CURB)
D-CB-25SC	09-11-02	STANDARD 5'2" X 5'2" SQUARE CONCRETE NO. 25 CATCH BASIN (FOR USE WITH 6" MOUNTABLE CURB)
D-CB-25SD	09-11-02	STANDARD 7' X 7' SQUARE CONCRETE NO. 25 CATCH BASIN (FOR USE WITH 6" MOUNTABLE CURB)
D-CB-25SE	05-05-05	STANDARD 9' X 9' SQUARE CONCRETE NO. 25 CATCH BASIN (FOR USE WITH 6" MOUNTABLE CURB)
D-CB-26P	07-29-02	STANDARD PRECAST RECTANGULAR CONCRETE NO. 26 CATCH BASIN (FOR USE WITH 6" MOUNTABLE CURB)
D-CB-26S	07-29-02	STANDARD RECTANGULAR CONCRETE NO. 26 CATCH BASIN (FOR USE WITH 6" MOUNTABLE CURB)
D-CB-27S	07-29-02	STANDARD RECTANGULAR CONCRETE NO. 27 CATCH

		BASIN (FOR USE WITH 6" MOUNTABLE CURB)
D-CB-28B	07-29-02	STANDARD RECTANGULAR BRICK NO. 28 CATCH BASIN (FOR USE WITH 4" MOUNTABLE CURB)
D-CB-28LP	07-29-04	LOW PROFILE 32" X 32" SQUARE CONCRETE NO. 28LP CATCH BASIN (FOR USE WITH 4" MOUNTABLE CURB)
D-CB-28P	07-29-02	STANDARD PRECAST RECTANGULAR CONCRETE NO. 28 CATCH BASIN (FOR USE WITH 4" MOUNTABLE CURB)
D-CB-28RA	05-27-01	STANDARD PRECAST 48" CIRCULAR NO. 28 CATCH BASIN (FOR USE WITH 4" MOUNTABLE CURB)
D-CB-28RB	05-27-01	STANDARD PRECAST CIRCULAR NO. 28 CATCH BASIN (FOR USE WITH 4" MOUNTABLE CURB)
D-CB-28S	07-29-02	STANDARD RECTANGULAR CONCRETE NO. 28 CATCH BASIN (FOR USE WITH 4" MOUNTABLE CURB)
D-CB-29P	07-29-02	STANDARD PRECAST RECTANGULAR CONCRETE NO. 29 CATCH BASIN (FOR USE WITH 4" MOUNTABLE CURB)
D-CB-29S	07-29-02	STANDARD RECTANGULAR CONCRETE NO. 29 CATCH BASIN (FOR USE WITH 4" MOUNTABLE CURB)
D-CB-31R	10-26-03	STANDARD PRECAST CIRCULAR NO. 31 CATCH BASIN (FOR USE UNDER CONCRETE MEDIAN BARRIER WALL)
D-CB-31SD	09-11-02	STANDARD 7' X 7' SQUARE CONCRETE NO. 31 CATCH BASIN (FOR USE UNDER CONCRETE MEDIAN BARRIER WALL)
D-CB-31SE	02-13-04	STANDARD 9' X 9' SQUARE CONCRETE NO. 31 CATCH BASIN (FOR USE UNDER CONCRETE MEDIAN BARRIER WALL)
D-CB-32LP	06-30-03	STANDARD 80” X 32” RECTANGULAR CONCRETE NO. 32 CATCH BASIN (FOR USE UNDER CONCRETE MEDIUM BARRIER WALL)
D-CB-38RB	09-05-04	STANDARD PRECAST CIRCULAR NO. 38 CATCH BASIN
D-CB-38S	07-29-02	STANDARD 32" X 32" SQUARE CONCRETE NO. 38 CATCH BASIN
D-CB-38SB	09-05-04	STANDARD 4' X 4' SQUARE CONCRETE NO. 38 CATCH BASIN
D-CB-38SC	09-05-04	STANDARD 5'2" X 5'2" SQUARE CONCRETE NO. 38 CATCH BASIN
D-CB-39RB	05-27-01	STANDARD PRECAST CIRCULAR NO. 39 CATCH BASIN

D-CB-39S	07-29-02	STANDARD 4' X 4' SQUARE CONCRETE NO. 39 CATCH BASIN
D-CB-39SC		STANDARD 5'2" X 5'2" SQUARE CONCRETE NO. 39 CATCH BASIN
D-CB-39SD	09-11-02	STANDARD 7' X 7' SQUARE CONCRETE NO. 39 CATCH BASIN
D-CB-39SE	02-13-04	STANDARD 9' X 9' SQUARE CONCRETE NO. 39 CATCH BASIN
D-CB-40S	07-29-02	STANDARD 4' X 8' RECTANGULAR CONCRETE NO. 40 CATCH BASIN
D-CB-40SE	05-05-05	STANDARD 9’ X 9’ SQUARE CONCRETE NO. 40. CATCH BASIN
D-CB-41LP	07-29-04	LOW PROFILE 32" X 32" SQUARE CONCRETE NO. 41LP CATCH BASIN (FOR USE UNDER CONCRETE MEDIAN BARRIER WALL)
D-CB-41P	07-29-02	STANDARD 4' X 3' PRECAST RECTANGULAR CONCRETE NO. 41 CATCH BASIN (FOR USE UNDER CONCRETE MEDIAN BARRIER WALL)
D-CB-41RB	05-27-01	STANDARD PRECAST CIRCULAR NO. 41 CATCH BASIN (FOR USE UNDER CONCRETE MEDIAN BARRIER WALL)
D-CB-41S	07-29-02	STANDARD 4' X 3' RECTANGULAR CONCRETE NO. 41 CATCH BASIN (FOR USE UNDER CONCRETE MEDIAN BARRIER WALL)
D-CB-41SB	07-29-02	STANDARD 4' X 4' SQUARE CONCRETE NO. 41 CATCH BASIN (FOR USE UNDER CONCRETE MEDIAN BARRIER WALL)
D-CB-41SC	09-11-02	STANDARD 5'2" X 5'2" SQUARE CONCRETE NO. 41 CATCH BASIN (FOR USE UNDER CONCRETE MEDIAN BARRIER WALL)
D-CB-41SD	09-11-02	STANDARD 7' X 7' SQUARE CONCRETE NO. 41 CATCH BASIN (FOR USE UNDER CONCRETE MEDIAN BARRIER WALL)
D-CB-41SE	05-05-05	STANDARD 9' X 9' SQUARE CONCRETE NO. 41 CATCH BASIN (FOR USE UNDER CONCRETE MEDIAN BARRIER WALL)
D-CB-42RB	05-27-01	STANDARD PRECAST CIRCULAR NO. 42 CATCH BASIN
D-CB-42S	01-19-05	STANDARD 32" X 32" SQUARE CONCRETE NO. 42 CATCH BASIN
D-CB-42SB	07-29-04	STANDARD 4' X 4' SQUARE CONCRETE NO. 42 CATCH BASIN

D-CB-42SC		STANDARD 5'2" X 5'2" SQUARE CONCRETE NO. 42 CATCH BASIN
D-CB-42SD	09-11-02	STANDARD 7' X 7' SQUARE CONCRETE NO. 42 CATCH BASIN
D-CB-43R	05-27-01	STANDARD PRECAST CIRCULAR NO. 43R CATCH BASIN
D-CB-43SB	07-29-02	STANDARD 8' X 4' RECTANGULAR CONCRETE NO. 43SB CATCH BASIN
D-CB-43SC	07-29-02	STANDARD 8' X 5'2" RECTANGULAR CONCRETE NO. 43SC CATCH BASIN
D-CB-44SE	05-05-05	STANDARD 9' X 9' SQUARE CONCRETE NO. 44 CATCH BASIN
D-CB-45S	05-27-01	STANDARD 8' X 4' RECTANGULAR CONCRETE NO. 45 CATCH BASIN (FOR USE UNDER CONCRETE MEDIAN BARRIER WALL)
D-CB-46SE	05-05-05	STANDARD 9' X 9' SQUARE CONCRETE NO. 46 CATCH BASIN (FOR USE UNDER CONCRETE MEDIAN BARRIER WALL)
D-CB-51SC	09-11-02	STANDARD 5'2" X 5'2" SQUARE CONCRETE NO. 51 CATCH BASIN (FOR USE IN FRONT OF CONCRETE RETAINING WALL)
D-CB-51SD		STANDARD 7' X 7' SQUARE CONCRETE NO. 51 CATCH BASIN FOR USE IN FRONT OF CONCRETE RETAINING WALL)
D-CB-51SE		STANDARD 9’ X 9’ SQUARE CONCRETE NO. 51 CATCH BASIN
D-CB-52SE		STANDARD 9’ x 9’ SQUARE CONCRETE NO. 52 CATCH BASIN
D-CBB-12A	05-27-01	TYPE "B" CAST IRON FRAME, GRATE & NONMOUNTABLE INLET DETAILS FOR NOS. 10, 12, 14, 16, AND 17 TYPE CATCH BASINS
D-CBB-12B	05-27-01	TYPE "B" CAST IRON FRAME, GRATE & 6" MOUNTABLE INLET DETAILS FOR NOS. 25, 26 AND 27 TYPE CATCH BASINS
D-CBB-12C	05-27-01	TYPE "B" CAST IRON FRAME, GRATE & 4" MOUNTABLE INLET DETAILS FOR NOS. 28 AND 29 TYPE CATCH BASINS
D-CBB-13	05-27-01	TYPE "B" CAST IRON FRAME, GRATE & NONMOUNTABLE INLET DETAILS FOR NO. 13 TYPE CATCH BASINS
D-CBB-31	05-27-01	TYPE "B" CAST IRON FRAME, GRATE & INLET DETAILS FOR NOS. 31, 41, 45, 46, & 51 TYPE CATCH BASINS
D-CBB-42	05-27-01	CAST IRON GRATE DETAILS FOR NOS. 42, 43 & 44 TYPE

		CATCH BASINS
D-JBS-1	07-29-02	STANDARD 32" X 32" SQUARE CONCRETE NO. 1 JUNCTION BOX
D-JBS-2	07-29-02	STANDARD 4' X 4' SQUARE CONCRETE NO. 2 JUNCTION BOX
D-JBS-3	09-11-02	STANDARD 5'2" X 5'2" SQUARE CONCRETE NO. 3 JUNCTION BOX
D-JBS-4	09-11-02	STANDARD 7' X 7' SQUARE CONCRETE NO. 4 JUNCTION BOX
D-JBS-5	09-11-02	STANDARD 9' X 9' SQUARE CONCRETE NO. 5 JUNCTION BOX
D-MH-2	05-27-01	STANDARD MASONRY & PRECAST NO. 3 MANHOLE
D-MH-3	04-15-00	STANDARD PRECAST CIRCULAR LID DETAILS FOR NO. 3 MANHOLE
D-MH-3A	05-27-01	STANDARD PRECAST CIRCULAR LID DETAILS FOR NO. 3 MANHOLE (108" AND 120" DIA.)
D-MH-4	05-27-01	STANDARD NO. 3 MANHOLE CASTINGS AND STEPS
D-MH-5	09-11-02	STANDARD 5'2" X 5'2" SQUARE CONCRETE NO. 3 MANHOLE
D-MH-6	09-11-02	STANDARD 7' X 7' SQUARE CONCRETE NO. 3 MANHOLE
D-MH-7	09-11-02	STANDARD 9' X 9' SQUARE CONCRETE NO. 3 MANHOLE
D-SDS-1	07-29-02	STANDARD 32" X 32" SQUARE CONCRETE NO. 1 SPRING DRAIN BOX
D-SDS-2A	07-29-02	STANDARD 4' X 4' SQUARE CONCRETE NO. 2A SPRING DRAIN BOX
D-SDS-2B	07-29-02	STANDARD 4' X 4' SQUARE CONCRETE NO. 2B SPRING DRAIN BOX
D-SDS-3A	07-29-02	STANDARD 5'2" X 5'2" SQUARE CONCRETE NO. 3A SPRING DRAIN BOX
D-SLD-1	05-27-01	SLOTTED DRAINS
D-SLD-2	05-27-01	SLOTTED DRAINS
D-SLD-3	05-27-01	SLOTTED DRAINS
D-TD-1		TRENCH DRAIN

DRAINAGE – NATURAL STREAM DESIGN

D-NSD-1	BOULDER CLUSTERS
D-NSD-2	ROCK VANES
D-NSD-3	LOG DEFELECTORS AND LOG VANES
D-NSD-4	LOG DROPS AND STEP POOLS
D-NSD-5	BOULDER RIFFLES
D-NSD-6	CONSTRUCTED RIFFLES
D-NSD-7	COCONUT FIBER ROLLS AND LIVE SILTATION
D-NSD-8	LIVE FASCINES AND WILLOW CUTTINGS
D-NSD-9	BRUSH MATTRESS
D-NSD-10	LARGE WOODY DEBRIS
D-NSD-11	VEGETATED RIPRAP AND GABIONS
D-NSD-12	VEGETATED MSE WALLS
D-NSD-13	LONGITUDINAL STONE TOE AND ARTICULATED CONCRETE MAT

ROADWAY AND PAVEMENT APPURTENANCES

RP-CS-1	09-29-10	CONCRETE SHOULDER RUMBLE STRIP DETAIL (FOR 4-LANE DIVIDED HIGHWAY)
RP-CS-2	09-29-10	CONCRETE SHOULDER RUMBLE STRIP DETAIL (FOR 6-LANE OR WIDER DIVIDED HIGHWAY)
RP-D-15	07-15-08	DETAILS OF STANDARD CONCRETE DRIVEWAYS
RP-D-16	07-15-08	DETAILS OF LOWERED STANDARD CONCRETE DRIVEWAYS
RP-DHO-1	10-26-93	MEDIAN OPENINGS ON 4-LANE DIVIDED HIGHWAY
RP-H-3	04-13-11	HANDICAP RAMP AND TRUNCATED DOME SURFACE DETAIL
RP-H-4	04-13-11	PERPENDICULAR CURB RAMP
RP-H-5	04-13-11	PARALLEL CURB RAMP

RP-H-6	04-13-11	MEDIAN CROSSING
RP-H-7	04-13-11	PERPENDICULAR HANDICAP RAMP FOR 20’ THRU 75’ RADIUS
RP-H-8	04-13-11	PERPENDICULAR HANDICAP RAMP FOR 20’ THRU 75’ RADIUS
RP-H-9	04-13-11	PARALLEL HANDICAP RAMP FOR 20’ THRU 75’ RADIUS
RP-I-5	12-18-96	EXAMPLES OF STREET AND ALLEY INTERSECTIONS
RP-J-1	10-26-00	PORTLAND CEMENT CONCRETE PAVEMENT JOINT TYPES AND SPACING
RP-J-3	10-26-00	PORTLAND CEMENT CONCRETE PAVEMENT JOINT TYPES AND SPACING
RP-J-5	07-01-01	TYPICAL ACCELERATION AND DECELERATION LANE JOINT TYPES AND SPACING FOR CONCRETE RAMPS
RP-J-7	01-30-12	CONCRETE RAMP JOINT TYPES AND SPACING
RP-J-9	02-02-12	CONTRACTION AND CONSTRUCTION JOINTS FOR CONCRETE PAVEMENT
RP-J-11	07-29-96	3/4" AND 1-3/4" EXPANSION AND EDGE PAVEMENT JOINTS
RP-J-13	03-20-91	3/4" AND 1-3/4" ELASTOMERIC COMPRESSION JOINT SEALS
RP-J-15	01-19-02	LONGITUDINAL CONTRACTION AND CONSTRUCTION JOINTS
RP-J-17	02-02-12	DOWEL ASSEMBLY DEVICES
RP-J-18	02-02-12	DOWEL ASSEMBLY DEVICES
RP-J-19	02-02-12	DOWEL ASSEMBLY DEVICES
RP-J-23	01-24-12	CONCRETE PAVEMENT REPAIR DETAILS
RP-J-24	05-27-01	CONCRETE PAVEMENT SPALL AND RANDOM CRACK REPAIR DETAILS
RP-J-25	05-27-01	CONCRETE PAVEMENT JOINT REPAIR DETAILS
RP-MC-1	02-28-02	STANDARD 4" SLOPING (MOUNTABLE) CONCRETE CURBS AND CONCRETE CURBS AND GUTTERS

RP-MC-2	02-28-02	STANDARD 6" SLOPING (MOUNTABLE) CONCRETE CURBS AND CONCRETE CURBS AND GUTTERS
RP-NMC-10	07-29-03	STANDARD VERTICAL (NONMOUNTABLE) CONCRETE CURBS AND CONCRETE CURBS AND GUTTERS
RP-NMC-11	02-28-02	STANDARD VERTICAL (NONMOUNTABLE) CONCRETE CURBS AND CONCRETE CURBS AND GUTTERS
RP-PMR-1	05-27-01	STANDARD DETAILS FOR PROPOSED PERMANENT MAINTENANCE RAMP
RP-R-1	05-27-01	STANDARD RAMPS TO SIDE ROADS
RP-R-2		STANDARD CONSTRUCTION DETAILS FOR ROUNDABOUTS
RP-S-7	07-29-96	DETAILS FOR STANDARD CONCRETE SIDEWALKS
RP-S-8	01-19-93	DETAILS FOR STANDARD CONCRETE STEPS AND PIPE HANDRAILS

SAFETY APPURTENANCES AND FENCE

S-F-1		HIGH VISIBILITY FENCE
S-F-10	06-01-09	STANDARD RIGHT-OF-WAY STOCK FENCE
S-F-10A	06-01-09	STANDARD RIGHT-OF-WAY STOCK FENCE WITH TIMBER POSTS
S-F-10B	05-14-10	STANDARD RIGHT-OF-WAY CHAIN LINK FENCE
S-F-10C	05-14-10	RIGHT-OF-WAY FENCE AT BRIDGES AND BOX CULVERTS
S-F-10D		RIGHT-OF-WAY FENCE LOCATIONS AT INTERCHANGES
S-FG-11	05-14-10	STANDARD STOCK FENCE GATE
S-FG-20	01-24-08	EXAMPLES OF WATER GATES AND WATER CROSSINGS
S-GR-11	11-26-07	W-BEAM & THRIE BEAM BARRIER RAIL AND RUB RAIL ALTERNATES
S-GR-12	05-27-03	W-BEAM BARRIER POST DETAILS AND SPECIFICATIONS
S-GR-13	05-27-03	BARRIER RAIL MOUNTING, POST BLOCK-OUTS WITH VERTICAL ADJUSTMENT HOLES
S-GR-13A		BARRIER RAIL MOUNTING POST FOR PLASTIC BLOCK-OUTS WITH HORIZONTAL ADJUSTMENT HOLES

S-GR-14	04-17-12	W-BEAM BARRIER FASTENING HARDWARE AND BRIDGE APPROACH DELINEATORS
S-GR-15	06-30-05	W-BEAM BARRIER TERMINAL ELEMENT DETAILS
S-GR-16	05-27-01	GUARDRAIL BARRIER TREATMENT FOR PIERS IN MEDIAN
S-GR-17	09-11-02	BRIDGE END PROTECTION IN MEDIAN FOR DUAL BRIDGE
S-GR-18	05-15-08	GUARDRAIL TERMINAL (TYPE IN-LINE) AND SHOULDER LINE DETAIL
S-GR-19	06-01-09	GUARDRAIL TERMINAL ANCHORS, TYPE 12 AND TYPE 13
S-GR-19A	06-30-09	TYPE 12 BURIED-IN-BACKSLOPE GUARDRAIL TERMINAL
S-GR-19B	05-15-08	TYPE 12 ALTERNATE BURIED IN BACKSLOPE GUARDRAIL TERMINAL
S-GR-19C		GUARDRAIL TERMINAL ANCHOR, TYPE 13 ALTERNATE
S-GR-20	05-27-01	MEDIAN DIVIDER GUARDRAIL AND GUARDRAIL TERMINAL ANCHORS
S-GR-21	06-30-09	LENGTH OF NEED AND TERMINAL REQUIREMENTS IN FILLS
S-GR-22	03-10-10	GUARDRAIL ATTACHMENT TO CONCRETE DECKS OF BOX AND SLAB CULVERTS AND BRIDGES
S-GR-23	09-11-02	GUARDRAIL ATTACHMENT TO STRUCTURES AND PROTECTIVE GUARDRAIL AT BRIDGE ENDS DETAILS
S-GR-23A		GUARDRAIL ATTACHMENT TO BRIDGE END FOR LOW-VOLUME LOCAL ROADS (ADT<400)
S-GR-24	05-15-08	GUARDRAIL END TERMINALS AT BRIDGE ENDS
S-GR-26	03-15-08	SLOTTED GUARDRAIL TERMINAL ANCHOR (TYPE 21)
S-GR-27	05-27-03	GUARDRAIL TERMINAL ANCHOR (TYPE 21) ELEMENT ASSEMBLY DETAILS
S-GR-28	06-30-05	GUARDRAIL TERMINAL ANCHOR (TYPE 21) POST AND ASSEMBLY DETAILS
S-GR-38	06-30-09	DETAILS FOR CONSTRUCTION OF EARTH PAD FOR TYPE 38 GUARDRAIL END TERMINALS
S-GR-38A	06-30-05	DETAILS FOR CONSTRUCTION OF ALTERNATE EARTH PAD FOR TYPE 38 GUARDRAIL END TERMINALS

S-GR-39	05-27-01	DETAILS FOR CONSTRUCTION OF EARTH PAD FOR TYPE 21 GUARDRAIL END TERMINALS
S-GR-43		TANGENTIAL GUARDRAIL TERMINAL ANCHOR (TYPE 38) POST LAYOUT AND ERECTION DETAILS
S-GR-44		TANGENTIAL GUARDRAIL TERMINAL ANCHOR (TYPE 38) (2 TUBE) GUARDRAIL ELEMENT POST AND ASSEMBLY DETAILS
S-GR-45		LONG SPAN GUARDRAIL-ONE POST OMITTED
S-GR-46		CURVED GUARDRAIL
S-MB-1	06-06-11	STANDARD CONCRETE MEDIAN BARRIER
S-MB-2	05-27-01	STANDARD CONCRETE MEDIAN BARRIER (BRIDGE PIER PROTECTION)
S-MB-3	10-26-99	STANDARD CONCRETE GLARE SCREEN MEDIAN BARRIER
S-MB-3A	10-26-99	STANDARD CONCRETE GLARE SCREEN MEDIAN BARRIER
S-MB-4	05-27-01	STANDARD CONCRETE GLARE SCREEN MEDIAN BARRIER (BRIDGE PIER PROTECTION)
S-MB-7		STANDARD DETAILS FOR CONCRETE BARRIER WALL INCLUDING GUARDRAIL ATTACHMENT
S-MB-8		STANDARD DETAILS FOR CONCRETE BARRIER WALL AT BRIDGE BENTS INCLUDING GUARDRAIL ATTACHMENT
S-RP-2	01-19-99	STANDARD CONCRETE RIGHT-OF-WAY MARKERS
S-SSMB-1		32” SINGLE SLOPE CONCRETE BARRIER WALL
S-SSMB-2		51” SINGLE SLOPE CONCRETE BARRIER WALL
S-SSMB-3	07-30-10	51” HALF SIZE SINGLE SLOPE CONCRETE BARRIER WALL (BRIDGE PIER PROTECTION)
S-SSMB-4	07-30-10	FLARED SINGLE SLOPE CONCRETE MEDIAN BARRIER WALL
S-SSMB-5		SINGLE SLOPE MEDIAN BARRIER WALL CATCH BASIN DETAIL
S-SSMB-6		GUARDRAIL ATTACHMENT TO SINGLE SLOPE CONCRETE BARRIER WALL

S-SSMB-7		FOOTING DETAILS FOR OVERHEAD SIGN STRUCTURE 32" MEDIAN BARRIER WALL
S-SSMB-8		FOOTING DETAILS FOR OVERHEAD SIGN STRUCTURE 51" MEDIAN BARRIER WALL
S-SSMB-9		SINGLE SLOPE BARRIER WALL FOR GRADE SEPARATED MEDIAN

TRAFFIC CONTROL APPURTENANCES

T-FAB-1	05-27-97	FLASHING YELLOW ARROW BOARD
T-FO-1		FIBER OPTIC AERIAL ENTRANCE DETAILS
T-FO-2		FIBER OPTIC UNDERGROUND ENTRANCE DETAILS
T-FO-3		FIBER OPTIC AERIAL CONNECTION DETAILS
T-FO-4		FIBER OPTIC PULL BOX, CABINET & POLE DETAILS
T-L-1	02-15-07	STANDARD LIGHTING DETAILS - FOUNDATIONS
T-L-1SA	07-29-04	STANDARD LIGHTING DETAILS FOR SINGLE ARM SUPPORTS
T-L-1TM		STANDARD LIGHTING DETAILS TENON MOUNTED OFFSET LIGHTING SUPPORTS
T-L-2	09-11-03	FOUNDATION DETAIL FOR LUMINAIRE MOUNTED ON CONCRETE MEDIAN BARRIER
T-L-3	04-15-96	STANDARD LIGHTING DETAILS - PULL BOXES
T-L-4	05-25-11	STANDARD LIGHTING DETAILS CONDUIT, CABLE INSTALLATION
T-M-1	11-01-11	DETAILS OF PAVEMENT MARKINGS FOR CONVENTIONAL ROADS AND MARKING ABBREVIATIONS
T-M-2	01-12-12	DETAILS OF PAVEMENT MARKINGS FOR CONVENTIONAL ROADS
T-M-3	09-19-91	MARKING STANDARDS FOR TRAFFIC ISLANDS, MEDIANS & PAVED SHOULDERS ON CONVENTIONAL ROADS
T-M-4	11-01-11	STANDARD INTERSECTION PAVEMENT MARKINGS
T-M-5	01-12-12	MARKING DETAILS FOR EXPRESSWAYS & FREEWAYS

T-M-6	01-12-12	MARKING DETAIL FOR EXPRESSWAY & FREEWAY INTERCHANGES
T-M-7	01-12-12	GORE MARKING DETAILS FOR EXPRESSWAY & FREEWAY INTERCHANGES
T-M-8	01-12-12	MARKING DETAILS FOR EXPRESSWAYS & FREEWAYS
T-M-9	11-01-11	MARKING DETAILS FOR RAMP INTERSECTIONS
T-M-10	11-01-11	SIGNING AND PAVEMENT MARKINGS FOR SHARED-USE PATHS
T-M-11	11-01-11	SIGNING AND PAVEMENT MARKINGS FOR BICYCLE LANES AND ROUTES ON RURAL ROADS
T-M-12	11-01-11	SIGNING AND PAVEMENT MARKINGS FOR URBAN BICYCLE LANES
T-M-13		SIGNING AND PAVEMENT MARKINGS FOR BICYCLE LANES
T-M-14	11-01-11	SIGNING AND PAVEMENT MARKINGS FOR BICYCLE LANES AT INTERSECTIONS
T-M-15		ASPHALT SHOULDER RUMBLE STRIP INSTALLATION DETAILS FOR NON-ACCESS CONTROLLED ROUTES
T-M-15A	11-01-11	ASPHALT SHOULDER RUMBLE STRIP INSTALLATION DETAILS FOR INTERSTATE AND ACCESS CONTROLLED ROUTES
T-M-16	11-01-11	ASPHALT SHOULDER RUMBLE STRIP INSTALLATION DETAILS FOR NON-ACCESS CONTROLLED ROUTES
T-PBR-1	06-30-09	INTERCONNECTED PORTABLE BARRIER RAIL
T-PBR-2	11-01-11	DETAIL FOR VERTICAL PANELS AND FLEXIBLE DELINEATORS
T-RR-1	11-01-11	TYPICAL PAVEMENT MARKING AT RAILROAD-HIGHWAY GRADE CROSSINGS AND RAILROAD ADVANCE WARNING SIGN
T-RR-2	11-01-11	STANDARD DRAWING FOR RAILROAD AND HIGHWAY CROSSING SIGNAL WITH GATE
T-RR-3	11-01-11	STANDARD DRAWING FOR RAILROAD-HIGHWAY CROSSING SIGNAL
T-RR-4	11-01-11	STANDARD DRAWING FOR TYPICAL CURB & GUTTER PLAN

		FOR RAILROAD-HIGHWAY CROSSING WITH OR WITHOUT GATES
T-RR-5	11-01-11	STANDARD DRAWING FOR RAILROAD-HIGHWAY CROSSING SIGNAL TYPICAL CANTILEVER SIGN
T-RR-6		TYPICAL SIGNING AND MARKING AT PASSIVE RAILROAD HIGHWAY GRADE CROSSINGS
T-S-6	02-12-91	STANDARD MOUNTING DETAILS - BOLTED EXTRUDED PANELS
T-S-7	02-12-91	HIGHWAY SHIELDS USED ON INTERSTATE AND U.S. NUMBERED ROUTES
T-S-8	07-15-91	HIGHWAY SHIELDS USED ON STATE NUMBERED ROUTES AND ARROWS
T-S-9	11-01-11	STANDARD LAYOUT - GROUND MOUNTED SIGNS
T-S-10	04-04-12	STANDARD MOUNTING DETAILS - FLAT SHEET SIGNS, ALUMINUM-STEEL DESIGN
T-S-11	06-06-11	DELINEATOR AND MILEPOST DETAILS
T-S-12	05-27-03	STANDARD STEEL GROUND MOUNTED SIGNS, BREAK-AWAY TYPE POST FOOTING DETAILS, SQUARE TUBES
T-S-13	05-27-01	STANDARD STEEL GROUND MOUNTED SIGNS, BREAK-AWAY TYPE POST FOOTING DETAILS, I-BEAMS
T-S-14	05-27-01	STANDARD STEEL GROUND MOUNTED SIGNS, BREAK-AWAY TYPE POST FOOTING DETAILS, WF-BEAMS
T-S-15	12-07-90	STANDARD CONDUIT & GROUND DETAILS FOR OVERHEAD & CANTILEVER SIGN STRUCTURES
T-S-16	11-01-11	GROUND MOUNTED ROADSIDE SIGN AND DETAILS
T-S-16A	11-01-11	GROUND MOUNTED ROADSIDE SIGN PLACEMENT DETAILS
T-S-17	10-26-96	STANDARD GROUND MOUNTED SIGN USING PERFORATED/KNOCKOUT SQUARE TUBE
T-S-18	05-27-01	END OF ROADWAY AND DEAD END SIGNS, METAL BARRICADES (TYPE III) & WORK ZONE SPEED SIGNS
T-S-19	07-29-91	STANDARD MEMBERS BENDAWAY SIGN SUPPORTS STEEL DESIGN

T-S-20	11-01-11	SIGN DETAILS
T-S-21		DETAILS FOR SIGN MOUNTS ON CONCRETE MEDIAN BARRIERS
T-SG-1	11-01-11	WOOD POLE, DETAILS FOR SPAN MOUNTED SIGNALS
T-SG-2	07-29-04	LOOP LEAD-INS CONDUIT AND PULL BOXES
T-SG-3	11-11-04	STANDARD NOTES AND DETAILS OF INDUCTIVE LOOPS
T-SG-3A		ALTERNATE DETECTION DETAILS
T-SG-4		SPAN WIRE AND MESSENGER CABLE DETAILS
T-SG-5	07-29-04	CONTROLLER CABINET DETAILS
T-SG-7	11-01-11	SIGNAL HEAD ASSEMBLIES AND PEDESTRIAN PUSH BUTTON SIGNS
T-SG-7A	11-01-11	TYPICAL SIGNAL HEAD PLACEMENT
T-SG-8	11-01-11	STRAIN POLE DETAILS FOR SPAN MOUNTED SIGNALS
T-SG-9	11-16-07	DETAILS OF CANTILEVER SIGNAL SUPPORT
T-SG-9A		MISCELLANEOUS SIGNAL DETAILS
T-SG-10	01-05-10	MAST ARM POLE AND STRAIN POLES FOUNDATION DETAILS
T-SG-11	07-29-04	MAINTENANCE OF EXISTING SIGNALS DURING HIGHWAY CONSTRUCTION
T-SG-12	11-01-11	TYPICAL WIRING FOR SIGNAL HEADS AND DETECTION LOOPS
T-SG-13	06-01-09	FLASHING BEACON DETAIL
T-WZ-10	04-02-12	ADVANCE ROAD WORK SIGNING ON HIGHWAYS AND FREEWAYS
T-WZ-11	03-13-09	ONE LANE CLOSURE DETAIL ON DIVIDED HIGHWAYS
T-WZ-12	03-13-09	ONE LANE CLOSURE DETAIL FOR BRIDGES ON DIVIDED HIGHWAYS
T-WZ-13	03-13-09	TWO-OUTSIDE LANE CLOSURE ON FREEWAY OR EXPRESSWAY

T-WZ-14	03-13-09	TWO-OUTSIDE LANE CLOSURE ON INTERSTATE AND EXPRESSWAY (PORTABLE BARRIER RAIL)
T-WZ-15	04-02-12	INTERIOR LANE CLOSURE ON FREEWAYS OR EXPRESSWAYS
T-WZ-16	03-13-09	LANE SHIFT ON DIVIDED HIGHWAYS AND FREEWAYS
T-WZ-18	03-13-09	SHOULDER CLOSURE DETAIL FOR FREEWAYS AND DIVIDED HIGHWAYS
T-WZ-19	04-02-12	MEDIAN CROSS-OVER DETAIL ON DIVIDED HIGHWAYS
T-WZ-20	12-18-99	GEOMETRIC MEDIAN CROSS-OVER DETAIL ON DIVIDED HIGHWAYS
T-WZ-21	03-15-11	LANE CLOSURE WITH LEFT HAND MERGE AND LANE SHIFT
T-WZ-30	09-01-05	TRAFFIC CONTROL 2-LANE, 2-WAY DIVERSION (40 MPH OR LESS)
T-WZ-31	09-01-05	TRAFFIC CONTROL 2-LANE, 2-WAY DIVERSION (GREATER THAN 40 MPH)
T-WZ-32	03-03-06	TRAFFIC CONTROL PLAN SIGNAL LAYOUT FOR TRAFFIC SIGNAL AT TWO LANE BRIDGE RECONSTRUCTION SITE
T-WZ-33	05-27-98	TRAFFIC CONTROL PLAN FOR CLOSE INTERSECTION CONDITIONS USING TRAFFIC SIGNAL AT TWO LANE BRIDGE RECONSTRUCTION SITE
T-WZ-34	09-01-05	TRAFFIC CONTROL PLAN GENERAL NOTES FOR TRAFFIC SIGNAL AT TWO LANE BRIDGE RECONSTRUCTION SITE
T-WZ-35	04-02-12	TRAFFIC CONTROL PLAN PAY ITEM AND SIGN DETAILS FOR TRAFFIC SIGNAL AT TWO LANE BRIDGE RECONSTRUCTION SITE
T-WZ-36	04-02-12	LANE CLOSURE ON LOW-VOLUME 2-LANE HIGHWAY
T-WZ-40	04-02-12	RIGHT LANE CLOSURES AT NEAR SIDE OF INTERSECTIONS
T-WZ-41	04-02-12	LEFT LANE CLOSURES AT NEAR SIDE OF INTERSECTIONS
T-WZ-42	04-02-12	CENTER LANE CLOSURES AT NEAR SIDE OF INTERSECTIONS
T-WZ-50	04-02-12	TRAFFIC CONTROL FOR SIGNALS ONLY PROJECTS ON 2 OR 3 LANE MAJOR ROUTES

T-WZ-51	04-02-12	TRAFFIC CONTROL FOR SIGNALS ONLY PROJECTS ON 4 OR 5 LANE MAJOR ROUTES
T-WZ-52	04-02-12	TRAFFIC CONTROL FOR SIGNALS ONLY PROJECTS ON 4 OR 5 LANE MAJOR AND MINOR ROUTES
T-WZ-53	04-02-12	TRAFFIC CONTROL FOR SIGNALS ONLY PROJECTS ON 4 OR MORE LANE DIVIDED MAJOR ROUTES
T-WZ-54	04-02-12	TRAFFIC CONTROL FOR SIGNALS ONLY PROJECTS ON 4 OR MORE LANE DIVIDED MAJOR ROUTES AND 4 OR MORE LANE MINOR ROUTES
T-WZ-55		SIDEWALK TRAFFIC CONTROL

EROSION PREVENTION AND SEDIMENT CONTROL

EC-STR-1	04-01-08	DEWATERING STRUCTURE
EC-STR-2	05-14-10	SEDIMENT FILTER BAG
EC-STR-3B	04-01-08	SILT FENCE
EC-STR-3C	04-01-08	SILT FENCE WITH WIRE BACKING
EC-STR-3D	04-01-08	ENHANCED SILT FENCE
EC-STR-3E	04-01-08	SILT FENCE FABRIC JOINING DETAILS
EC-STR-4	01-01-10	ENHANCED SILT FENCE CHECK (TRAPEZOIDAL DITCH)
EC-STR-4A	01-01-10	ENHANCED SILT FENCE CHECK (V-DITCH)
EC-STR-4B		ENHANCED SILT FENCE CHECK DETAILS
EC-STR-6	04-01-08	ROCK CHECK DAM
EC-STR-6A		ENHANCED ROCK CHECK DAM
EC-STR-7	04-01-08	SEDIMENT TRAP WITH CHECK DAM
EC-STR-8		FILTER SOCK
EC-STR-11	04-01-08	CULVERT PROTECTION TYPE 1
EC-STR-11A		CULVERT PROTECTION TYPE 2

EC-STR-12	04-01-08	ROCK SEDIMENT DAM
EC-STR-13	04-01-08	ROCK AND EARTH SEDIMENT EMBANKMENT
EC-STR-15	04-01-08	SEDIMENT BASIN
EC-STR-16	04-01-08	SEDIMENT BASINS RISER AND COLLAR APPURTENANCES
EC-STR-17	04-01-08	SEDIMENT BASIN EMBANKMENT DETAILS
EC-STR-19	04-01-08	CATCH BASIN PROTECTION
EC-STR-21	04-01-08	PERMANENT RIPRAP BASIN ENERGY DISSIPATOR
EC-STR-25	04-01-08	TEMPORARY CULVERT CROSSING, CONSTRUCTION EXIT, CONSTRUCTION FORD
EC-STR-27	04-01-08	TEMPORARY SLOPE DRAIN AND BERM
EC-STR-29	04-01-08	PERMANENT SLOPE DRAIN PIPE
EC-STR-30		INSTREAM DIVERSION (WITHOUT TRAFFIC)
EC-STR-30A		INSTREAM DIVERSION (WITH TRAFFIC)
EC-STR-31	04-01-08	TEMPORARY DIVERSION CHANNEL
EC-STR-31A	04-01-08	TEMPORARY DIVERSION CHANNEL DESIGN
EC-STR-32	04-01-08	TEMPORARY DIVERSION CULVERTS
EC-STR-33	04-01-08	SUSPENDED PIPE DIVERSION (DOWNSTREAM)
EC-STR-33A	04-01-08	SUSPENDED PIPE DIVERSION (UPSTREAM)
EC-STR-34	04-01-08	EROSION CONTROL BLANKET FOR SLOPE INSTALLATION
EC-STR-35	04-01-08	FILTER BERMS
EC-STR-36	04-01-08	TURF REINFORCEMENT MAT FOR CHANNEL INSTALLATION
EC-STR-37	04-01-08	SEDIMENT TUBE
EC-STR-38	04-01-08	FLOATING TURBIDITY CURTAIN
EC-STR-39	04-01-08	CURB INLET PROTECTION TYPE 1 & 2
EC-STR-39A	06-24-10	CURB INLET PROTECTION TYPE 3 & 4
EC-STE-40		CATCH BASIN FILTER ASSEMBLY FOR CIRCULAR

STRUCTURES

EC-STR-41	CATCH BASIN FILTER ASSEMBLY (TYPE 1)
EC-STR-41A	CATCH BASIN FILTER ASSEMBLY (TYPE 1) SLIPCOVER DETAILS
EC-STR-42	CATCH BASIN FILTER ASSEMBLY (TYPE 2)
EC-STR-42A	CATCH BASIN FILTER ASSEMBLY (TYPE 2) SLIPCOVER DETAILS
EC-STR-43	CATCH BASIN FILTER ASSEMBLY (TYPE 3)
EC-STR-43A	CATCH BASIN FILTER ASSEMBLY (TYPE 3) SLIPCOVER DETAILS
EC-STR-44	CATCH BASIN FILTER ASSEMBLY (TYPE 4)
EC-STR-44A	CATCH BASIN FILTER ASSEMBLY (TYPE 4) SLIPCOVER DETAILS
EC-STR-45	CATCH BASIN FILTER ASSEMBLY (TYPE 5)
EC-STR-45A	CATCH BASIN FILTER ASSEMBLY (TYPE 5) SLIPCOVER DETAILS
EC-STR-46	CATCH BASIN FILTER ASSEMBLY (TYPE 6)
EC-STR-46A	CATCH BASIN FILTER ASSEMBLY (TYPE 6) SLIPCOVER DETAILS
EC-STR-47	CATCH BASIN FILTER ASSEMBLY (TYPE 7)
EC-STR-47A	CATCH BASIN FILTER ASSEMBLY (TYPE 7) SLIPCOVER DETAILS
EC-STR-48	CATCH BASIN FILTER ASSEMBLY (TYPE 8)
EC-STR-48A	CATCH BASIN FILTER ASSEMBLY (TYPE 8) SLIPCOVER DETAILS
EC-STR-49	CATCH BASIN FILTER ASSEMBLY (TYPE 9)
EC-STR-49A	CATCH BASIN FILTER ASSEMBLY (TYPE 9) SLIPCOVER DETAILS
EC-STR-50	CATCH BASIN FILTER ASSEMBLY (TYPE 10)
EC-STR-50A	CATCH BASIN FILTER ASSEMBLY (TYPE 10) SLIPCOVER DETAILS

EC-STR-51		CATCH BASIN FILTER ASSEMBLY (TYPE 11)
EC-STR-51A		CATCH BASIN FILTER ASSEMBLY (TYPE 11) SLIPCOVER DETAILS
EC-STR-55	04-01-08	GABION CHECK DAM
EC-STR-56	04-01-08	GABION CHECK DAM DESIGN TABLES
EC-STR-57	04-01-08	GABION ASSEMBLY DETAILS
EC-STR-58	04-01-08	GABION ASSEMBLY DETAILS
EC-STR-59	04-01-08	GABION CHECK DAM GENERAL NOTES AND COMPONENT PROPERTIES
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EL-W-1	05-27-96	DETAILS OF TREE WALLS
EL-W-2	05-27-01	STANDARD GRAVITY-TYPE RETAINING WALLS

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CHAPTER 2 – STANDARD STRUCTURE DRAWINGS

STRUCTURE DESIGN STANDARD DRAWINGS

BRIDGE APPURTENANCES ENGLISH (NEW STRUCTURES)

STD–1–1	07–31–00	BRIDGE RAILING CONCRETE PARAPET
STD–1–1SS	11-01-10	BRIDGE RAILING SINGLE SLOPE CONCRETE PARAPET
STD–1–2	03–28–08	SLIDER PLATE AND DECK DRAIN
STD-1-2SS		SLIDER PLATES FOR SINGLE SLOPE PARAPETS AND DECK DRAINS
STD–1– 3	07–31–00	STD. CONCRETE MEDIAN BARRIER
STD–1–3SS	11-01-10	STD. SINGLE SLOPE CONCRETE MEDIAN BARRIER
STD–1–4	01–05–01	SLIDER PLATES FOR MEDIAN BARRIER
STD-1-4SS		SLIDER PLATE ASSEMBLIES FOR SINGLE SLOPE MEDIAN BARRIER
STD–1–5	04–08–05	PAVEMENT AT BRIDGE ENDS
STD–1–6	04–28–97	BRIDGE END DRAIN W/ PABE
STD–1–7	07–31–00	BRIDGE END DRAIN W/ PABE
STD–1–8	05–01–95	BRIDGE END DRAIN 2’ X 8’ 7” W/PABE
STD–1–9	05–01–95	BRIDGE END DRAIN 4’ X 7” W/PABE
STD–1–10	03–28–94	BRIDGE END DRAIN W/O PABE
STD–1–11	05–21–99	BRIDGE END DRAIN W/O PABE
STD–1–12	03–28–94	BRIDGE END DRAIN 2’x8’7” W/O PABE
STD–1–13	03–28–94	BRIDGE END DRAIN 4’x8’7” W/O PABE
STD–2–1	11-01-10	BRIDGE MOUNTED INTERCONNECTED PORTABLE BARRIER RAIL
STD–2–2		VERTICAL PANEL DETAILS
STD–3–1	11-01-10	STRIPSEAL EXPANSION JOINT
STD–3–2	11-01-10	STRIPSEAL EXPANSION JOINT
STD–4–1	04–08–05	STD. PRECAST PRESTRESSED BRIDGE DECK PANELS GENERAL DETAILS

STD–4–2	04–08–05	STD. PRECAST PRESTRESSED BRIDGE DECK PANELS DESIGN CRITERIA
STD–4–3	03–02–02	STD.PRECAST PRESTRESSED BRIDGE DECK PANELS GENERAL DETAILS
STD–4–4	06–10–96	STD. PRECAST PRESTRESSED BRIDGE DECK PANELS CONSTRUCTION DETAILS
STD–5–1	10–25–93	STD. PILE DETAILS
STD–5–2	04–08–05	STD. PILE DETAILS
STD–6–1	11-01-10	STANDARD SEISMIC DETAILS
STD–6–2	11–07–94	STANDARD SEISMIC DETAILS
STD–7–1	11-01-10	STD. CONCRETE RAIL
STD–8–2	11-01-10	LIGHT STANDARD SUPPORT DETAILS
STD–8–2SS		SINGLE SLOPE PARAPET STANDARD LIGHT SUPPORT DETAILS
STD–8–3	09–01–91	MEDIAN BARRIER LIGHT STANDARD SUPPORT DETAILS
STD–8–3SS		SINGLE SLOPE MEDIAN BARRIER STANDARD LIGHT SUPPORT DETAILS
STD–8–4		SIGN, LUMINAIRE, AND TRAFFIC SIGNAL SUPPORTS
STD–9–1	10–07–08	REINFORCING BAR SUPPORT DETAILS FOR CONCRETE SLABS
STD–10–1	04–08–05	MISCELLANEOUS ABUTMENT AND DRAINAGE DETAILS
STD–11–1	08–13-02	BRIDGE RAILING W/ STRUCTURAL TUBING
STD–11–2		STANDARD CONCRETE CLASSIC RAIL
STD–14–1	10–15–08	STD. DETAILS AND INT. DIAPH.DETAILS FOR BULB – TEE BEAMS
STD–14–2	11-01-10	STD. DETAILS AND INT. DIAPH.DETAILS FOR I-BEAMS
STD–14–3	10–15–08	STD. DETAILS FOR PRESTRESSED BOX BEAMS

BRIDGE APPURTENANCES ENGLISH (BOX CULVERTS) (See Section 4-604.00)

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STD–15–2	3–28–08	GENERAL NOTES
STD–15–3	02–28–03	DESIGN SECTION LIMITS

STD–15–4	12–07–01	TYPICAL SECTION AND DETAILS
STD–15–5	02–28–03	TYPICAL ELEVATION
STD–15–6	03–28–08	CURB AND RAIL DETAILS SKEW NOT LESS THAN 45 DEG.
STD–15–7	03–02–02	STANDARD EDGE BEAM DETAILS FOR FILLS GREATER THAN 3’ - 8”
STD–15–8	12–07–01	INTERIOR WALL END TREATMENTS
STD–15–9	02–28–03	TYPICAL WINGWALL DETAILS AND NOTES
STD–15–10	11-06-08	WINGWALL DIMENSIONS AND QUANTITIES
STD–15–11		WINGWALL DIMENSIONS AND QUANTITIES
STD–15–12	03–28–08	WINGWALL & SPECIAL RETAINING WALL DESIGN SECTION
STD–15–13		WINGWALL DESIGN SECTION
STD–15–14	02–28–03	BACKFILL AND DRAINAGE DETAILS
STD–15–15		BACKFILL AND DRAINAGE DETAILS
STD–15–16	12–07–01	PAVED OUTLET DETAIL
STD-15-16A		LOW FLOW CHANNEL CONSTRUCTION DETAILS FOR CULVERT INLET AND OUTLET
STD-15-17		DEBRIS DEFLECTION WALL
STD-15-18		DEBRIS DEFLECTION WALL
STD-15-19		SIDEWALK AND MISCELLANEOUS DETAILS
STD-15-20		WARPED SLOPE DETAIL
STD-15-21	03-02-02	STAGE CONSTRUCTION JOINT DETAIL (FILL ABOVE TOP OF SLAB NOT GREATER THAN 3’-8”)
STD-15-22	02-28-03	EXTENSION DETAILS
STD-15-23	12-07-01	EXTENSION DETAILS FOR SCOURED OUTLET
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STD-15-25	11-01-10	PRECAST BOX CULVERT DETAILS
STD-15-26		PRECAST BOX CULVERT DETAILS
STD-15-27		PRECAST BOX CULVERT DETAILS
STD-15-28		PRECAST BOX CULVERT DETAILS

STD-15-29		PRECAST BOX CULVERT DETAILS
STD-15-30		STANDARD INTERNAL ENERGY DISSIPATOR FOR BOX AND PIPE CULVERTS
STD-15-35		BOX BRIDGE, 1 BARREL AT 6', CLEAR HTS. 3' - 6', 0 - 60' FILL
STD-15-36		BOX BRIDGE, 1 BARREL AT 8', CLEAR HTS. 3' - 4', 0 - 60' FILL
STD-15-37		BOX BRIDGE, 1 BARREL AT 8', CLEAR HTS. 5' - 8', 0 - 60' FILL
STD-15-38	09-19-06	BOX BRIDGE, 1 BARREL AT 10', CLEAR HTS. 4' - 6', 0 - 60' FILL
STD-15-39		BOX BRIDGE, 1 BARREL AT 10', CLEAR HTS. 7' - 10', 0 - 60' FILL
STD-15-40		BOX BRIDGE, 1 BARREL AT 12', CLEAR HTS. 4' - 7', 0 - 60' FILL
STD-15-41		BOX BRIDGE, 1 BARREL AT 12', CLEAR HTS. 8' - 12', 0 - 60' FILL
STD-15-42		BOX BRIDGE, 1 BARREL AT 14', CLEAR HTS. 5' - 7', 0 - 60' FILL
STD-15-43		BOX BRIDGE, 1 BARREL AT 14', CLEAR HTS. 8' - 11', 0 - 60' FILL
STD-15-44		BOX BRIDGE, 1 BARREL AT 14', CLEAR HTS. 12' - 14', 0 - 60' FILL
STD-15-45		BOX BRIDGE, 1 BARREL AT 16', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-15-46		BOX BRIDGE, 1 BARREL AT 16', CLEAR HTS. 9' - 12', 0 - 60' FILL
STD-15-47		BOX BRIDGE, 1 BARREL AT 16', CLEAR HTS. 13' - 16', 0 - 60' FILL
STD-15-48		BOX BRIDGE, 1 BARREL AT 18', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-15-49		BOX BRIDGE, 1 BARREL AT 18', CLEAR HTS. 9' - 13', 0 - 60' FILL
STD-15-50		BOX BRIDGE, 1 BARREL AT 18', CLEAR HTS. 14' - 18', 0 - 60' FILL
STD-15-55		BOX BRIDGE, 2 BARRELS AT 6', CLEAR HTS. 3' - 6', 0 - 60' FILL
STD-15-56		BOX BRIDGE, 2 BARRELS AT 8', CLEAR HTS. 3' - 4', 0 - 60' FILL
STD-15-57		BOX BRIDGE, 2 BARRELS AT 8', CLEAR HTS. 5' - 8', 0 - 60' FILL
STD-15-58		BOX BRIDGE, 2 BARRELS AT 10', CLEAR HTS. 4' - 6', 0 - 60' FILL
STD-15-59		BOX BRIDGE, 2 BARRELS AT 10', CLEAR HTS. 7' - 10', 0 - 60' FILL
STD-15-60		BOX BRIDGE, 2 BARRELS AT 12', CLEAR HTS. 4' - 7', 0 - 60' FILL
STD-15-61		BOX BRIDGE, 2 BARRELS AT 12', CLEAR HTS. 8' - 12', 0 - 60' FILL
STD-15-62		BOX BRIDGE, 2 BARRELS AT 14', CLEAR HTS. 5' - 7', 0 - 60' FILL
STD-15-63		BOX BRIDGE, 2 BARRELS AT 14', CLEAR HTS. 8' - 11', 0 - 60' FILL

STD-15-64		BOX BRIDGE, 2 BARRELS AT 14', CLEAR HTS. 12' - 14', 0 - 60' FILL
STD-15-65		BOX BRIDGE, 2 BARRELS AT 16', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-15-66		BOX BRIDGE, 2 BARRELS AT 16', CLEAR HTS. 9' - 12', 0 - 60' FILL
STD-15-67		BOX BRIDGE, 2 BARRELS AT 16', CLEAR HTS. 13' - 16', 0 - 60' FILL
STD-15-68		BOX BRIDGE, 2 BARRELS AT 18', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-15-69		BOX BRIDGE, 2 BARRELS AT 18', CLEAR HTS. 9' - 13', 0 - 60' FILL
STD-15-70		BOX BRIDGE, 2 BARRELS AT 18', CLEAR HTS. 14' - 18', 0 - 60' FILL
STD-15-75		BOX BRIDGE, 3 BARRELS AT 6', CLEAR HTS. 3' - 6', 0 - 60' FILL
STD-15-76		BOX BRIDGE, 3 BARRELS AT 8', CLEAR HTS. 3' - 4', 0 - 60' FILL
STD-15-77	12-07-01	BOX BRIDGE, 3 BARRELS AT 8', CLEAR HTS. 5' - 8', 0 - 60' FILL
STD-15-78	12-07-01	BOX BRIDGE, 3 BARRELS AT 10', CLEAR HTS. 4' - 6', 0 - 60' FILL
STD-15-79	12-07-01	BOX BRIDGE, 3 BARRELS AT 10', CLEAR HTS. 7' - 10', 0 - 60' FILL
STD-15-80		BOX BRIDGE, 3 BARRELS AT 12', CLEAR HTS. 4' - 7', 0 - 60' FILL
STD-15-81		BOX BRIDGE, 3 BARRELS AT 12', CLEAR HTS. 8' - 12', 0 - 60' FILL
STD-15-82		BOX BRIDGE, 3 BARRELS AT 14', CLEAR HTS. 5' - 7', 0 - 60' FILL
STD-15-83		BOX BRIDGE, 3 BARRELS AT 14', CLEAR HTS. 8' - 11', 0 - 60' FILL
STD-15-84		BOX BRIDGE, 3 BARRELS AT 14', CLEAR HTS. 12' - 14', 0 - 60' FILL
STD-15-85		BOX BRIDGE, 3 BARRELS AT 16', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-15-86		BOX BRIDGE, 3 BARRELS AT 16', CLEAR HTS. 9' - 12', 0 - 60' FILL
STD-15-87		BOX BRIDGE, 3 BARRELS AT 16', CLEAR HTS. 13' - 16', 0 - 60' FILL
STD-15-88		BOX BRIDGE, 3 BARRELS AT 18', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-15-89		BOX BRIDGE, 3 BARRELS AT 18', CLEAR HTS. 9' - 13', 0 - 60' FILL
STD-15-90		BOX BRIDGE, 3 BARRELS AT 18', CLEAR HTS. 14' - 18', 0 - 60' FILL
STD-15-95		SLAB BRIDGE, 1 BARREL AT 6', CLEAR HTS. 3' - 6', 0 - 60' FILL
STD-15-96		SLAB BRIDGE, 1 BARREL AT 8', CLEAR HTS. 3' - 4', 0 - 60' FILL
STD-15-97		SLAB BRIDGE, 1 BARREL AT 8', CLEAR HTS. 5' - 8', 0 - 60' FILL
STD-15-98		SLAB BRIDGE, 1 BARREL AT 10', CLEAR HTS. 4' - 6', 0 - 60' FILL

STD-15-99	02-28-03	SLAB BRIDGE, 1 BARREL AT 10', CLEAR HTS. 7' - 10', 0 - 60' FILL
STD-15-100	02-28-03	SLAB BRIDGE, 1 BARREL AT 12', CLEAR HTS. 4' - 7', 0 - 60' FILL
STD-15-101	02-28-03	SLAB BRIDGE, 1 BARREL AT 12', CLEAR HTS. 8' - 12', 0 - 60' FILL
STD-15-102		SLAB BRIDGE, 1 BARREL AT 14', CLEAR HTS. 5' - 9', 0 - 60' FILL
STD-15-103		SLAB BRIDGE, 1 BARREL AT 14', CLEAR HTS. 10' - 14', 0 - 60' FILL
STD-15-104		SLAB BRIDGE, 1 BARREL AT 16', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-15-105		SLAB BRIDGE, 1 BARREL AT 16', CLEAR HTS. 9' - 12', 0 - 60' FILL
STD-15-106		SLAB BRIDGE, 1 BARREL AT 16', CLEAR HTS. 13' - 16', 0 - 60' FILL
STD-15-107		SLAB BRIDGE, 1 BARREL AT 18', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-15-108		SLAB BRIDGE, 1 BARREL AT 18', CLEAR HTS. 9' - 13', 0 - 60' FILL
STD-15-109		SLAB BRIDGE, 1 BARREL AT 18', CLEAR HTS. 14' - 18', 0 - 60' FILL
STD-15-115	02-28-03	SLAB BRIDGE, 2 BARRELS AT 6', CLEAR HTS. 3' - 6', 0 - 60' FILL
STD-15-116	02-28-03	SLAB BRIDGE, 2 BARRELS AT 8', CLEAR HTS. 3' - 4', 0 - 60' FILL
STD-15-117	02-28-03	SLAB BRIDGE, 2 BARRELS AT 8', CLEAR HTS. 5' - 8', 0 - 60' FILL
STD-15-118	02-28-03	SLAB BRIDGE, 2 BARRELS AT 10', CLEAR HTS. 4' - 6', 0 - 60' FILL
STD-15-119	02-28-03	SLAB BRIDGE, 2 BARRELS AT 10', CLEAR HTS. 7' - 10', 0 - 60' FILL
STD-15-120	02-28-03	SLAB BRIDGE, 2 BARRELS AT 12', CLEAR HTS. 4' - 7', 0 - 60' FILL
STD-15-121	02-28-03	SLAB BRIDGE, 2 BARRELS AT 12', CLEAR HTS. 8' - 12', 0 - 60' FILL
STD-15-122	02-28-03	SLAB BRIDGE, 2 BARRELS AT 14', CLEAR HTS. 5' - 7', 0 - 60' FILL
STD-15-123	02-28-03	SLAB BRIDGE, 2 BARRELS AT 14', CLEAR HTS. 8' - 11', 0 - 60' FILL
STD-15-124	02-28-03	SLAB BRIDGE, 2 BARRELS AT 14', CLEAR HTS. 12' - 14', 0 - 60' FILL
STD-15-125	02-28-03	SLAB BRIDGE, 2 BARRELS AT 16', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-15-126	02-28-03	SLAB BRIDGE, 2 BARRELS AT 16', CLEAR HTS. 9' - 12', 0 - 60' FILL
STD-15-127	02-28-03	SLAB BRIDGE, 2 BARRELS AT 16', CLEAR HTS. 13' - 16', 0 - 60' FILL
STD-15-128	02-28-03	SLAB BRIDGE, 2 BARRELS AT 18', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-15-129	02-28-03	SLAB BRIDGE, 2 BARRELS AT 18', CLEAR HTS. 9' - 13', 0 - 60' FILL
STD-15-130	02-28-03	SLAB BRIDGE, 2 BARRELS AT 18', CLEAR HTS. 14' - 18', 0 - 60' FILL
STD-15-135		SLAB BRIDGE, 3 BARRELS AT 6', CLEAR HTS. 3' - 6', 0 - 60' FILL

STD-15-136		SLAB BRIDGE, 3 BARRELS AT 8', CLEAR HTS. 3' - 4', 0 - 60' FILL
STD-15-137		SLAB BRIDGE, 3 BARRELS AT 8', CLEAR HTS. 5' - 8', 0 - 60' FILL
STD-15-138		SLAB BRIDGE, 3 BARRELS AT 10', CLEAR HTS. 4' - 6', 0 - 60' FILL
STD-15-139		SLAB BRIDGE, 3 BARRELS AT 10', CLEAR HTS. 7' - 10', 0 - 60' FILL
STD-15-140		SLAB BRIDGE, 3 BARRELS AT 12', CLEAR HTS. 4' - 7', 0 - 60' FILL
STD-15-141		SLAB BRIDGE, 3 BARRELS AT 12', CLEAR HTS. 8' - 12', 0 - 60' FILL
STD-15-142		SLAB BRIDGE, 3 BARRELS AT 14', CLEAR HTS. 5' - 7', 0 - 60' FILL
STD-15-143		SLAB BRIDGE, 3 BARRELS AT 14', CLEAR HTS. 8' - 11', 0 - 60' FILL
STD-15-144		SLAB BRIDGE, 3 BARRELS AT 14', CLEAR HTS. 12' - 14', 0 - 60' FILL
STD-15-145		SLAB BRIDGE, 3 BARRELS AT 16', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-15-146		SLAB BRIDGE, 3 BARRELS AT 16', CLEAR HTS. 9' - 12', 0 - 60' FILL
STD-15-147		SLAB BRIDGE, 3 BARRELS AT 16', CLEAR HTS. 13' - 16', 0 - 60' FILL
STD-15-148	12-07-01	SLAB BRIDGE, 3 BARRELS AT 18', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-15-149	12-07-01	SLAB BRIDGE, 3 BARRELS AT 18', CLEAR HTS. 9' - 13', 0 - 60' FILL
STD-15-150	12-07-01	SLAB BRIDGE, 3 BARRELS AT 18', CLEAR HTS. 14' - 18', 0 - 60' FILL

BRIDGE APPURTENANCES ENGLISH (LRFD BOX CULVERTS) (See Section 4-604.00)

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STD-17-10	TYPICAL WINGWALL DETAILS AND NOTES

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STD-17-18	BACKFILL DETAILS
STD-17-19	PAVED OUTLET DETAIL
STD-17-20	LOW FLOW CHANNEL CONSTRUCTION DETAILS FOR CULVERT INLET AND OUTLET
STD-17-21	DEBRIS DEFLECTION WALL FOR BOX BRIDGE
STD-17-22	DEBRIS DEFLECTION WALL FOR SLAB BRIDGE
STD-17-23	SIDEWALK AND MISCELLANEOUS DETAILS
STD-17-24	WARPED SLOPE DETAIL
STD-17-25	STAGE CONSTRUCTION JOINT DETAIL (FILL ABOVE TOP OF SLAB NOT GREATER THAN 3'-6")
STD-17-26	EXTENSION DETAILS
STD-17-27	EXTENSION DETAILS FOR SCOURED OUTLET
STD-17-28	END SECTION DETAILS
STD-17-29	PRECAST BOX CULVERT DETAILS
STD-17-34	INTERNAL ENERGY DISSIPATOR FOR BOX AND PIPE CULVERTS
STD-17-51	BOX BRIDGE, 1 BARREL AT 6', CLEAR HTS. 3' - 6', 0 - 60' FILL
STD-17-52	BOX BRIDGE, 1 BARREL AT 8', CLEAR HTS. 3' - 5', 0 - 60' FILL
STD-17-53	BOX BRIDGE, 1 BARREL AT 8', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-54	BOX BRIDGE, 1 BARREL AT 10', CLEAR HTS. 4' - 6', 0 - 60' FILL
STD-17-55	BOX BRIDGE, 1 BARREL AT 10', CLEAR HTS. 7' - 10', 0 - 60' FILL
STD-17-56	BOX BRIDGE, 1 BARREL AT 12', CLEAR HTS. 4' - 6', 0 - 60' FILL
STD-17-57	BOX BRIDGE, 1 BARREL AT 12', CLEAR HTS. 7' - 9', 0 - 60' FILL

STD-17-58	BOX BRIDGE, 1 BARREL AT 12', CLEAR HTS. 10' - 12', 0 - 60' FILL
STD-17-59	BOX BRIDGE, 1 BARREL AT 14', CLEAR HTS. 5' - 7', 0 - 60' FILL
STD-17-60	BOX BRIDGE, 1 BARREL AT 14', CLEAR HTS. 8' - 11', 0 - 60' FILL
STD-17-61	BOX BRIDGE, 1 BARREL AT 14', CLEAR HTS. 12' - 14', 0 - 60' FILL
STD-17-62	BOX BRIDGE, 1 BARREL AT 16', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-63	BOX BRIDGE, 1 BARREL AT 16', CLEAR HTS. 9' - 12', 0 - 60' FILL
STD-17-64	BOX BRIDGE, 1 BARREL AT 16', CLEAR HTS. 13' - 16', 0 - 60' FILL
STD-17-65	BOX BRIDGE, 1 BARREL AT 18', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-66	BOX BRIDGE, 1 BARREL AT 18', CLEAR HTS. 9' - 11', 0 - 60' FILL
STD-17-67	BOX BRIDGE, 1 BARREL AT 18', CLEAR HTS. 12' - 14', 0 - 60' FILL
STD-17-68	BOX BRIDGE, 1 BARREL AT 18', CLEAR HTS. 15' - 18', 0 - 60' FILL
STD-17-71	BOX BRIDGE, 2 BARRELS AT 6', CLEAR HTS. 3' - 6', 0 - 60' FILL
STD-17-72	BOX BRIDGE, 2 BARRELS AT 8', CLEAR HTS. 3' - 5', 0 - 60' FILL
STD-17-73	BOX BRIDGE, 2 BARRELS AT 8', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-74	BOX BRIDGE, 2 BARRELS AT 10', CLEAR HTS. 4' - 6', 0 - 60' FILL
STD-17-75	BOX BRIDGE, 2 BARRELS AT 10', CLEAR HTS. 7' - 10', 0 - 60' FILL
STD-17-76	BOX BRIDGE, 2 BARRELS AT 12', CLEAR HTS. 4' - 6', 0 - 60' FILL
STD-17-77	BOX BRIDGE, 2 BARRELS AT 12', CLEAR HTS. 7' - 9', 0 - 60' FILL
STD-17-78	BOX BRIDGE, 2 BARRELS AT 12', CLEAR HTS. 10' - 12', 0 - 60' FILL
STD-17-79	BOX BRIDGE, 2 BARRELS AT 14', CLEAR HTS. 5' - 7', 0 - 60' FILL
STD-17-80	BOX BRIDGE, 2 BARRELS AT 14', CLEAR HTS. 8' - 11', 0 - 60' FILL
STD-17-81	BOX BRIDGE, 2 BARRELS AT 14', CLEAR HTS. 12' - 14', 0 - 60' FILL
STD-17-82	BOX BRIDGE, 2 BARRELS AT 16', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-83	BOX BRIDGE, 2 BARRELS AT 16', CLEAR HTS. 9' - 12', 0 - 60' FILL
STD-17-84	BOX BRIDGE, 2 BARRELS AT 16', CLEAR HTS. 13' - 16', 0 - 60' FILL
STD-17-85	BOX BRIDGE, 2 BARRELS AT 18', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-86	BOX BRIDGE, 2 BARRELS AT 18', CLEAR HTS. 9' - 11', 0 - 60' FILL

STD-17-87	BOX BRIDGE, 2 BARRELS AT 18', CLEAR HTS. 12' - 14', 0 - 60' FILL
STD-17-88	BOX BRIDGE, 2 BARRELS AT 18', CLEAR HTS. 15' - 18', 0 - 60' FILL
STD-17-91	BOX BRIDGE, 3 BARRELS AT 6', CLEAR HTS. 3' - 6', 0 - 60' FILL
STD-17-92	BOX BRIDGE, 3 BARRELS AT 8', CLEAR HTS. 3' - 5', 0 - 60' FILL
STD-17-93	BOX BRIDGE, 3 BARRELS AT 8', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-94	BOX BRIDGE, 3 BARRELS AT 10', CLEAR HTS. 4' - 6', 0 - 60' FILL
STD-17-95	BOX BRIDGE, 3 BARRELS AT 10', CLEAR HTS. 7' - 10', 0 - 60' FILL
STD-17-96	BOX BRIDGE, 3 BARRELS AT 12', CLEAR HTS. 4' - 6', 0 - 60' FILL
STD-17-97	BOX BRIDGE, 3 BARRELS AT 12', CLEAR HTS. 7' - 9', 0 - 60' FILL
STD-17-98	BOX BRIDGE, 3 BARRELS AT 12', CLEAR HTS. 10' - 12', 0 - 60' FILL
STD-17-99	BOX BRIDGE, 3 BARRELS AT 14', CLEAR HTS. 5' - 7', 0 - 60' FILL
STD-17-100	BOX BRIDGE, 3 BARRELS AT 14', CLEAR HTS. 8' - 11', 0 - 60' FILL
STD-17-101	BOX BRIDGE, 3 BARRELS AT 14', CLEAR HTS. 12' - 14', 0 - 60' FILL
STD-17-102	BOX BRIDGE, 3 BARRELS AT 16', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-103	BOX BRIDGE, 3 BARRELS AT 16', CLEAR HTS. 9' - 12', 0 - 60' FILL
STD-17-104	BOX BRIDGE, 3 BARRELS AT 16', CLEAR HTS. 13' - 16', 0 - 60' FILL
STD-17-105	BOX BRIDGE, 3 BARRELS AT 18', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-106	BOX BRIDGE, 3 BARRELS AT 18', CLEAR HTS. 9' - 11', 0 - 60' FILL
STD-17-107	BOX BRIDGE, 3 BARRELS AT 18', CLEAR HTS. 12' - 14', 0 - 60' FILL
STD-17-108	BOX BRIDGE, 3 BARRELS AT 18', CLEAR HTS. 15' - 18', 0 - 60' FILL
STD-17-111	SLAB BRIDGE, 1 BARREL AT 6', CLEAR HTS. 3' - 6', 0 - 60' FILL
STD-17-112	SLAB BRIDGE, 1 BARREL AT 8', CLEAR HTS. 3' - 5', 0 - 60' FILL
STD-17-113	SLAB BRIDGE, 1 BARREL AT 8', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-114	SLAB BRIDGE, 1 BARREL AT 10', CLEAR HTS. 4' - 6', 0 - 60' FILL
STD-17-115	SLAB BRIDGE, 1 BARREL AT 10', CLEAR HTS. 7' - 10', 0 - 60' FILL
STD-17-116	SLAB BRIDGE, 1 BARREL AT 12', CLEAR HTS. 4' - 6', 0 - 60' FILL
STD-17-117	SLAB BRIDGE, 1 BARREL AT 12', CLEAR HTS. 7' - 9', 0 - 60' FILL
STD-17-118	SLAB BRIDGE, 1 BARREL AT 12', CLEAR HTS. 10' - 12', 0 - 60' FILL

STD-17-119	SLAB BRIDGE, 1 BARREL AT 14', CLEAR HTS. 5' - 7', 0 - 60' FILL
STD-17-120	SLAB BRIDGE, 1 BARREL AT 14', CLEAR HTS. 8' - 11', 0 - 60' FILL
STD-17-121	SLAB BRIDGE, 1 BARREL AT 14', CLEAR HTS. 12' - 14', 0 - 60' FILL
STD-17-122	SLAB BRIDGE, 1 BARREL AT 16', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-123	SLAB BRIDGE, 1 BARREL AT 16', CLEAR HTS. 9' - 12', 0 - 60' FILL
STD-17-124	SLAB BRIDGE, 1 BARREL AT 16', CLEAR HTS. 13' - 16', 0 - 60' FILL
STD-17-125	SLAB BRIDGE, 1 BARREL AT 18', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-126	SLAB BRIDGE, 1 BARREL AT 18', CLEAR HTS. 9' - 11', 0 - 60' FILL
STD-17-127	SLAB BRIDGE, 1 BARREL AT 18', CLEAR HTS. 12' - 14', 0 - 60' FILL
STD-17-128	SLAB BRIDGE, 1 BARREL AT 18', CLEAR HTS. 15' - 18', 0 - 60' FILL
STD-17-131	SLAB BRIDGE, 2 BARRELS AT 6', CLEAR HTS. 3' - 6', 0 - 60' FILL
STD-17-132	SLAB BRIDGE, 2 BARRELS AT 8', CLEAR HTS. 3' - 5', 0 - 60' FILL
STD-17-133	SLAB BRIDGE, 2 BARRELS AT 8', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-134	SLAB BRIDGE, 2 BARRELS AT 10', CLEAR HTS. 4' - 6', 0 - 60' FILL
STD-17-135	SLAB BRIDGE, 2 BARRELS AT 10', CLEAR HTS. 7' - 10', 0 - 60' FILL
STD-17-136	SLAB BRIDGE, 2 BARRELS AT 12', CLEAR HTS. 4' - 6', 0 - 60' FILL
STD-17-137	SLAB BRIDGE, 2 BARRELS AT 12', CLEAR HTS. 7' - 9', 0 - 60' FILL
STD-17-138	SLAB BRIDGE, 2 BARRELS AT 12', CLEAR HTS. 10' - 12', 0 - 60' FILL
STD-17-139	SLAB BRIDGE, 2 BARRELS AT 14', CLEAR HTS. 5' - 7', 0 - 60' FILL
STD-17-140	SLAB BRIDGE, 2 BARRELS AT 14', CLEAR HTS. 8' - 11', 0 - 60' FILL
STD-17-141	SLAB BRIDGE, 2 BARRELS AT 14', CLEAR HTS. 12' - 14', 0 - 60' FILL
STD-17-142	SLAB BRIDGE, 2 BARRELS AT 16', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-143	SLAB BRIDGE, 2 BARRELS AT 16', CLEAR HTS. 9' - 12', 0 - 60' FILL
STD-17-144	SLAB BRIDGE, 2 BARRELS AT 16', CLEAR HTS. 13' - 16', 0 - 60' FILL
STD-17-145	SLAB BRIDGE, 2 BARRELS AT 18', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-146	SLAB BRIDGE, 2 BARRELS AT 18', CLEAR HTS. 9' - 11', 0 - 60' FILL
STD-17-147	SLAB BRIDGE, 2 BARRELS AT 18', CLEAR HTS. 12' - 14', 0 - 60' FILL

STD-17-148	SLAB BRIDGE, 2 BARRELS AT 18', CLEAR HTS. 15' - 18', 0 - 60' FILL
STD-17-151	SLAB BRIDGE, 3 BARRELS AT 6', CLEAR HTS. 3' - 6', 0 - 60' FILL
STD-17-152	SLAB BRIDGE, 3 BARRELS AT 8', CLEAR HTS. 3' - 5', 0 - 60' FILL
STD-17-153	SLAB BRIDGE, 3 BARRELS AT 8', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-154	SLAB BRIDGE, 3 BARRELS AT 10', CLEAR HTS. 4' - 6', 0 - 60' FILL
STD-17-155	SLAB BRIDGE, 3 BARRELS AT 10', CLEAR HTS. 7' - 10', 0 - 60' FILL
STD-17-156	SLAB BRIDGE, 3 BARRELS AT 12', CLEAR HTS. 4' - 6', 0 - 60' FILL
STD-17-157	SLAB BRIDGE, 3 BARRELS AT 12', CLEAR HTS. 7' - 9', 0 - 60' FILL
STD-17-158	SLAB BRIDGE, 3 BARRELS AT 12', CLEAR HTS. 10' - 12', 0 - 60' FILL
STD-17-159	SLAB BRIDGE, 3 BARRELS AT 14', CLEAR HTS. 5' - 7', 0 - 60' FILL
STD-17-160	SLAB BRIDGE, 3 BARRELS AT 14', CLEAR HTS. 8' - 11', 0 - 60' FILL
STD-17-161	SLAB BRIDGE, 3 BARRELS AT 14', CLEAR HTS. 12' - 14', 0 - 60' FILL
STD-17-162	SLAB BRIDGE, 3 BARRELS AT 16', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-163	SLAB BRIDGE, 3 BARRELS AT 16', CLEAR HTS. 9' - 12', 0 - 60' FILL
STD-17-164	SLAB BRIDGE, 3 BARRELS AT 16', CLEAR HTS. 13' - 16', 0 - 60' FILL
STD-17-165	SLAB BRIDGE, 3 BARRELS AT 18', CLEAR HTS. 6' - 8', 0 - 60' FILL
STD-17-166	SLAB BRIDGE, 3 BARRELS AT 18', CLEAR HTS. 9' - 11', 0 - 60' FILL
STD-17-167	SLAB BRIDGE, 3 BARRELS AT 18', CLEAR HTS. 12' - 14', 0 - 60' FILL
STD-17-168	SLAB BRIDGE, 3 BARRELS AT 18', CLEAR HTS. 15' - 18', 0 - 60' FILL

BRIDGE APPURTENANCES ENGLISH (BRIDGE REPAIRS)

SBR–2–115	01–04–96	GENERAL NOTES AND DETAILS FOR EXPANSION JOINT REPLACEMENT CONSTRUCTION TYPES "A" THRU "J" - 1991
SBR–2–116	01–04–96	GENERAL DETAILS FOR STRIPSEAL EXPANSION JOINT REPLACEMENTCONSTRUCTION DETAILS TYPES "A" THRU "J" - 1991
SBR–2–117	05–30–96	STRIPSEAL EXPEANSION JOINTS – REPLACEMENT CONSTRUCTION DETAILS TYPE "A" AND TYPE "B" - 1991
SBR–2–118	05–30–96	STRIPSEAL EXPANSION JOINT REPLACEMENT CONSTRUCTION DETAILS TYPE "C" AND TYPE "D" - 1991
SBR–2–119	05–30–96	STRIPSEAL EXPANSION JOINT REPLACEMENT

		CONSTRUCTION DETAILS TYPE “E” AND TYPE “F” - 1991
SBR–2–120	05–30–96	STRIPSEAL EXPANSION JOINT REPLACEMENT CONSTRUCTION DETAILS TYPE “G” AND “H” - 1991
SBR–2–121	01–04–96	STRIPSEAL EXPANSION JOINT REPLACEMENT CONSTRUCTION DETAILS TYPE “J” - 1991
SBR–2–122	01–04–96	DETAILS FOR PRECAST SLAB BRIDGE CHANNELS, SPANS 16’ – 0” THRU 34’ – 0”, DEGREE OF SKEW 90 - 75 - 60 - 45 - 1992
SBR–2–123	01–04–96	DETAILS FOR PRECAST SLAB BRIDGE CHANNELS, SPANS 16’ – 0” THRU 34’ -0”, DEGREE OF SKEW 90 - 75 - 60 - 45 - 1992
SBR–2–124	01–04–96	DETAILS SHOWING REPLACEMENT OF EXISTING BRIDGERAIL SYSTEM WITH NEW JERSEY SHAPE CONCRETE PARAPET AND NEW 10’ -2” ENDPOST - 1988
SBR–2–125	11–05–01	DETAILS SHOWING REPLACEMENT OF EXISTING BRIDGERAIL SYSTEM WITH NEW JERSEY SHAPE CONCRETE PARAPET AND NEW 10’ -2” ENDPOST - 1988
SBR–2–126	01–04–96	DETAILS SHOWING REPLACEMENT OF EXISTING BRIDGERAIL SYSTEM WITH NEW JERSEY SHAPE CONCRETE PARAPET AND NEW 10’ -2” ENDPOST - 1988
SBR–2–127	11–05–01	DETAILS SHOWING PIER PROTECTION WITH NEW CONCRETE BARRIER WALL - 1988
SBR–2–128	01–04–96	DETAILS SHOWING PIER PROTECTION WITH NEW CONCRETE BARRIER WALL - 1988
SBR–2–129	11–05–01	DETAILS SHOWING PIER PROTECTION WITH NEW VERTICAL CONCRETE BARRIER - 1988
SBR–2–130	01–04–96	DETAILS SHOWING PIER PROTECTION WITH NEW VERTICAL CONCRETE BARRIER - 1988
SBR–2–131	01–22–02	DETAILS SHOWING GUARDRAIL ATTACHMENT AT BRIDGE ENDS TO EXISTING CONCRETE SLOPE FACE ENDPOST - 1989
SBR–2–132	01–04–96	DETAILS SHOWING GUARDRAIL ATTACHMENT AT BRIDGE ENDS EXISTING CONCRETE SLOPE FACE ENDPOST - 1989
SBR–2–133	01–22–02	DETAILS SHOWING GUARDRAIL ATTACHMENT AT BRIDGE ENDS TO EXISTING CONCRETE VERTICAL FACE ENDPOST – 1989
SBR–2–134	01–04-96	DETAILS SHOWING GUARDRAIL ATTACHMENT AT BRIDGE ENDS TO EXISTING CONCRETE VERTICAL FACE ENDPOST - 1989
SBR–2–135	01–22–02	GUARDRAIL ATACHMENT TO EXISTING PIER PROTECTION – 1991

SBR–2–136	11–05–01	STANDARD DRAWING FOR REPLACING EXISTING CONCRETE ENDPOST AND GUARDRAIL AT EXISTING BRIDGE ENDS - 1992
SBR–2–137	11–05–01	STANDARD SHOWING DETAILS FOR ATTACHING NEW GUARDRAIL TO EXISTING END OF BRIDGE - 1992
SBR–2–138	11–05–01	STANDARD SHOWING DETAILS FOR ATTACHING NEW GUARDRAIL AT EXISTING BRIDGE END AND ALONG EXISTING BRIDGE RAIL - 1992
SBR–2–140	11–05–01	STANDARD SHOWING DETAILS FOR ATTACHING NEW GUARDRAIL ALONG EXISTING BRIDGE RAILS - 1992
SBR–2–144	01–22–02	STANDARD SHOWING DETAILS OF ATTACHING GUARDRAIL BRIDGERAIL TO TOP OF EXISTING CURBS - 1992

SECTION VI – GENERAL NOTES AND SPECIAL NOTES

CHAPTER 1 – GENERAL NOTES

CHAPTER 2 – SPECIAL NOTES

SECTION VI – GENERAL NOTES AND SPECIAL NOTES

CHAPTER 1 – GENERAL NOTES

6-100.00 GRADING

(1) ANY AREA THAT IS DISTURBED OUTSIDE LIMITS OF CONSTRUCTION DURING THE LIFE OF THIS PROJECT SHALL BE REPAIRED BY THE CONTRACTOR AT HIS EXPENSE.

(2) CERTIFICATION FOR ALL BORROW PITS MUST BE OBTAINED IN ACCORDANCE WITH SUBSECTION 107.06 OF THE STANDARD SPECIFICATIONS.

(3) THE CONTRACTOR SHALL NOT DISPOSE OF ANY MATERIAL EITHER ON OR OFF STATE-OWNED R.O.W. IN A REGULATORY FLOOD WAY AS DEFINED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY WITHOUT APPROVAL BY SAME. ALL MATERIAL SHALL BE DISPOSED OF IN UPLAND (NON-WETLAND) AREAS AND ABOVE ORDINARY HIGH WATER OF ANY ADJACENT WATERCOURSE. THIS DOES NOT ELIMINATE THE NEED TO OBTAIN ANY OTHER LICENSES OR PERMITS THAT MAY BE REQUIRED BY ANY OTHER FEDERAL, STATE OR LOCAL AGENCY.

(4) ARCHAEOLOGICAL SITE NO. _____ MUST BE AVOIDED AS A SOURCE OF FILL OR HEAVY MACHINERY STAGING AREA. EARTH FILL WILL BE REQUIRED FROM AREAS OUTSIDE THE PROPOSED RIGHT-OF-WAY. CERTIFICATION MUST BE OBTAINED IN ACCORDANCE WITH SUBSECTION 107.06 OF THE STANDARD SPECIFICATIONS.

6-105.00 SEEDING AND SODDING

(1) ALL EXISTING ROADS WITHIN THE RIGHT-OF-WAY AND NOT IN THE GRADED AREA THAT ARE TO BE ABANDONED SHALL BE SCARIFIED, OBLITERATED, TOPSOILED AND SEEDED. SCARIFYING AND OBLITERATING THE PAVEMENT WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COST WILL BE INCLUDED IN THE COST OF OTHER ITEMS. TOPSOIL, IN ACCORDANCE WITH SECTION 203 OF THE STANDARD SPECIFICATIONS, WILL BE MEASURED AND PAID FOR UNDER ITEMS 203-04 AND/OR 203-07. SEEDING, IN ACCORDANCE WITH SECTION 801 OF THE STANDARD SPECIFICATIONS, WILL BE MEASURED AND PAID FOR UNDER ITEM 801-01.

(2) SOD SHALL BE PLACED AT LOCATIONS SHOWN ON THE PLANS TO PREVENT DAMAGE TO ADJACENT FACILITIES AND PROPERTY DUE TO EROSION ON ALL NEWLY GRADED CUT AND FILL SLOPES AS WORK PROGRESSES.

NOTE: SEE SECTION 4-801.05. NOTE (3) SHALL BE PLACED IN THE GENERAL NOTES WITH THE BLANK BEING FILLED IN WITH THE PROPER ITEM NUMBER

(3) ITEM NO. ____ SHALL BE USED ON SLOPES 3:1 OR STEEPER AND OTHER AREAS AS INDICATED IN THE PLANS THAT ARE INACCESSIBLE FOR MOWING.

(4) ITEM NO. 801-01, SEEDING (WITH MULCH), SHALL BE USED WHERE EROSION CONTROL BLANKET OR SOD ARE NOT APPLIED.

(5) ITEM NO. 801-02, SEEDING (WITHOUT MULCH) AND EROSION CONTROL BLANKET, SHALL BE PLACED AT LOCATIONS SHOWN ON THE PLANS AS WELL AS LOCATIONS DIRECTED BY THE ENGINEER.

6-110.00 GUARDRAIL

(1) THE CONTRACTOR SHALL NOT REMOVE ANY SECTIONS OF EXISTING GUARDRAIL TO REWORK SHOULDERS OR FLATTEN SLOPES UNTIL THE ENGINEER CONCURS IN THE NECESSITY OF REMOVAL DUE TO CONSTRUCTION REQUIREMENTS AND THE APPROPRIATE WARNING DEVICES ARE INSTALLED. THE PROPOSED GUARDRAIL, INCLUDING ANY ANCHOR SYSTEM, SHALL BE INSTALLED QUICKLY TO MINIMIZE TRAFFIC EXPOSURE TO ANY HAZARD. NO PAYMENT WILL BE MADE FOR A SECTION OF PROPOSED GUARDRAIL, INCLUDING ANCHORS, UNTIL IT IS COMPLETE IN PLACE.

NOTE: NOTE (2) NOT NECESSARY IF NOTE (1) IS USED.

(2) THE PROPOSED GUARDRAIL, INCLUDING ANY ANCHOR SYSTEM, SHALL BE INSTALLED QUICKLY TO MINIMIZE TRAFFIC EXPOSURE TO ANY HAZARD. NO PAYMENT WILL BE MADE FOR A SECTION OF PROPOSED GUARDRAIL, INCLUDING ANCHORS, UNTIL IT IS COMPLETE IN PLACE.

NOTE: NOTE (3) NOT NECESSARY IF NOTE (2) IS USED. IF BARRICADES OR DRUMS AND TYPE "A" LIGHTS ARE NOT ALREADY IN THE CONTRACT, BE SURE TO PROVIDE FOR PAYMENT.

(3) IF ANY APPROACH END OF A SECTION OF GUARDRAIL OR BRIDGE RAIL MUST TEMPORARILY BE LEFT INCOMPLETE AND EXPOSED TO TRAFFIC, THE CONTRACTOR SHALL USE TWO (2) TEMPORARY BARRICADES OR DRUMS WITH TYPE A LIGHTS AND ROUNDED END ELEMENTS AS MINIMUM MEASURES TO PROTECT TRAFFIC FROM THE HAZARD OF AN EXPOSED END. ALL COST OF FURNISHING AND INSTALLING A TEMPORARY ROUNDED END ELEMENT SHALL BE INCLUDED IN THE COST OF THE PROPOSED GUARDRAIL.

NOTE: NOTE (4) TO BE USED ON NEW ALIGNMENT ONLY.

(4) GUARDRAIL IS TO BE COMPLETE IN PLACE BEFORE THE MAINLINE ROADWAY IS OPENED TO TRAFFIC.

6-115.00 DRAINAGE

(1) THE CONTRACTOR SHALL SHAPE DITCHES TO THE SPECIFIED DESIGN. THIS WORK WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COST WILL BE INCLUDED IN THE COST OF OTHER ITEMS.

NOTE: SEE SECTION 4-204.00

(2) EXCAVATION FOR _____ WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT WILL BE INCLUDED IN THE PRICE BID PER LINEAR FOOT OF PIPE (PIPE CULVERTS, STORM SEWERS, CONDUITS, ALL OTHER CULVERTS AND MINOR STRUCTURES).

NOTE: SEE SECTION 4-204.05

(3) CULVERT EXCAVATION FOR CONCRETE BOX OR SLAB TYPE CULVERTS OR BRIDGES WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COST WILL BE INCLUDED IN THE COST OF OTHER ITEMS.

(4) THE CUTTING OF INLET AND OUTLET DITCHES WHERE SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER WILL BE MEASURED AND PAID FOR AS ITEM NO. 203-01 ROAD AND DRAINAGE EXCAVATION (UNCLASSIFIED).

(5) WHERE A CULVERT (PIPE, SLAB OR BOX) IS MOVED TO A NEW LOCATION OTHER THAN THAT SHOWN ON THE PLANS, INCREASING OR DECREASING THE AMOUNT OF CULVERT EXCAVATION, NO INCREASE OR DECREASE IN THE AMOUNT OF PAYMENT WILL BE MADE DUE TO SUCH CHANGE.

(6) DURING CONSTRUCTION OF DRAINAGE STRUCTURES ALL COST ASSOCIATED WITH MAINTAINING THE FLOW OF WATER AND TRAFFIC, AT THESE STRUCTURES, DURING THE PHASED CONSTRUCTION OF THIS PROJECT ARE TO BE INCLUDED IN THE UNIT PRICE OF THE DRAINAGE STRUCTURES AND TRAFFIC CONTROL ITEMS.

6-120.00 UTILITIES

(1) THE LOCATIONS OF UTILITIES SHOWN WITHIN THESE PLANS ARE APPROXIMATE ONLY. EXACT LOCATIONS SHALL BE DETERMINED IN THE FIELD BY CONTACTING THE UTILITY COMPANIES INVOLVED. NOTIFICATION BY CALLING THE TENNESSEE ONE CALL SYSTEM, INC., AT 1-800-351-1111 AS REQUIRED BY TCA 65-31-106 WILL BE REQUIRED.

(2) UNLESS OTHERWISE NOTED, ALL UTILITY ADJUSTMENTS WILL BE PERFORMED BY THE UTILITY OR IT'S REPRESENTATIVE. THE CONTRACTOR AND UTILITY OWNERS WILL BE REQUIRED TO COOPERATE WITH EACH OTHER IN ORDER TO EXPEDITE THE WORK REQUIRED BY THIS CONTRACT. ON CONTRACTS WHERE CONSTRUCTION STAKES, LINES, AND GRADES ARE CONTRACT ITEMS, THE CONTRACTOR WILL BE REQUIRED TO PROVIDE RIGHT-OF-WAY OR SLOPE STAKES, DITCH OR STREAM BED GRADES, OR OTHER ESSENTIAL SURVEY STAKING TO PREVENT CONFLICTS WITH THE HIGHWAY CONSTRUCTION. FREQUENTLY, THIS WILL BE REQUIRED AS THE FIRST ITEM OF WORK AND AT ANY LOCATION ON THE PROJECT DIRECTED BY THE ENGINEER.

(3) THE CONTRACTOR WILL PROVIDE ALL NECESSARY PROTECTIVE MEASURES TO SAFEGUARD EXISTING UTILITIES FROM DAMAGE DURING CONSTRUCTION OF THIS PROJECT. IN THE EVENT THAT SPECIAL EQUIPMENT IS REQUIRED TO WORK OVER AND AROUND THE UTILITIES, THE CONTRACTOR WILL BE REQUIRED TO FURNISH SUCH EQUIPMENT. THE COST OF PROTECTING UTILITIES FROM DAMAGE AND FURNISHING SPECIAL EQUIPMENT WILL BE INCLUDED IN THE PRICE BID FOR OTHER ITEMS OF CONSTRUCTION.

(4) PRIOR TO SUBMITTING HIS BID, THE CONTRACTOR WILL BE SOLELY RESPONSIBLE FOR CONTACTING OWNERS OF ALL AFFECTED UTILITIES IN ORDER TO DETERMINE THE EXTENT TO WHICH UTILITY RELOCATIONS AND/OR ADJUSTMENTS WILL HAVE UPON THE SCHEDULE OF WORK FOR THE PROJECT. WHILE SOME WORK MAY BE REQUIRED 'AROUND' UTILITY FACILITIES THAT WILL REMAIN IN PLACE, OTHER UTILITY FACILITIES MAY NEED TO BE ADJUSTED CONCURRENTLY WITH THE CONTRACTOR'S OPERATIONS. ADVANCE CLEAR CUTTING MAY BE REQUIRED BY THE ENGINEER AT ANY LOCATION WHERE CLEARING IS CALLED FOR IN THE SPECIFICATIONS AND CLEAR CUTTING IS NECESSARY FOR A UTILITY RELOCATION. ANY ADDITIONAL COST WILL BE INCLUDED IN THE UNIT PRICE BID FOR THE CLEARING ITEM SPECIFIED IN THE PLANS.

(5) THE CONTRACTOR SHALL NOTIFY EACH INDIVIDUAL UTILITY OWNER OF HIS PLAN OF OPERATION IN THE AREA OF THE UTILITIES. PRIOR TO COMMENCING WORK, THE CONTRACTOR SHALL CONTACT THE UTILITY OWNERS AND REQUEST THEM TO PROPERLY LOCATE THEIR RESPECTIVE UTILITY ON THE GROUND. THIS NOTIFICATION SHALL BE GIVEN AT LEAST THREE (3) BUSINESS DAYS PRIOR TO COMMENCEMENT OF OPERATIONS AROUND THE UTILITY IN ACCORDANCE WITH TCA 65-31-106.

6-125.00 FENCING

(1) LOCATION OF THE FENCE SHALL BE ONE FOOT INSIDE THE RIGHT-OF-WAY EXCEPT WHERE SHOWN ON THE PLANS.

(2) FENCES SHALL BE TURNED IN AT DRAINAGE STRUCTURES, STOCK PASSES AND BRIDGES WHERE DIRECTED BY THE ENGINEER SO AS TO ABUT WINGWALLS AND/OR ABUTMENTS.

(3) THE CONTRACTOR SHALL GIVE THE AFFECTED PROPERTY OWNERS TWO WEEKS NOTICE PRIOR TO CUTTING FENCES.

(4) THE CONTRACTOR SHALL BE REQUIRED TO INSTALL ACCESS CONTROL FENCES PRIOR TO CUTTING EXISTING STOCK FENCES IN AREAS UTILIZED BY DOMESTIC LIVESTOCK OR OTHER AREAS AS DIRECTED BY THE ENGINEER.

6-130.00 MISCELLANEOUS

(1) ALL DETOUR, ACCESS, SERVICE AND FRONTAGE ROADS SHALL BE CONSTRUCTED WITH A MINIMUM OF ONE (1) COURSE OF BASE MATERIAL BEFORE TRAFFIC IS INTERRUPTED ON EXISTING ROADS.

(2) THE CONTRACTOR SHALL BE REQUIRED TO REMOVE AND RESET MAILBOXES WHERE AND AS DIRECTED BY THE ENGINEER.

(3) NOTHING IN THE GENERAL NOTES OR SPECIAL PROVISIONS SHALL RELIEVE THE CONTRACTOR FROM HIS RESPONSIBILITIES TOWARD THE SAFETY AND CONVENIENCE OF THE GENERAL PUBLIC AND THE RESIDENTS ALONG THE PROPOSED CONSTRUCTION AREA

6-135.00 ROAD CLOSURE

(1) NO LESS THAN SEVEN (7) DAYS PRIOR TO THE CLOSURE OF THE ROAD, THE CONTRACTOR SHALL NOTIFY THE FOLLOWING INDIVIDUALS OR AGENCIES COMPLETELY DESCRIBING THE AFFECTED ROADS AND THE APPROXIMATE DURATION OF THE CONSTRUCTION: THESE PARTIES INCLUDE, BUT ARE NOT LIMITED TO: (1) LOCAL LAW ENFORCEMENT OFFICE, (2) LOCAL FIRE DEPARTMENT, (3) AMBULANCE SERVICE, (4) LOCAL SCHOOL SUPERINTENDENT, (5) UNITED STATES POSTAL SERVICE, AND (6) LOCAL ROAD SUPERINTENDENT.

6-140.00 RIGHT – OF – WAY

NOTE: SEE SECTION 2-300.00. NOTES (1) OR (2) TO BE USED ON ALL ROW PROJECTS.

NOTE: NOTE (1) TO BE USED FOR PLANS PREPARED OR MANAGED IN THE HEADQUARTERS DESIGN OFFICE.

(1) IT IS INTENDED THAT ALL BUILDINGS AND/OR PORTIONS OF BUILDINGS THAT ARE WITHIN THE PROPOSED RIGHT-OF-WAY AND/OR EASEMENT LINES FOR THE PROJECT BE REMOVED THERE FROM IN THE PROCESS OF RIGHT-OF-WAY ACQUISITION. IF ANY SUCH BUILDINGS OR IMPROVEMENTS ARE NOT REMOVED IN THE COURSE OF RIGHT-OF-WAY ACQUISITION, THE CIVIL ENGINEERING MANAGER 2, DESIGN DIVISION IS TO BE NOTIFIED IN SUFFICIENT TIME TO PERMIT HAVING SUCH REMOVALS DESIGNATED AS A PART OF THE CONSTRUCTION CONTRACT.

NOTE: NOTE (2) TO BE USED FOR PLANS PREPARED OR MANAGED IN THE REGIONAL DESIGN OFFICES.

(2) IT IS INTENDED THAT ALL BUILDINGS AND/OR PORTIONS OF BUILDINGS THAT ARE WITHIN THE PROPOSED RIGHT-OF-WAY AND/OR EASEMENT LINES FOR THE PROJECT BE REMOVED THERE FROM IN THE PROCESS OF RIGHT-OF-WAY ACQUISITION. IF ANY SUCH BUILDINGS OR IMPROVEMENTS ARE NOT REMOVED IN THE COURSE OF RIGHT-OF-WAY ACQUISITION, THE CIVIL ENGINEERING MANAGER 2, DESIGN DIVISION AND THE CIVIL ENGINEERING MANAGER 1, REGIONAL DESIGN OFFICE, ARE TO BE NOTIFIED IN SUFFICIENT TIME TO PERMIT HAVING SUCH REMOVALS DESIGNATED AS A PART OF THE CONSTRUCTION CONTRACT.

(3) ALL RAMPS MUST CONFORM TO THE DEPARTMENT'S "POLICY ON FINANCING CONSTRUCTION OF PUBLIC ROAD INTERSECTIONS AND DRIVEWAYS ON HIGHWAY RESURFACING, RECONSTRUCTION AND CONSTRUCTION PROJECTS ON NEW LOCATIONS", THE MANUAL ON RULES AND REGULATIONS FOR CONSTRUCTING DRIVEWAYS ON STATE HIGHWAY RIGHT-OF-WAY, STANDARD DRAWING RP-R-1, AND OTHER ACCEPTED DESIGN AND SAFETY STANDARDS.

NOTE: SEE SECTION 2-300.05. NOTES (4) THROUGH (8) ARE TO BE USED ON NEW OR RECONSTRUCTION PROJECTS WITH PARTIAL ACCESS CONTROL. NOTES (4) THROUGH (7) AND NOTE (9) GO ON ALL NEW OR RECONSTRUCTION PROJECTS WITH NO ACCESS CONTROL.

(4) EXISTING PAVED DRIVEWAY PER TRACT REMAINDER WILL BE REPLACED IN KIND TO A TOUCHDOWN POINT.

(5) WHERE THE EXISTING DRIVEWAY IS UNPAVED AND THE PROPOSED DRIVEWAY EXCEEDS 7 PERCENT IN GRADE, EACH DRIVEWAY WILL BE PAVED TO A TOUCHDOWN POINT OR UNTIL THE GRADE IS LESS THAN 7 PERCENT.

(6) WHERE THE EXISTING DRIVEWAY IS UNPAVED AND THE PROPOSED DRIVEWAY IS LESS THAN 7 PERCENT IN GRADE, EACH DRIVEWAY WILL BE PAVED A SHOULDER WIDTH FROM THE EDGE OF PAVEMENT AND THE REMAINDER OF THAT DRIVEWAY REPLACED IN KIND TO A TOUCHDOWN POINT.

(7) ANY NECESSARY PAVING OF DRIVEWAYS WILL BE DONE DURING PAVING OPERATIONS ON THE MAIN ROADWAY.

(8) TRACT REMAINDERS NOT HAVING AN EXISTING DRIVEWAY WILL BE PROVIDED ONE 50-FOOT OPENING IN THE ACCESS CONTROL FENCE AND A DRIVEWAY WILL BE CONSTRUCTED UNLESS ACCESS IS PROVIDED FROM AN INTERSECTING ROAD OR BASED ON PHYSICAL CONDITIONS AND/OR CONFLICTS WITH OTHER DESIGN CONSIDERATIONS WHICH PREVENT AN ACCESS OPENING. PAVING OF THESE NEW DRIVEWAYS WILL BE IN ACCORDANCE TO THE 7 PERCENT CRITERIA PREVIOUSLY MENTIONED FOR EXISTING DRIVEWAYS.

(9) NEW DRIVEWAYS PROVIDED IN THE PLANS WILL BE PAVED BASED ON THE 7 PERCENT CRITERIA. THOSE 7 PERCENT OR STEEPER IN GRADE WILL BE PAVED AND THOSE FLATTER THAN 7 PERCENT WILL BE COVERED WITH BASE STONE.

NOTE: SEE SECTION 2-300.05. NOTES (10) AND (11) GO ON PROJECTS THAT ARE ON STATE ROUTES AND NOTE (12) GOES ON PROJECTS THAT ARE NOT ON STATE ROUTES.

(10) ON PROJECTS WITHOUT CURB AND GUTTER THAT ARE ON STATE ROUTES, IT WILL BE THE RESPONSIBILITY OF THE OWNER TO SECURE A PERMIT AND TO CONSTRUCT ADDITIONAL DRIVEWAYS AND FIELD ENTRANCES OTHER THAN THOSE PROVIDED IN THE PLANS.

(11) ON PROJECTS WITH CURB AND GUTTER THAT ARE ON STATE ROUTES, IT WILL BE THE RESPONSIBILITY OF THE OWNER TO SECURE A PERMIT. AFTER THE PERMIT HAS BEEN GRANTED, THE DEPARTMENT WILL CONSTRUCT THE DRIVEWAY OR FIELD ENTRANCE THROUGH THE CURB AND SIDEWALK, PROVIDED THE CURB AND SIDEWALK HAVE NOT BEEN CONSTRUCTED. IT WILL BE THE RESPONSIBILITY OF THE PROPERTY OWNER TO CONSTRUCT THE DRIVEWAY OR FIELD ENTRANCE FROM BACK OF SIDEWALK TO TOUCHDOWN POINT FOR ANY ADDITIONAL DRIVEWAYS OR FIELD ENTRANCES OTHER THAN THOSE PROVIDED IN THE PLANS.

(12) ON NON-STATE ROUTES, ADDITIONAL DRIVEWAYS AND FIELD ENTRANCES OTHER THAN THOSE PROVIDED IN THE PLANS SHALL

REQUIRE A PERMIT ONLY IF THE LOCAL AGENCY SPECIFIES THE NEED FOR THAT PERMIT.

NOTE: SEE SECTION 1-210.05.

(13) EASEMENT REQUIRED FOR THE RAILROAD CROSSING IS TO BE OBTAINED BY THE UTILITIES ENGINEER BY PROVISIONS CONTAINED IN THE CROSSING AGREEMENT NEGOTIATED WITH THE RAILROAD.

6-145.00 PAVEMENT MARKINGS

NOTE: SEE SECTION 4-716.05 THROUGH 4-716.36.

TEMPORARY PAVEMENT MARKING ON INTERMEDIATE LAYERS

(1) TEMPORARY PAVEMENT LINE MARKINGS ON INTERMEDIATE LAYERS OF PAVEMENT SHALL BE REFLECTIVE TAPE OR REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAYS WORK. SHORT, UNMARKED SECTIONS SHALL NOT BE ALLOWED. THESE MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 716-05.01, PAINTED PAVEMENT MARKING (4" LINE), L.M.

(2) TEMPORARY PAVEMENT LINE MARKINGS ON INTERMEDIATE LAYERS OF PAVEMENT SHALL BE REFLECTIVE TAPE OR REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAYS WORK. SHORT, UNMARKED SECTIONS SHALL NOT BE ALLOWED. THESE MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 716-05.20, PAINTED PAVEMENT MARKING (6" LINE), L.M.

(3) TEMPORARY PAVEMENT LINE MARKINGS ON INTERMEDIATE LAYERS OF PAVEMENT SHALL BE REFLECTIVE TAPE OR REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAYS WORK. SHORT, UNMARKED SECTIONS SHALL NOT BE ALLOWED. THESE MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 716-05.02, PAINTED PAVEMENT MARKING (8" BARRIER LINE), L.F.

(4) WIDE (8 INCH) TEMPORARY PAVEMENT MARKING LINE WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 716-05.02 PAINTED PAVEMENT MARKING (8" BARRIER LINE), LIN. FT.

FINAL PAVEMENT MARKING IF 4" ENHANCED FLATLINE THERMOPLASTIC IS USED

(5) PERMANENT PAVEMENT LINE MARKINGS SHALL BE 4" ENHANCED FLATLINE THERMOPLASTIC INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK. SHORT UNMARKED SECTIONS SHALL NOT BE ALLOWED. PAVEMENT MARKINGS WILL BE MEASURED AND PAID

FOR UNDER ITEM NO. 716-12.01, ENHANCED FLATLINE THERMO PVMT MRKNG (4IN LINE), L.M. THE CONTRACTOR SHALL HAVE THE OPTION OF USING REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK AND THEN INSTALLING THE PERMANENT MARKINGS AFTER THE PAVING OPERATION IS COMPLETED. THE TEMPORARY MARKINGS FOR THE FINAL SURFACE WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COSTS ARE TO BE INCLUDED IN THE PRICE BID FOR THE PERMANENT MARKINGS.

FINAL PAVEMENT MARKING IF 6" ENHANCED FLATLINE THERMOPLASTIC IS USED

(6) PERMANENT PAVEMENT LINE MARKINGS SHALL BE 6" ENHANCED FLATLINE THERMOPLASTIC INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK. SHORT UNMARKED SECTIONS SHALL NOT BE ALLOWED. PAVEMENT MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 716-12.02, ENHANCED FLATLINE THERMO PVMT MRKNG (6IN LINE), L.M. THE CONTRACTOR SHALL HAVE THE OPTION OF USING REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK AND THEN INSTALLING THE PERMANENT MARKINGS AFTER THE PAVING OPERATION IS COMPLETED. THE TEMPORARY MARKINGS FOR THE FINAL SURFACE WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COSTS ARE TO BE INCLUDED IN THE PRICE BID FOR THE PERMANENT MARKINGS.

FINAL PAVEMENT MARKING IF 8" ENHANCED FLATLINE THERMOPLASTIC IS USED

(7) PERMANENT PAVEMENT LINE MARKINGS SHALL BE 8" ENHANCED FLATLINE THERMOPLASTIC INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK. SHORT UNMARKED SECTIONS SHALL NOT BE ALLOWED. PAVEMENT MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 716-12.03, ENHANCED FLATLINE THERMO PVMT MRKNG (8IN BARRIER LINE), L.F. THE CONTRACTOR SHALL HAVE THE OPTION OF USING REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK AND THEN INSTALLING THE PERMANENT MARKINGS AFTER THE PAVING OPERATION IS COMPLETED. THE TEMPORARY MARKINGS FOR THE FINAL SURFACE WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COSTS ARE TO BE INCLUDED IN THE PRICE BID FOR THE PERMANENT MARKINGS.

FINAL PAVEMENT MARKING IF 4" SPRAY THERMOPLASTIC (60 mil) IS USED

(8) PERMANENT PAVEMENT LINE MARKINGS SHALL BE 4" SPRAY THERMOPLASTIC (60 mil) INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK. SHORT UNMARKED SECTIONS SHALL

NOT BE ALLOWED. PAVEMENT MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 716-13.01, SPRAY THERMO PVMT MRKNG (60 mil) (4IN LINE), L.M. THE CONTRACTOR SHALL HAVE THE OPTION OF USING REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK AND THEN INSTALLING THE PERMANENT MARKINGS AFTER THE PAVING OPERATION IS COMPLETED. THE TEMPORARY MARKINGS FOR THE FINAL SURFACE WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COSTS ARE TO BE INCLUDED IN THE PRICE BID FOR THE PERMANENT MARKINGS.

FINAL PAVEMENT MARKING IF 6" SPRAY THERMOPLASTIC (60 mil) IS USED

(9) PERMANENT PAVEMENT LINE MARKINGS SHALL BE 6" SPRAY THERMOPLASTIC (60 mil) INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK. SHORT UNMARKED SECTIONS SHALL NOT BE ALLOWED. PAVEMENT MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 716-13.02, SPRAY THERMO PVMT MRKNG (60 mil) (6IN LINE), L.M. THE CONTRACTOR SHALL HAVE THE OPTION OF USING REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK AND THEN INSTALLING THE PERMANENT MARKINGS AFTER THE PAVING OPERATION IS COMPLETED. THE TEMPORARY MARKINGS FOR THE FINAL SURFACE WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COSTS ARE TO BE INCLUDED IN THE PRICE BID FOR THE PERMANENT MARKINGS.

FINAL PAVEMENT MARKING IF 8" SPRAY THERMOPLASTIC (60 mil) IS USED

(10) PERMANENT PAVEMENT LINE MARKINGS SHALL BE 8" SPRAY THERMOPLASTIC (60 mil) INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK. SHORT UNMARKED SECTIONS SHALL NOT BE ALLOWED. PAVEMENT MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 716-13.03, SPRAY THERMO PVMT MRKNG (60 mil) (8IN BARRIER LINE), L.F. THE CONTRACTOR SHALL HAVE THE OPTION OF USING REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK AND THEN INSTALLING THE PERMANENT MARKINGS AFTER THE PAVING OPERATION IS COMPLETED. THE TEMPORARY MARKINGS FOR THE FINAL SURFACE WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COSTS ARE TO BE INCLUDED IN THE PRICE BID FOR THE PERMANENT MARKINGS.

FINAL PAVEMENT MARKING IF 4" SPRAY THERMOPLASTIC (40 mil) IS USED

(11) PERMANENT PAVEMENT LINE MARKINGS SHALL BE 4" SPRAY THERMOPLASTIC (40 mil) INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK. SHORT UNMARKED SECTIONS SHALL NOT BE ALLOWED. PAVEMENT MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 716-13.06, SPRAY THERMO PVMT MRKNG (40 mil)

(4IN LINE), L.M. THE CONTRACTOR SHALL HAVE THE OPTION OF USING REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK AND THEN INSTALLING THE PERMANENT MARKINGS AFTER THE PAVING OPERATION IS COMPLETED. THE TEMPORARY MARKINGS FOR THE FINAL SURFACE WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COSTS ARE TO BE INCLUDED IN THE PRICE BID FOR THE PERMANENT MARKINGS.

FINAL PAVEMENT MARKING IF 6" SPRAY THERMOPLASTIC (40 mil) IS USED

(12) PERMANENT PAVEMENT LINE MARKINGS SHALL BE 6" SPRAY THERMOPLASTIC (40 mil) INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK. SHORT UNMARKED SECTIONS SHALL NOT BE ALLOWED. PAVEMENT MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 716-13.07, SPRAY THERMO PVMT MRKNG (40 mil) (6IN LINE), L.M. THE CONTRACTOR SHALL HAVE THE OPTION OF USING REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK AND THEN INSTALLING THE PERMANENT MARKINGS AFTER THE PAVING OPERATION IS COMPLETED. THE TEMPORARY MARKINGS FOR THE FINAL SURFACE WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COSTS ARE TO BE INCLUDED IN THE PRICE BID FOR THE PERMANENT MARKINGS.

FINAL PAVEMENT MARKING IF 8" SPRAY THERMOPLASTIC (40 mil) IS USED

(13) PERMANENT PAVEMENT LINE MARKINGS SHALL BE 8" SPRAY THERMOPLASTIC (40 mil) INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK. SHORT UNMARKED SECTIONS SHALL NOT BE ALLOWED. PAVEMENT MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 716-13.08, SPRAY THERMO PVMT MRKNG (40 mil) (8IN BARRIER LINE), L.F. THE CONTRACTOR SHALL HAVE THE OPTION OF USING REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK AND THEN INSTALLING THE PERMANENT MARKINGS AFTER THE PAVING OPERATION IS COMPLETED. THE TEMPORARY MARKINGS FOR THE FINAL SURFACE WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COSTS ARE TO BE INCLUDED IN THE PRICE BID FOR THE PERMANENT MARKINGS.

FINAL PAVEMENT MARKING IF REFLECTORIZED PAINT IS USED

(14) PERMANENT PAVEMENT LINE MARKINGS SHALL BE REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH

DAY'S WORK. SHORT, UNMARKED SECTIONS SHALL NOT BE ALLOWED. THESE MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 716-05.01 PAINTED PAVEMENT MARKING (4IN LINE), L.M.

(15) PERMANENT PAVEMENT LINE MARKINGS SHALL BE REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK. SHORT, UNMARKED SECTIONS SHALL NOT BE ALLOWED. THESE MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 716-05.20 PAINTED PAVEMENT MARKING (6IN LINE), L.M.

(16) PERMANENT PAVEMENT LINE MARKINGS SHALL BE REFLECTORIZED PAINT INSTALLED TO PERMANENT STANDARDS AT THE END OF EACH DAY'S WORK. SHORT, UNMARKED SECTIONS SHALL NOT BE ALLOWED. THESE MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. 716-05.02 PAINTED PAVEMENT MARKING (8IN BARRIER LINE), L.F.

DETOURS, LANE SHIFTS AND MEDIAN CROSS-OVERS

(17) THE PAVEMENT MARKING ON THE _____(C)_____ FOR _____(D)_____WILL BE INSTALLED AND MAINTAINED TO THE SAME STANDARDS AS FOR PERMANENT MARKINGS ON THE MAIN ROADWAY. THESE MARKINGS SHALL BE IN PLACE PRIOR TO ALLOWING TRAFFIC ONTO THE PAVEMENT. THESE PAVEMENT MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM NO. _____(E)_____, LIN. MI.

(C) NOTE: FILL IN THE BLANK WITH APPROPRIATE WORDS(S) FOR THE SPECIAL ROADWAY(S): DETOUR, LANE SHIFT, MEDIAN CROSSOVER, ETC.

(D) NOTE: FILL IN THE BLANK WITH APPROPRIATE WORD(S) FOR THE KIND OF PAVEMENT MARKING(S) NEEDED: CENTERLINE, EDGELINES, LANE LINES.

(E) NOTE: SEE SECTIONS 4-712.10 AND 4-716.11. FILL IN THE BLANK WITH ITEM NO. 716-05.01 PAINTED PAVEMENT MARKING (4IN LINE), L.M., 716-05.20 PAINTED PAVEMENT MARKING (6IN LINE), L.M., OR ITEM NO. 716-05.02 PAINTED PAVEMENT MARKING (8IN BARRIER LINE), L.F.

(18) BEFORE OPENING THE _____(C)_____ TO TRAFFIC, THE TRANSITIONAL MARKINGS ON THE EXISTING ROADWAY MUST BE IN PLACE. THESE MARKINGS WILL BE MEASURED AND PAID FOR UNDER ITEM 712-09.01 REMOVABLE PAVEMENT MARKING LINE, LIN. FT. ALL EXISTING MARKINGS IN THE AREA OF THESE TRANSITIONAL MARKINGS SHALL BE OBLITERATED AND ALL EXISTING RAISED PAVEMENT MARKERS SHALL BE REMOVED TO ELIMINATE CONFLICTING MARKINGS. REMOVAL OF THE EXISTING CONFLICTING MARKINGS AND RAISED PAVEMENT

MARKERS WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COST WILL BE INCLUDED IN ITEM NO. 712-01 TRAFFIC CONTROL, LUMP SUM.

(C) NOTE: FILL IN THE BLANK WITH APPROPRIATE WORDS(S) FOR THE SPECIAL ROADWAY(S): DETOUR, LANE SHIFT, MEDIAN CROSSOVER, ETC.

(19) BEFORE OPENING THE _____(C)_____TO TRAFFIC, THE TRANSITIONAL MARKINGS ON THE EXISTING ROADWAY MUST BE IN PLACE. ALL EXISTING MARKINGS IN THE AREA OF THESE TRANSITIONAL MARKINGS SHALL BE OBLITERATED AND ALL EXISTING RAISED PAVEMENT MARKERS SHALL BE REMOVED TO ELIMINATE CONFLICTING MARKINGS. REMOVAL OF THE EXISTING CONFLICTING MARKINGS AND RAISED PAVEMENT MARKERS WILL NOT BE MEASURED AND PAID FOR DIRECTLY, BUT THE COST WILL BE INCLUDED IN ITEM NO. 712-01 TRAFFIC CONTROL, LUMP SUM.

(C) NOTE: FILL IN THE BLANK WITH APPROPRIATE WORDS(S) FOR THE SPECIAL ROADWAY(S): DETOUR, LANE SHIFT, MEDIAN CROSSOVER, ETC.

6-150.00 PAVEMENT

NOTE: NOTES (1), (2), (3), (4), (5), AND (8) ARE TO BE PLACED ON ALL RESURFACING PROJECTS ON ROADWAYS WITH SHOULDERS AND DITCHES (NO CURB AND GUTTER).

NOTE: NOTES (1), (2), (3), (6), (7), AND (8) ARE TO BE PLACED ON ALL RESURFACING PROJECTS ON ROADWAYS WITH URBAN CURB AND GUTTERS.

6-150.01 PAVING

(1) THE CONTRACTOR SHALL BE REQUIRED TO PAVE IN THE DIRECTION OF TRAFFIC.

(2) THE CONTRACTOR SHALL BE REQUIRED TO COLD PLANE AND PAVE IN THE DIRECTION OF TRAFFIC.

6-150.02 RESURFACING

NOTES (3) THROUGH (8) FOR RESURFACING ONLY

(3) WHERE DIRECTED BY THE TDOT ENGINEER, THE CONTRACTOR SHALL BE REQUIRED TO SHAPE PUBLIC SIDE ROADS, BUSINESS ENTRANCES, AND PRIVATE DRIVES, AS WELL AS CLEANING OF EXISTING DRAINS BEFORE PLACING MATERIALS. ALL COSTS ARE TO BE INCLUDED IN THE PRICE BID FOR OTHER ITEMS OF CONSTRUCTION.

(4) ALL PUBLIC SIDE ROADS SHALL BE PAVED ONE PAVER WIDTH THROUGH THE INTERSECTION AS A MINIMUM. A SATISFACTORY TRANSITION FROM THE NEW PAVEMENT TO THE EXISTING GRADE OF THE INTERSECTING PUBLIC ROAD OR BUSINESS ENTRANCE SHALL BE PROVIDED. SHOULD THE PAVEMENT OF THE INTERSECTING PUBLIC ROAD BE DISTRESSED, THE RESURFACING WIDTH MAY BE INCREASED TO THE NORMAL RIGHT OF WAY LINE.

(5) PRIVATE DRIVEWAYS, FIELD ENTRANCES, AND BUSINESS ENTRANCES WILL BE RESURFACED A PAVER WIDTH (LANE WIDTH) AS A MINIMUM. A PAVEMENT TAPER TO TRANSITION THE NEW PAVEMENT SHALL BE REQUIRED, IT SHALL BE BASED ON AN ADDITIONAL ONE FOOT OF WIDTH PER ONE INCH DEPTH OF PAVEMENT. IF THE SHOULDER IS NARROW ENOUGH THAT THE SUM OF THE SHOULDER AND THE TRANSITION ARE LESS THAN A PAVER WIDTH, THE TRANSITION SHALL OCCUR WITHIN THE PAVER WIDTH. IF THE SUM OF THE SHOULDER AND THE TRANSITION IS GREATER THAN A PAVER WIDTH (LANE WIDTH), THE TRANSITION SHALL OCCUR OUTSIDE OF THE PAVER WIDTH.

(6) ON CURB AND GUTTER SECTIONS, PUBLIC ROAD INTERSECTIONS SHALL BE RESURFACED TO THE END OF RADIUS. A SATISFACTORY TRANSITION FROM THE NEW PAVEMENT TO THE EXISTING GRADE OF THE INTERSECTING PUBLIC ROAD SHALL BE PROVIDED.

(7) ON URBAN TYPICAL SECTIONS, (CURB AND GUTTER), RESIDENTIAL DRIVEWAYS AND BUSINESS ENTRANCES SHALL HAVE A MINIMUM WIDTH OF MATERIAL NOT LESS THAN ONE FOOT USED IN THE TRANSITION TO FEATHER THE PAVEMENT EDGE.

(8) IN ALL CASES, THE LENGTH OF THE PAVEMENT TRANSITION, THE THICKNESS AND WIDTH OF THE RESURFACING AND ANY ADDITIONAL PAVEMENT MATERIALS SHALL BE AS DIRECTED BY THE TDOT ENGINEER.

6-155.00 GRADED SOLID ROCK

NOTE: IF A NOTE WORDED DIFFERENTLY FROM (1) IS SUPPLIED, THAT NOTE SHOULD BE USED. IF A MAXIMUM DIMENSION TWO FEET OR LESS IS SPECIFIED, NOTE (2) IS NOT NECESSARY; HOWEVER, IF A MAXIMUM DIMENSION GREATER THAN TWO FEET BUT NOT THREE FEET IS SPECIFIED, IT SHALL BE NECESSARY TO CONTACT THE CONSTRUCTION OFFICE FOR THE APPROPRIATE MAXIMUM DEPTH TO BE USED IN NOTE (2).

(1) THE ROCK FILL (GRADED SOLID ROCK) MATERIAL SHALL CONSIST OF SOUND, NON-DEGRADABLE LIMESTONE OR SANDSTONE WITH A MAXIMUM SIZE OF 3'-0". AT LEAST 50% (BY WEIGHT) OF THE ROCK SHALL BE UNIFORMLY DISTRIBUTED BETWEEN 1'-0" AND 3'-0" IN DIAMETER, AND NO GREATER THAN 10% (BY WEIGHT) SHALL BE LESS THAN 2" IN DIAMETER. THE MATERIAL SHALL BE ROUGHLY EQUIDIMENSIONAL; THIN, SLABBY

MATERIALS WILL NOT BE ACCEPTED. THE CONTRACTOR SHALL BE REQUIRED TO PROCESS THE MATERIAL WITH AN ACCEPTABLE MECHANICAL MEANS (A SCREENING PROCESS CAPABLE OF PRODUCING THE REQUIRED GRADATION). THE ROCK SHALL BE APPROVED BY A REPRESENTATIVE OF THE DIVISION OF MATERIALS AND TESTS BEFORE USE.

(2) THIS GRADED SOLID ROCK MATERIAL SHALL BE PLACED IN LAYERS NOT EXCEEDING FIVE FEET IN DEPTH.

6-160.00 RIPRAP

NOTES (1) AND (2) ARE NOT REQUIRED IF CLASS A-1, A-2, A-3, B, OR C MACHINED RIPRAP IS USED.

(1) MACHINED RIPRAP SHALL BE IN ACCORDANCE WITH SECTION 709 OF THE STANDARD SPECIFICATIONS EXCEPT AS MODIFIED BY THIS NOTE. MACHINED RIPRAP SHALL BE CLEAN SHOT ROCK CONTAINING NO SAND, DUST, OR ORGANIC MATERIALS AND SHALL VARY IN SIZE FROM __" TO __ '-__". THE STONE SIZES SHALL BE DISTRIBUTED UNIFORMLY THROUGHOUT THE SIZE RANGE WITH NO MORE THAN 20% OF THE MATERIAL (BY WEIGHT) LESS THAN __". THE THICKNESS OF THE STONE LAYER SHALL BE __'-__" (+/-3") AND THE SIZE GRADATION SHALL BE UNIFORMLY DISTRIBUTED THROUGHOUT THE LAYER THICKNESS AND FROM TOP TO BOTTOM OF THE SLOPE.

UPON COMPLETION OF THE PROJECT, A VISUAL INSPECTION SHALL REVEAL THAT APPROXIMATELY 50% OF THE SURFACE AREA CONSISTS OF STONES __" OR LARGER. PAYMENT WILL BE MADE UNDER ITEM 709-05.10 MACHINED RIPRAP (DESCRIPTION), C.Y., AND QUANTITIES WILL BE BASED ON THE AVERAGE THICKNESS OF __'- __".

(2) RIPRAP SHALL CONSIST OF FURNISHING AND PLACING EITHER RUBBLE STONES BY HAND OR MACHINED. RUBBLE STONE SHALL MEET THE REQUIREMENTS OF SECTION 709 OF THE STANDARD SPECIFICATIONS AND SHALL BE CLEAN (FREE FROM ORGANIC MATTER), DURABLE, ANGULAR WITH FRACTURED FACES, NEARLY RECTANGULAR IN SHAPE WITH A BREADTH OR THICKNESS AT LEAST ONE-THIRD ITS LENGTH.

IF THE CONTRACTOR ELECTS TO USE MACHINED RIPRAP, IT SHALL BE IN ACCORDANCE WITH SECTION 709 OF THE STANDARD SPECIFICATIONS EXCEPT AS MODIFIED BY THIS NOTE. MACHINED RIPRAP SHALL BE CLEAN SHOT ROCK CONTAINING NO SAND, DUST, OR ORGANIC MATERIALS, AND SHALL VARY IN SIZE FROM __" TO __'- __". THE STONE SIZES SHALL BE DISTRIBUTED UNIFORMLY THROUGHOUT THE SIZE RANGE WITH NO MORE THAN 20% OF THE MATERIAL (BY WEIGHT) LESS THAN __". THE THICKNESS OF THE STONE LAYER SHALL BE __'- __" (+/-3") AND THE SIZE GRADATION SHALL BE UNIFORMLY

DISTRIBUTED THROUGHOUT THE LAYER THICKNESS AND FROM TOP TO BOTTOM OF THE SLOPE. UPON COMPLETION OF THE PROJECT, A VISUAL INSPECTION SHALL REVEAL THAT APPROXIMATELY 50% OF THE SURFACE AREA CONSISTS OF STONES __" OR LARGER. PAYMENT WILL BE MADE UNDER ITEM ___(A)_____ AND QUANTITIES WILL BE BASED ON A THICKNESS OF __'- __".

(A) NOTE: FILL IN THE BLANK WITH APPROPRIATE RIPRAP ITEM NUMBER.

6-165.00 SIGNING

(1) THE LETTERS, DIGITS, ARROWS, BORDERS, AND ALPHABET ACCESSORIES ON ALL FLAT SHEET SIGNS SHALL BE APPLIED BY SILK SCREENING PROCESS, EXCEPT THAT CUTOUT DIRECT APPLIED COPY SHALL BE USED ON ALL FLAT SHEET SIGNS WITH A GREEN BACKGROUND. THE LETTERS, DIGITS, ARROWS, BORDERS, AND ALPHABET ACCESSORIES ON ALL EXTRUDED PANEL SIGNS SHALL BE DEMOUNTABLE AND ATTACHED TO THE SIGN FACE, AS OUTLINED IN THE STANDARD SPECIFICATIONS. ALL SHIELDS ON GUIDE SIGNS SHALL BE DEMOUNTABLE AND ATTACHED TO THE SIGN FACE AS OUTLINED IN THE STANDARD SPECIFICATIONS.

(2) THE LENGTHS OF ALL SIGN SUPPORTS SHOWN ON THE SIGN SCHEDULE ARE APPROXIMATE AND ARE FOR ESTIMATING PURPOSES ONLY. THE LENGTHS WERE COMPUTED FROM THE CROSS-SECTIONS CONTAINED IN THE CONSTRUCTION PLANS. IN THE EVENT THE SUPPORT LENGTHS ARE 2 FEET SHORTER OR LONGER THAN SHOWN ON THE PLANS, THE ENGINEER SHALL VERIFY THE SUPPORT TYPE WITH THE DESIGN DIVISION, SIGNING AND MARKING SECTION, TELEPHONE NO. (615)-741-0982. THE CONTRACTOR SHALL VERIFY ALL SUPPORT LENGTHS AT THE SITE PRIOR TO ORDERING MATERIAL.

(3) THE TOP OF THE SIGN FOOTINGS SHALL BE PLACED LEVEL WITH THE GROUND LINE.

(4) AFTER THE SIGN LOCATIONS HAVE BEEN STAKED, BUT PRIOR TO ORDERING ANY MATERIAL FOR THE SUPPORTS, THERE SHALL BE A FIELD INSPECTION AND APPROVAL BY THE REGIONAL CONSTRUCTION OFFICE.

(5) THE CONTRACTOR SHALL BE REQUIRED TO FURNISH LAYOUT DRAWINGS (3 SETS) OF ALL EXTRUDED PANEL SIGNS WITH SPACING OF ALL LETTERS, NUMERALS, SHIELDS, AND ARROWS. THE LAYOUT DRAWINGS SHALL BE SENT TO THE DESIGN DIVISION, SIGNING AND MARKING SECTION, SUITE 1300, J. K. POLK BUILDING, NASHVILLE, TN 37243-1402.

(6) ALL SIGNS MARKED “TO BE REMOVED” ARE TO BE REMOVED BY THE CONTRACTOR AND PAID FOR UNDER ITEM 713-15 AND BECOME THE PROPERTY OF THE CONTRACTOR.

(7) THE EXISTING FOOTINGS ARE TO BE REMOVED 6 INCHES BELOW GROUND LINE.

(8) THE LETTERS, DIGITS, ARROWS, BORDERS, AND ALPHABET ACCESSORIES ON ALL FLAT SHEET SIGNS SHALL BE APPLIED BY SILK SCREENING PROCESS, EXCEPT THAT CUT-OUT DIRECT APPLIED COPY SHALL BE USED ON ALL FLAT SHEET SIGNS WITH A GREEN BACKGROUND, OR BROWN BACKGROUND.

(9) THE LENGTHS OF ALL SIGN SUPPORTS SHOWN ON THE SIGN SCHEDULE ARE APPROXIMATE AND ARE FOR ESTIMATING PURPOSES ONLY. THE CONTRACTOR SHALL VERIFY ALL SUPPORT LENGTHS AT THE SITE PRIOR TO ERECTION.

(10) THE LETTERS, DIGITS, ARROWS, BORDERS, AND ALPHABET ACCESSORIES ON ALL FLAT SHEET SIGNS SHALL BE APPLIED BY SILK SCREENING PROCESS.

6-170.00 TRAFFIC CONTROL DIRECTIONAL SIGNING

NOTE: NOTES (1) THROUGH (5) ARE TO BE PLACED ON ALL ACCESS CONTROLLED AND INTERSTATE RECONSTRUCTION PROJECTS AND ACCESS CONTROLLED AND INTERSTATE RESURFACING PROJECTS WHEN THE TRAFFIC CONTROL PHASING REQUIRES PLACEMENT OF TEMPORARY PAVEMENT MARKINGS WHICH CONFLICT DIRECTIONAL SIGNS OR REQUIRES DIRECTIONAL SIGNS TO BE RELOCATED OR ADJUSTED.

(1) ON ALL ACCESS CONTROLLED AND INTERSTATE RECONSTRUCTION AND NEW CONSTRUCTION PROJECTS, THE CONTRACTOR SHALL UTILIZE ALL EXISTING DIRECTIONAL SIGNING FOR AS LONG AS POSSIBLE. THESE EXISTING SIGNS CAN BE MOVED USING TEMPORARY SUPPORTS AS NEEDED. AS SOON AS THESE EXISTING DIRECTIONAL SIGNS COME DOWN PERMANENTLY, THE CONTRACTOR SHALL HAVE UP AT LEAST ONE NEW TEMPORARY “ADVANCE GUIDE SIGN” AND ONE NEW TEMPORARY “EXIT DIRECTIONAL SIGN” AT ALL EXIT RAMPS. THESE SIGNS ARE TO BE MAINTAINED WITHIN CLEAR VIEW OF THE PUBLIC ON THE RIGHT SIDE OF THE HIGHWAY AND SHALL BE REPLACED IF DAMAGED, DURING ALL PHASES OF CONSTRUCTION, AS DIRECTED BY THE ENGINEER.

(2) THE SIZE OF THESE NEW TEMPORARY SIGNS WILL BE DETERMINED BY THE MESSAGE. THE MESSAGE SHALL BE THE SAME AS THE EXISTING SIGN THAT THESE NEW TEMPORARY SIGNS WILL BE REPLACING. THE LETTER SIZE SHALL BE A MINIMUM OF 8 INCH, “D” UPPER CASE LETTER. THE

DIRECTIONAL ARROW WILL BE A "B" ARROW AT A 45 DEGREE ANGLE (SAME ANGLE AS THE EXISTING ARROW). THE MATERIAL SHALL BE 0.100 INCH SHEET ALUMINUM; THE COLOR SHALL BE A REFLECTIVE GREEN BACKGROUND WITH REFLECTIVE WHITE COPY.

(3) ALL WORK AND MATERIAL TO MAKE THESE NEW TEMPORARY DIRECTIONAL SIGNS ALONG WITH ADEQUATE SUPPORTS AND TO MOVE THEM AS NEEDED DURING EACH PHASE OF CONSTRUCTION WILL BE PAID FOR UNDER ITEM NO. _____(A)_____, AS DIRECTED BY THE ENGINEER.

(A) NOTE: FILL IN THE BLANK WITH APPROPRIATE 712-SERIES ITEM NUMBER.

(4) SOME OF THESE DIRECTIONAL SIGNS WILL NEED AN INTERSTATE, U.S., OR A STATE HIGHWAY SHIELD, A CARDINAL DIRECTION, AND A DIRECTION ARROW TO ACCOMPANY THE DIRECTIONAL SIGN. THESE SIGNS SHALL BE MOUNTED BELOW THE DIRECTIONAL SIGN.

(5) ALL EXISTING "EMERGENCY REFERENCE MARKERS" AND "HOSPITAL SIGNS" SHALL BE MAINTAINED WITHIN FULL VIEW OF THE MOTORING PUBLIC THROUGHOUT ALL PHASES OF CONSTRUCTION. ALL WORK IN MOVING AND TEMPORARY SUPPORTS SHALL BE PAID FOR UNDER ITEM NO. _____(B)_____.

(B) NOTE: FILL IN THE BLANK WITH APPROPRIATE 712-SERIES ITEM NUMBER.

NOTE: NOTE (6) SHOULD BE PLACED ON ACCESS CONTROL AND INTERSTATE PROJECTS WITH EXISTING "LOGO" SIGNS.

(6) WHEN "LOGO" SIGNS ARE ON ACCESS CONTROLLED AND INTERSTATE RECONSTRUCTION AND NEW CONSTRUCTION PROJECTS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING THESE SIGNS IN FULL VIEW TO THE MOTORING PUBLIC DURING ALL PHASES OF CONSTRUCTION. THE CONTRACTOR SHALL BE HELD RESPONSIBLE TO THE DEPARTMENT FOR THE REIMBURSEMENT OF THE SIGN FACE IF IT IS DAMAGED. ALL WORK IN MOVING THESE "LOGO" SIGNS AND THE TEMPORARY SUPPORTS ARE TO BE PAID FOR UNDER ITEM NO. _____(C)_____, AS DIRECTED BY THE ENGINEER. THE SUPPORTS FOR THE FINAL LOCATION OF THESE SIGNS WILL BE PAID FOR UNDER OTHER ITEMS OF CONSTRUCTION.

(C) NOTE: FILL IN THE BLANK WITH APPROPRIATE 712-SERIES ITEM NUMBER.

NOTE: NOTE (7) SHOULD BE PLACED ON NON-ACCESS CONTROLLED PROJECTS.

(7) WHEN EXISTING "TOURIST ORIENTED DIRECTIONAL SIGNS" (TODS) ARE ON NON-ACCESS CONTROLLED CONSTRUCTION PROJECTS, THE

CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING THESE SIGNS IN FULL VIEW TO THE MOTORING PUBLIC DURING ALL PHASES OF CONSTRUCTION. ALL WORK IN MOVING THESE "TODS" AND TEMPORARY SUPPORTS ARE TO BE PAID FOR UNDER ITEM NO. ____(D)____, AS DIRECTED BY THE ENGINEER. NEW SUPPORTS AND SIGN FACE FOR FINAL LOCATION WILL BE PAID FOR UNDER OTHER ITEMS OF CONSTRUCTION.

(D) NOTE: FILL IN THE BLANK WITH APPROPRIATE 712-SERIES ITEM NUMBER.

6-175.00 SIGNALIZATION

(1) EQUIPMENT AND INSTALLATION OF TRAFFIC SIGNALS SHALL COMPLY WITH TDOT STANDARD SPECIFICATIONS, SECTION 730.

NOTE: NOTE (2) IS FOR USE IN HAMILTON COUNTY, AS DIRECTED.

(2) EQUIPMENT AND INSTALLATION SHALL COMPLY WITH THE TDOT "SPECIAL PROVISIONS REGARDING SECTION 730C-TRAFFIC SIGNALS."

NOTE: NOTE (3) IS FOR USE IN KNOX COUNTY, AS DIRECTED.

(3) EQUIPMENT AND INSTALLATION SHALL COMPLY WITH THE TDOT "SPECIAL PROVISIONS REGARDING SECTION 730K-TRAFFIC SIGNALS."

NOTE: NOTE (4) IS FOR USE IN SHELBY COUNTY, AS DIRECTED.

(4) EQUIPMENT AND INSTALLATION SHALL COMPLY WITH THE TDOT "SPECIAL PROVISIONS REGARDING SECTION 730M-TRAFFIC SIGNALS."

NOTE: NOTE (5) IS FOR USE IN DAVIDSON COUNTY, AS DIRECTED.

(5) EQUIPMENT AND INSTALLATION SHALL COMPLY WITH THE TDOT "SPECIAL PROVISIONS REGARDING SECTION 730N-TRAFFIC SIGNALS."

(6) SALVAGEABLE EQUIPMENT SHALL BECOME THE PROPERTY OF THE (CITY OR COUNTY) AND SHALL BE STOCKPILED AT A LOCATION DESIGNATED BY THE ENGINEER FOR PICKUP BY THE (CITY OR COUNTY).

(7) IF RESURFACING IS INCLUDED IN THE PROJECT, SIGNAL DETECTION LOOPS SHALL BE INSTALLED BEFORE THE FINAL SURFACE IS APPLIED.

(8) ANY SIGNAL HEADS, WHEN VISIBLE TO DRIVERS BUT NOT OPERATIONAL, SHALL BE COMPLETELY COVERED.

(9) SIGNAL HEADS SHALL FLASH A MINIMUM OF SEVEN (7) DAYS PRIOR TO ACTIVATION OF THE SIGNAL.

(10) THE CONTRACTOR SHALL CONTACT _____ A MINIMUM OF THIRTY (30) DAYS PRIOR TO ACTIVATION OF THE SIGNAL TO OBTAIN THE INITIAL SIGNAL TIMINGS.

NOTE: FOR NOTES (11) THROUGH (18) SEE SECTION 4-730.08.

(11) THE PROJECT ENGINEER SHALL NOTIFY THE LOCAL GOVERNMENTAL AGENCY RESPONSIBLE FOR TRAFFIC CONTROL MAINTENANCE AT LEAST ONE DAY IN ADVANCE OF THE COLD PLANING ACTIVITY AT SIGNALIZED INTERSECTIONS WHERE DETECTOR LOOPS ARE ON THE PAVEMENT. THE MAINTAINING AGENCY WILL THEN BE RESPONSIBLE FOR DISCONNECTING THE LOOP DETECTORS AND MAKING ANY NECESSARY TIMING ADJUSTMENTS IN THE SIGNAL CONTROLLER PRIOR TO THE CONSTRUCTION.

(12) THE PROJECT ENGINEER SHALL BE RESPONSIBLE FOR SUPPLYING THE CONTRACTOR WITH AS BUILT SIGNAL PLANS AT THE PRE-CONSTRUCTION CONFERENCE. THESE PLANS WILL PROVIDE THE CONTRACTOR WITH THE DESIRED LOCATION FOR DETECTOR LOOP REPLACEMENT.

(13) LOOPS SHALL BE INSTALLED IN THE LEVELING COURSE IF A LEVELING COURSE IS PROVIDED.

(14) LOOP REPLACEMENT SHALL BE IN ACCORDANCE WITH SECTION 730 OF THE STANDARD SPECIFICATIONS.

6-180.00 CONSTRUCTION WORK ZONE & TRAFFIC CONTROL

(1) ADVANCED WARNING SIGNS SHALL NOT BE DISPLAYED MORE THAN FORTY-EIGHT (48) HOURS BEFORE PHYSICAL CONSTRUCTION BEGINS. SIGNS MAY BE ERECTED UP TO ONE WEEK BEFORE NEEDED, IF THE SIGN FACE IS FULLY COVERED.

(2) IF THE CONTRACTOR MOVES OFF THE PROJECT, HE SHALL COVER OR REMOVE ALL UNNEEDED SIGNS AS DIRECTED BY THE ENGINEER. COSTS OF REMOVAL, COVERING, AND REINSTALLING SIGNS SHALL NOT BE MEASURED AND PAID FOR SEPARATELY, BUT ALL COSTS SHALL BE INCLUDED IN THE ORIGINAL UNIT PRICE BID FOR ITEM NO 712-06, SIGNS (CONSTRUCTION) PER SQUARE FOOT.

(3) A LONG TERM BUT SPORADIC USE WARNING SIGN, SUCH AS A FLAGGER SIGN, MAY REMAIN IN PLACE WHEN NOT REQUIRED PROVIDED THE SIGN FACE IS FULLY COVERED.

(4) TRAFFIC CONTROL DEVICES SHALL NOT BE DISPLAYED OR ERECTED UNLESS RELATED CONDITIONS ARE PRESENT NECESSITATING WARNING.

(5) USE OF BARRICADES, PORTABLE BARRIER RAILS, VERTICAL PANELS, AND DRUMS SHALL BE LIMITED TO THE IMMEDIATE AREAS OF CONSTRUCTION WHERE A HAZARD IS PRESENT. THESE DEVICES SHALL

NOT BE STORED ALONG THE ROADWAY WITHIN THIRTY (30) FEET OF THE EDGE OF THE TRAVELED WAY BEFORE OR AFTER USE UNLESS PROTECTED BY GUARDRAIL, BRIDGE RAIL, AND/OR BARRIERS INSTALLED FOR OTHER PURPOSES FOR ROADWAYS WITH CURRENT ADT'S LESS THAN 1500 AND DESIGN SPEED OF LESS THAN 60 MPH. THIS DISTANCE SHALL INCREASE TO FORTY-FIVE (45) FEET FOR ROADWAYS WITH CURRENT ADT'S OF 1500 OR GREATER AND DESIGN SPEED OF 60 MPH OR GREATER OR ON THE OUTSIDE OF A HORIZONTAL CURVE. THESE DEVICES SHALL BE REMOVED FROM THE CONSTRUCTION WORK ZONE WHEN THE ENGINEER DETERMINES THEY ARE NO LONGER NEEDED. WHERE THERE IS INSUFFICIENT RIGHT-OF-WAY TO PROVIDE FOR THIS REQUIRED SETBACK, THE CONTRACTOR SHALL DETERMINE THE ALTERNATE LOCATIONS AND REQUEST THE ENGINEER'S APPROVAL TO USE THEM.

(6) THE CONTRACTOR SHALL NOT BE PERMITTED TO PARK ANY VEHICLES OR CONSTRUCTION EQUIPMENT DURING PERIODS OF INACTIVITY, WITHIN THIRTY (30) FEET OF THE EDGE OF PAVEMENT WHEN THE LANE IS OPEN TO TRAFFIC UNLESS PROTECTED BY GUARDRAIL, BRIDGE RAIL, AND/OR BARRIERS INSTALLED FOR OTHER PURPOSES FOR ROADWAYS WITH CURRENT ADT'S LESS THAN 1500 AND DESIGN SPEED OF LESS THAN 60 MPH. THIS DISTANCE SHALL BE INCREASED TO FORTY-FIVE (45) FEET FOR ROADWAYS WITH CURRENT ADT'S OF 1500 OR GREATER AND DESIGN SPEED OF 60 MPH OR GREATER OR ON THE OUTSIDE OF A HORIZONTAL CURVE. PRIVATELY OWNED VEHICLES SHALL NOT BE ALLOWED TO PARK WITHIN THIRTY (30) FEET OF A OPEN TRAFFIC LANE AT ANY TIME UNLESS PROTECTED AS DESCRIBED ABOVE FOR ROADWAYS WITH CURRENT ADT'S LESS THAN 1500 AND DESIGN SPEED OF LESS THAN 60 MPH. THIS DISTANCE SHALL BE INCREASED TO FORTY-FIVE (45) FEET FOR ROADWAYS WITH CURRENT ADT'S OF 1500 OR GREATER AND DESIGN SPEED OF 60 MPH OR GREATER OR ON THE OUTSIDE OF A HORIZONTAL CURVE. WHERE THERE IS INSUFFICIENT RIGHT-OF-WAY TO PROVIDE FOR THIS REQUIRED SETBACK, THE CONTRACTOR SHALL DETERMINE THE ALTERNATE LOCATIONS AND REQUEST THE ENGINEER'S APPROVAL TO USE THEM.

(7) ALL DETOUR AND CONSTRUCTION SIGNING SHALL BE IN STRICT ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.

(8) ALL DETOURS SHALL BE PAVED, STRIPED, SIGNED AND THE VERTICAL PANELS ARE TO BE IN PLACE BEFORE IT IS OPENED TO TRAFFIC.

6-185.00 LIGHTING

(1) INSTALLATION AND MATERIALS SHALL COMPLY WITH SECTIONS 714 AND 917 OF THE TENNESSEE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION DATED MARCH 1,

2006 AND WITH THE LATEST REVISIONS TO THE NATIONAL ELECTRIC CODE, NFPA 70.

(2) ALL WIRING SHALL BE CONCEALED UNDERGROUND IN 2-INCH SCHEDULE 40 PVC RIGID CONDUIT.

(3) THE GROUND WIRE SHALL BE RUN INSIDE CONDUIT WITHIN STRUCTURES, SHALL BE COLORED GREEN AND HAVE THW INSULATION.

(4) EXISTING FOUNDATIONS TO BE REMOVED A MINIMUM OF SIX INCHES BELOW GRADE.

(5) ALL INCIDENTAL EQUIPMENT AND MATERIAL REQUIRED FOR THE SUCCESSFUL EXECUTION OF THIS WORK SHALL BE FURNISHED IN 714 ITEMS WHETHER SPECIFICALLY NOTED OR NOT.

(6) LIGHT STANDARDS SHALL BE ROUND TAPERED POLES. LENGTH SHALL BE DETERMINED BY REQUIRED MOUNTING HEIGHT.

(7) STANDARDS SHALL BE DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF THE LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORT FOR HIGHWAY SIGNS, LUMINARIES AND TRAFFIC SIGNALS PUBLISHED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS.

(8) STANDARDS SHALL BE DESIGNED FOR 80-MPH WIND PRESSURE AND SHALL SUPPORT A 62-POUND LUMINAIRE ON A 15-FOOT ARM.

(9) ALL NEW ROADWAY LIGHT STANDARDS SHALL BE MOUNTED ON BASES WITH ACCESS DOOR. TRANSFORMER BASES SHALL MEET AASHTO SPECIFICATIONS AND HAVE FHWA APPROVAL. STANDARDS SHALL BE ALUMINUM WITH TRANSFORMER BASES.

(10) BRACKET ARMS SHALL BE ROUND TAPERED TRUSS TYPE WITH STRAP MOUNTING AND LENGTHS AS SCHEDULED.

(11) BRACKET ARM UPSWEEP SHALL BE THE SAME FOR ALL LIGHT STANDARDS OF THE SAME TYPE.

6-190.00 EROSION PREVENTION AND SEDIMENT CONTROL

6-190.01 DISTURBED AREA

(1) AREAS TO BE UNDISTURBED SHALL BE CLEARLY MARKED IN THE FIELD BEFORE CONSTRUCTION ACTIVITIES BEGIN.

(2) PRE-CONSTRUCTION VEGETATIVE GROUND COVER SHALL NOT BE DESTROYED, REMOVED OR DISTURBED (I.E. CLEARING AND GRUBBING

INITIATED) MORE THAN 15 CALENDAR DAYS PRIOR TO GRADING OR EARTH MOVING ACTIVITIES UNLESS THE AREA IS MULCHED, SEEDED WITH MULCH, OR OTHER TEMPORARY COVER IS INSTALLED.

(3) CLEARING, GRUBBING, AND OTHER DISTURBANCE TO RIPARIAN VEGETATION SHALL BE LIMITED TO THE MINIMUM NECESSARY FOR SLOPE CONSTRUCTION AND EQUIPMENT OPERATIONS. EXISTING VEGETATION SHOULD BE PRESERVED TO THE MAXIMUM EXTENT POSSIBLE. UNNECESSARY VEGETATION REMOVAL IS PROHIBITED.

(4) ALL DISTURBED AREAS SHALL BE PROPERLY STABILIZED AS SOON AS PRACTICABLE. PRIORITY SHALL BE GIVEN TO FINISHING OPERATIONS AND PERMANENT EPSC MEASURES OVER TEMPORARY EPSC MEASURES ON ALL PROJECTS.

(5) CONSTRUCTION SHALL BE SEQUENCED AND STAGED TO MINIMIZE THE EXPOSURE TIME OF GRADED OR DENUDED SOIL AREAS, PRESERVE TOPSOIL, AND MINIMIZE SOIL COMPACTION.

(6) NO MORE THAN 50 ACRES OF ACTIVE SOIL DISTURBANCE IS ALLOWED AT ANY TIME DURING THE CONSTRUCTION OF THE PROJECT. OFF-SITE BORROW OR WASTE AREAS ARE TO BE INCLUDED IN THE TOTAL DISTURBED AREA IF THE BORROW OR WASTE AREA IS EXCLUSIVE TO THE PROJECT PER TDOT'S WASTE AND BORROW MANUAL.

6-190.02 SEDIMENT CONTROL

(7) EPSC MEASURES SHALL BE INSTALLED AND FUNCTIONAL PRIOR TO ANY EARTH MOVING OPERATIONS, AND SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD.

(8) THE CONTRACTOR SHALL ESTABLISH AND MAINTAIN A PROACTIVE METHOD TO PREVENT THE OFF-SITE MIGRATION OR DEPOSIT OF SEDIMENT ON ROADWAYS USED BY THE GENERAL PUBLIC. IF SEDIMENT ESCAPES THE CONSTRUCTION SITE, OFF-SITE ACCUMULATIONS OF SEDIMENT THAT HAVE NOT REACHED A STREAM MUST BE REMOVED AT A FREQUENCY SUFFICIENT TO MINIMIZE OFF-SITE IMPACTS (E.G., FUGITIVE SEDIMENT THAT HAS ESCAPED THE CONSTRUCTION SITE AND HAS COLLECTED IN A STREET MUST BE REMOVED SO THAT IT IS NOT SUBSEQUENTLY WASHED INTO STORM SEWERS AND STREAMS BY THE NEXT RAIN AND/OR SO THAT IT DOES NOT POSE A SAFETY HAZARD TO USERS OF PUBLIC STREETS). ARRANGEMENTS CONCERNING REMOVAL OF SEDIMENT ON ADJOINING PROPERTY MUST BE SETTLED WITH THE ADJOINING PROPERTY OWNER BEFORE REMOVAL OF SEDIMENT.

(9) WATER PUMPED FROM WORK AREAS AND EXCAVATION MUST BE HELD IN SETTLING BASINS OR TREATED BY FILTRATION OR CHEMICAL TREATMENT PRIOR TO ITS DISCHARGE INTO SURFACE WATERS. ALL PHYSICAL AND/OR CHEMICAL TREATMENT WILL BE APPLIED IN

ACCORDANCE WITH MANUFACTURER'S GUIDELINES AND FULLY DESCRIBED IN THE EPSC PLANS. WATER MUST BE HELD IN SETTLING BASINS UNTIL AT LEAST AS CLEAR AS THE RECEIVING WATERS. SETTLING BASINS SHALL NOT BE LOCATED CLOSER THAN 20 FEET FROM THE TOP BANK OF A STREAM. SETTLING BASINS AND SEDIMENT TRAPS SHALL BE PROPERLY DESIGNED ACCORDING TO THE SIZE OF THE DRAINAGE AREAS OR VOLUME OF WATER TO BE TREATED. TREATED WATER MUST BE DISCHARGED THROUGH A PIPE OR WELL- VEGETATED OR LINED CHANNEL, SO THAT THE DISCHARGE DOES NOT CAUSE EROSION OR SEDIMENT TRANSPORT. DISCHARGES FROM BASINS AND IMPOUNDMENTS SHALL UTILIZE OUTLET STRUCTURES THAT ONLY WITHDRAW WATER FROM NEAR THE SURFACE OF THE BASIN OR IMPOUNDMENT. DISCHARGES MUST NOT CAUSE AN OBJECTIONABLE COLOR CONTRAST WITH THE RECEIVING STREAM.

(10) CHECK DAMS SHALL BE USED WHERE RUNOFF IS CONCENTRATED. CLEAN ROCK, BRUSH, GABION, OR SANDBAG CHECK DAMS SHALL BE PROPERLY CONSTRUCTED TO REDUCE VELOCITY AND CONTROL EROSION.

(11) FOR AN OUTFALL IN A DRAINAGE AREA OF 10 ACRES OR MORE, A TEMPORARY (OR PERMANENT) SEDIMENT BASIN OR EQUIVALENT CONTROL MEASURES THAT PROVIDES STORAGE FOR A CALCULATED VOLUME OF RUNOFF FROM A MINIMUM 2-YEAR/ 24-HOUR STORM EVENT, SHALL BE PROVIDED UNTIL FINAL STABILIZATION OF THE SITE. THE ENVIRONMENTAL AND DESIGN DIVISIONS MAY BE CONTACTED TO REVIEW AND CONCUR WITH ANY REVISION OF THE SWPPP BEFORE DISTURBANCE OF THE OUTFALL PROCEEDS.

(12) IF PERMANENT OR TEMPORARY VEGETATION IS TO BE USED AS AN EPSC MEASURE, THEN THE TIMING OF PLANTING OF VEGETATION SHALL BE SHOWN IN THE SWPPP. DELAYING PLANTING OF COVER VEGETATION UNTIL WINTER MONTHS OR DRY MONTHS SHOULD BE AVOIDED, IF POSSIBLE.

(13) OFFSITE VEHICLE TRACKING OF SEDIMENTS AND THE GENERATION OF DUST SHALL BE MINIMIZED. A STABILIZED CONSTRUCTION ACCESS (A POINT OF ENTRANCE/EXIT TO THE CONSTRUCTION PROJECT) SHALL BE PROVIDED, AS NEEDED, TO REDUCE THE TRACKING OF MUD AND DIRT ONTO PUBLIC ROADS BY CONSTRUCTION VEHICLES.

(14) TEMPORARY EPSC MEASURES MAY BE REMOVED AT THE BEGINNING OF THE WORKDAY, BUT MUST BE REPLACED AT THE END OF THE WORKDAY.

6-190.03 STREAM/WETLAND

(15) SOIL MATERIALS MUST BE PREVENTED FROM ENTERING WATERS OF THE STATE/U.S. EPSC MEASURES TO PROTECT WATER QUALITY MUST BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD. APPROPRIATE EPSC MEASURES MUST BE INSTALLED ALONG THE BASE OF ALL FILLS AND CUTS, ON THE DOWNHILL SIDE OF STOCKPILED SOIL, AND ALONG STREAM BANKS IN CLEARED AREAS TO PREVENT SEDIMENT MIGRATION INTO STREAMS IN ACCORDANCE WITH TDOT STANDARDS. THEY MUST BE INSTALLED ON THE CONTOUR, ENTRENCHED AND STAKED, AND EXTEND THE WIDTH OF THE AREA TO BE CLEARED.

(16) NEW CHANNEL CONSTRUCTION SHALL BE COMPLETED IN THE DRY AND STABILIZED FOR AT LEAST 72 HOURS PRIOR TO DIVERTING WATER FROM THE EXISTING AND/OR TEMPORARY CHANNEL.

(17) INSTREAM EPSC DEVICES REQUIRE THE ENVIRONMENTAL DIVISION'S PERMITS SECTION REVIEW AND MUST BE PROCESSED BY THE PERMITS SECTION TO OBTAIN TDEC, USACE, AND TVA PERMITS.

(18) THE OPERATION OF EQUIPMENT IN WATERS OF THE STATE/U.S., INCLUDING WETLANDS, SHALL BE ONLY AS SHOWN ON THE PROJECT PLANS AND/OR AS SO SPECIFIED IN THE ARAP/401, SECTION 404 PERMIT(S) AND/OR TVA26(A), IF APPLICABLE. ANY ADDITIONAL PERMITS REQUIRED BY THE CONTRACTOR'S METHOD OF OPERATION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN, AFTER RECEIVING THE APPROVAL OF TDOT ENVIRONMENTAL DIVISION.

(19) THE WIDTH OF THE FILL ASSOCIATED WITH TEMPORARY CROSSINGS SHALL BE LIMITED TO THE MINIMUM NECESSARY FOR THE ACTUAL CROSSING.

(20) STREAM BEDS SHALL NOT BE USED AS TRANSPORTATION ROUTES FOR CONSTRUCTION EQUIPMENT. TEMPORARY CROSSINGS MUST BE LIMITED TO ONE POINT PER STREAM AND EPSC MEASURES MUST BE USED WHERE THE STREAM BANKS ARE DISTURBED. WHERE THE STREAMBED IS NOT COMPOSED OF BEDROCK, A PAD OF CLEAN ROCK MUST BE USED AT THE CROSSING POINT AND CULVERTED TO PREVENT THE IMPOUNDMENT OF WATER FLOW. CLEAN ROCK IS ROCK OF VARIOUS TYPE AND SIZE, DEPENDING UPON APPLICATION, WHICH CONTAINS NO FINES, SOILS, OR OTHER WASTES OR CONTAMINANTS. OTHER MATERIALS USED FOR ALL TEMPORARY FILLS MUST BE COMPLETELY REMOVED IN THEIR ENTIRETY AFTER THE WORK IS COMPLETED AND THE AFFECTED AREAS RETURNED TO THEIR PREEXISTING ELEVATION. ALL TEMPORARY CROSSINGS MUST BE CONSTRUCTED IN ACCORDANCE WITH STD. DWG. EC-STR-25 UNLESS SPECIFICALLY ADDRESSED IN THE EPSC PLANS. ALTERNATIVELY, PLACING A TEMPORARY BRIDGE (BAILEY BRIDGE OR EQUIVALENT, TIMBERS, ETC.) FROM TOP OF BANK TO TOP OF BANK OR THE APPROPRIATE USE OF

BARGES AT THE CROSSING TO AVOID DISTURBANCE OF THE STREAMBED IS AN ACCEPTABLE OPTION.

(21) HEAVY EQUIPMENT WORKING IN WETLANDS MUST BE PLACED ON MATS, OR OTHER MEASURES MUST BE TAKEN TO MINIMIZE SOIL DISTURBANCE UNLESS SPECIFICALLY ADDRESSED IN THE EPSC PLANS. ANY MATS AND OTHER MEASURES USED FOR HEAVY EQUIPMENT MUST BE REMOVED IN THEIR ENTIRETY AFTER THE WORK IS COMPLETED.

(22) WETLANDS SHALL NOT BE USED AS EQUIPMENT STORAGE, STAGING, OR TRANSPORTATION AREAS, UNLESS PROVIDED FOR IN THE PLANS.

6-190.04 SPECIES

(23) NO ACTIVITY MAY SUBSTANTIALLY DISRUPT THE MOVEMENT OF THOSE SPECIES OF AQUATIC LIFE INDIGENOUS TO THE WATER BODY, INCLUDING THOSE SPECIES THAT NORMALLY MIGRATE THROUGH THE AREA. THE SWPPP SHALL BE MODIFIED TO INCLUDE EPSC MEASURES TO PREVENT NEGATIVE IMPACTS TO LEGALLY PROTECTED STATE OR FEDERAL FAUNA OR FLORA OR AS INDICATED IN THE ECOLOGICAL STUDIES OR ON THE PERMIT(S).

6-190.05 INSPECTION, MAINTENANCE, REPAIR

(24) EPSC CONTROLS WILL BE MAINTAINED IN ACCORDANCE WITH TDOT STANDARD DRAWINGS AND GOOD ENGINEERING PRACTICES.

(25) INSPECTION, REPAIR, AND MAINTENANCE OF EPSC MEASURES/STRUCTURES IS TO BE PERFORMED ON A REGULAR BASIS. SEDIMENT SHALL BE REMOVED FROM SEDIMENT CONTROL STRUCTURES WHEN THE DESIGN CAPACITY HAS BEEN REDUCED BY FIFTY PERCENT (50%). DURING SEDIMENT REMOVAL, THE CONTRACTOR SHALL TAKE CARE TO ENSURE THAT STRUCTURAL COMPONENTS OF EPSC MEASURES ARE NOT DAMAGED AND THUS MADE INEFFECTIVE. IF DAMAGE DOES OCCUR, THE CONTRACTOR SHALL REPAIR THE STRUCTURES AT THE CONTRACTOR'S OWN EXPENSE.

(26) SEDIMENT REMOVED FROM SEDIMENT CONTROL STRUCTURES SHALL BE PLACED AND BE TREATED IN A MANNER SO THAT THE SEDIMENT IS CONTAINED WITHIN THE PROJECT LIMITS AND DOES NOT MIGRATE INTO WATERS OF THE STATE/U.S. COST FOR THIS TREATMENT IS TO BE INCLUDED IN PRICE BID FOR ITEM NO. 209-05 SEDIMENT REMOVAL, C.Y.

(27) THE CONTRACTOR SHALL INSTALL A RAIN GAUGE EVERY LINEAR MILE AT ALL SITES WHERE CLEARING, GRUBBING, EXCAVATION, GRADING CUTTING OR FILLING IS BEING ACTIVELY PERFORMED, OR EXPOSED SOIL HAS NOT YET BEEN PERMANENTLY STABILIZED. IF THE PROJECT LENGTH

IS LESS THAN ONE LINEAR MILE, ONE RAIN GAUGE SHALL BE INSTALLED AT THE CENTER OF THE PROJECT OR AS INDICATED BY THE TDOT EPSC INSPECTOR. THE CONTRACTOR SHALL ENSURE THAT EACH GAUGE IS MAINTAINED IN GOOD WORKING CONDITION. TDOT AND/OR THE CONTRACTOR SHALL RECORD DAILY PRECIPITATION AND FORECASTED PERCENTAGE OF PRECIPITATION IN DETAILED RECORDS OF RAINFALL EVENTS INCLUDING DATES, AMOUNTS OF RAINFALL PER GAUGE, THE ESTIMATED DURATION (OR STARTING AND ENDING TIMES), AND FORECASTED PERCENTAGE OF PRECIPITATION FOR THE PROJECT. THIS INFORMATION SHALL BE PROVIDED TO THE ENGINEER ON A MONTHLY BASIS. THE COST FOR THE RAIN GAUGES IS TO BE INCLUDED IN THE UNIT BID PRICES FOR OTHER ITEMS. RAIN GAUGES SHALL BE AS SPECIFIED IN THE APPROVED TDOT RAINFALL MONITORING PLAN.

(28) INSPECTION OF EPSC MEASURES SHALL BE DONE AT LEAST TWICE PER CALENDAR WEEK AT LEAST 72 HOURS APART. A CALENDAR WEEK IS DEFINED AS SUNDAY THROUGH SATURDAY. QUALITY ASSURANCE/QUALITY CONTROL SITE ASSESSMENT OF EPSC SHALL BE PERFORMED PER THE TDOT ENVIRONMENTAL DIVISION'S COMPREHENSIVE INSPECTION OFFICE GUIDELINES.

(29) OUTFALL POINTS SHALL BE INSPECTED TO ASCERTAIN WHETHER EPSC MEASURES ARE EFFECTIVE IN PREVENTING SIGNIFICANT IMPACTS TO SURROUNDING WATERS. WHERE DISCHARGE LOCATIONS ARE INACCESSIBLE, NEARBY DOWNSTREAM LOCATIONS SHALL BE INSPECTED. LOCATIONS WHERE VEHICLES ENTER AND EXIT THE SITE SHALL BE INSPECTED FOR EVIDENCE OF OFF-SITE ROADWAY SEDIMENT TRACKING.

(30) UPON CONCLUSION OF THE INSPECTIONS, EPSC MEASURES FOUND TO BE INEFFECTIVE SHALL BE REPAIRED, REPLACED, OR MODIFIED BEFORE THE NEXT RAIN EVENT, IF POSSIBLE, BUT IN NO CASE MORE THAN 24 HOURS AFTER THE INSPECTION OR WHEN THE CONDITION IS IDENTIFIED. IF THE REPAIR, REPLACEMENT OR MODIFICATION IS NOT PRACTICAL WITHIN THE TIMEFRAME, WRITTEN DOCUMENTATION MUST BE PROVIDED IN THE FIELD BOOK AND AN ESTIMATED REPAIR, REPLACEMENT OR MODIFICATION SCHEDULE SHALL BE DOCUMENTED WITHIN 24 HOURS AFTER IDENTIFICATION.

(31) THE TDOT PROJECT SUPERVISOR (OR THEIR DESIGNEE) AND THE CONTRACTOR'S SITE SUPERINTENDENT ARE RESPONSIBLE FOR INSPECTIONS. MAINTENANCE AND REPAIR ACTIVITIES ARE THE RESPONSIBILITY OF THE CONTRACTOR. THE TDOT PROJECT SUPERVISOR OR THEIR DESIGNEE WILL COMPLETE THE INSPECTION REPORTS AND DISTRIBUTE COPIES PER THE CONTRACT.

6-190.06 MATERIALS

(32) WASTE AND BORROW AREAS SHALL BE LOCATED IN NON-WETLAND AREAS AND ABOVE THE 100-YEAR, FEDERAL EMERGENCY MANAGEMENT AGENCY FLOODPLAIN. BORROW AND WASTE DISPOSAL AREAS SHALL NOT AFFECT ANY WATERS OF THE STATE/U.S. UNLESS THESE AREAS ARE SPECIFICALLY COVERED BY AN ARAP, 404, OR NPDES PERMIT, OBTAINED SOLELY BY THE CONTRACTOR.

6-190.07 SWPPP, PERMITS, PLANS, RECORDS

(33) THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR AND OBTAIN ANY NECESSARY ENVIRONMENTAL PERMITS OR APPROVALS, INCLUDING BUT NOT LIMITED TO TDEC ARAP/401, USACE SECTION 404, TVA SECTION 26A, AND TDEC NPDES PERMITS, FROM FEDERAL, STATE AND/OR LOCAL AGENCIES REGARDING THE OPERATION OF ANY PROJECT-DEDICATED ASPHALT AND/OR CONCRETE PLANTS.

(34) ANY DISAGREEMENT BETWEEN THE PROJECT PLANS, THE PROJECT AS CONSTRUCTED, AND THE PERMIT(S) ISSUED FOR THE PROJECT, SHALL BE BROUGHT TO THE ATTENTION OF THE TDOT PROJECT ENGINEER. THE ENVIRONMENTAL DIVISION, DESIGN DIVISION, AND HEADQUARTERS CONSTRUCTION OFFICE SHALL BE CONTACTED IN THESE INSTANCES AND DECIDE WHICH HAS PRECEDENCE AND WHETHER PERMIT OR PLANS REVISIONS ARE NEEDED. IN GENERAL, PERMIT CONDITIONS WILL PREVAIL.

(35) THE FOLLOWING INFORMATION SHALL BE MAINTAINED ON OR NEAR THE SITE: DATES THAT MAJOR GRADING ACTIVITIES OCCUR, DATES WHERE CONSTRUCTION ACTIVITIES TEMPORARILY OR PERMANENTLY CEASE ON A PORTION OF THE SITE, DATES WHEN STABILIZATION MEASURES ARE INITIATED, EPSC INSPECTION RECORDS, QUALITY ASSURANCE SITE ASSESSMENT RECORDS, PRECIPITATION RECORDS, SWPPP, PROJECT ENVIRONMENTAL PERMITS, AND A COPY OF THE PROJECT EPSC INSPECTOR'S TDEC LEVEL 1 CERTIFICATION.

(36) ALL WATER QUALITY AND STORM WATER PERMITS, INCLUDING A COPY OF THE NOC WITH NPDES PERMIT TRACKING NUMBER AND THE LOCATION OF THE SWPPP, SHALL BE POSTED NEAR THE MAIN ENTRANCE OF THE CONSTRUCTION SITE ACCESSIBLE TO THE PUBLIC. THE NAME, COMPANY NAME, EMAIL ADDRESS, TELEPHONE NUMBER AND ADDRESS OF THE PROJECT SITE OWNER, OPERATOR, OR A LOCAL CONTACT PERSON WITH A BREIF DESCRIPTION OF THE PROJECT SHALL ALSO BE POSTED. IF POSTING THIS INFORMATION NEAR A MAIN ENTRANCE IS INFEASIBLE, THE INFORMATION SHALL BE PLACED IN A PUBLICLY ACCESSIBLE LOCATION NEAR WHERE THE CONSTRUCTION IS ACTIVELY UNDERWAY AND MOVED AS NECESSARY. THIS LOCATION SHALL BE POSTED AT THE CONSTRUCTION SITE. ALL POSTINGS SHALL BE MAINTAINED IN LEGIBLE CONDITION.

(37) IF A CHANGE IN PROJECT SCOPE OCCURS DURING CONSTRUCTION, INCLUDING VALUE ENGINEERING, THE ENVIRONMENTAL DIVISION SHALL BE CONTACTED TO DETERMINE WHETHER PERMIT REVISIONS OR MODIFICATIONS OF THE SWPPP ARE NEEDED. THE DESIGN DIVISION SHALL BE CONTACTED TO DETERMINE IF ANY PLAN REVISIONS ARE NEEDED.

(38) THE SWPPP SHALL BE UPDATED BY CONSTRUCTION WHENEVER EPSC INSPECTIONS INDICATE, OR WHERE STATE OR FEDERAL OFFICIALS DETERMINE EPSC MEASURES ARE PROVING INEFFECTIVE IN ELIMINATING OR SIGNIFICANTLY MINIMIZING POLLUTANT SOURCES OR ARE OTHERWISE NOT ACHIEVING THE GENERAL OBJECTIVES OF CONTROLLING POLLUTANTS IN STORM WATER DISCHARGES ASSOCIATED WITH THE CONSTRUCTION ACTIVITY. THE ENVIRONMENTAL DIVISION SHALL BE CONTACTED WHEN MAJOR DESIGN REVISIONS ARE REQUESTED BY CONSTRUCTION. THE ENVIRONMENTAL DIVISION MAY BE CONTACTED FOR GUIDANCE ON SPECIFIC SWPPP NEEDS. A COPY OF ANY CORRESPONDENCE REGARDING THE EFFECTIVENESS OF THE SWPPP OR EPSC CONTROLS SHALL BE RETAINED IN THE SWPPP.

(39) THE SWPPP SHALL BE UPDATED BY CONSTRUCTION WHENEVER A CHANGE IN CHEMICAL TREATMENT METHODS IS MADE INCLUDING USE OF A DIFFERENT CHEMICAL, DIFFERENT DOSAGE OR APPLICATION RATE, OR A DIFFERENT AREA OF APPLICATION.

(40) IF A TMDL IS DEVELOPED FOR THE RECEIVING WATERS FOR A POLLUTANT OF CONCERN (SILTATION AND/OR HABITAT ALTERATION) THE SWPPP SHALL BE MODIFIED OR UPDATED.

(41) PROJECT INSPECTORS AND SUPERVISORS (INCLUDING TDOT STAFF, CONSULTANTS AND CONTRACTOR STAFF) RESPONSIBLE FOR THE IMPLEMENTATION AND MAINTENANCE OF EPSC PLANS SHALL SUCCESSFULLY COMPLETE THE TDEC "LEVEL 1 - FUNDAMENTALS OF EROSION PREVENTION AND SEDIMENT CONTROL FOR CONSTRUCTION SITES" COURSE AND ANY REFRESHER COURSES AS REQUIRED TO MAINTAIN CERTIFICATION. A COPY OF CERTIFICATION RECORDS FOR THE COURSES SHALL BE KEPT ON SITE AND AVAILABLE UPON REQUEST.

6-190.08 LITTER, DEBRIS, WASTE, PETROLEUM

(42) THE CONTRACTOR SHALL ESTABLISH AND MAINTAIN A PROACTIVE METHOD TO PREVENT LITTER, CONSTRUCTION DEBRIS, AND CONSTRUCTION WASTES FROM ENTERING WATERS OF THE STATE/U.S. THESE MATERIALS WILL BE PICKED UP AND REMOVED FROM STORMWATER EXPOSURE PRIOR TO ANTICIPATED STORM EVENTS. AFTER USE, MATERIALS USED FOR EPSC WILL BE REMOVED FROM THE SITE.

(43) THE CONTRACTOR SHALL TAKE APPROPRIATE STEPS TO ENSURE THAT PETROLEUM PRODUCTS OR OTHER CHEMICAL POLLUTANTS ARE PREVENTED FROM ENTERING WATERS OF THE STATE/U.S. ALL EQUIPMENT REFUELING, SERVICING, AND STAGING AREAS SHALL COMPLY WITH ALL LOCAL, STATE, AND FEDERAL LAWS, RULES, REGULATIONS, AND ORDINANCES, INCLUDING THOSE OF THE NATIONAL FIRE PROTECTION ASSOCIATION (NFPA). APPROPRIATE CONTAINMENT MEASURES FOR THESE AREAS SHALL BE USED. ALL SPILLS MUST BE REPORTED TO THE APPROPRIATE AGENCY, AND MEASURES SHALL BE TAKEN IMMEDIATELY TO PREVENT THE POLLUTION OF WATERS OF THE STATE/U.S., INCLUDING GROUNDWATER, SHOULD A SPILL OCCUR.

CHAPTER 2 – SPECIAL NOTES

6-200.00 GRADING

NOTE: THESE NOTES SHALL BE ADDED TO THE PLANS AS SPECIAL NOTES ON ALL PROJECTS FOR WHICH A GEOTECHNICAL REPORT IS PREPARED UNLESS OTHERWISE DIRECTED BY THE DESIGN MANAGER AFTER CONSULTATION WITH THE SOILS AND GEOLOGY SECTION OF THE MATERIALS AND TESTS DIVISION AND THE HEADQUARTERS CONSTRUCTION DIVISION. ALL GRADING QUANTITIES ON THE ESTIMATED ROADWAY QUANTITIES SHEET SHOULD ALSO BE FOOTNOTED "REFER TO SPECIAL NOTES."

(1) THE GRADING TABULATIONS AND RESULTING EARTHWORK ASSOCIATED BID QUANTITIES WERE PREPARED UTILIZING AVAILABLE GEOTECHNICAL INFORMATION AND/OR REPORTS PREPARED FOR THIS PROJECT. THIS INFORMATION IS PROVIDED FOR GENERAL INFORMATION AND ESTIMATION GUIDANCE ONLY.

(2) BORING DEPICTIONS SHOWN ON THE FOUNDATION DATA SHEETS, SOILS SHEETS, PLANS, AND CROSS-SECTIONS INDICATE SOIL AND ROCK CONDITIONS AT THE SPECIFIC BORING LOCATIONS. ANY SOIL PROFILE AND/OR ROCK LINE IS INTERPRETIVE BASED ON THE JUDGMENT OF THE GEOTECHNICAL ENGINEER/GEOLOGIST. THE TRANSITION BETWEEN BORINGS AND LAYERS MAY VARY SIGNIFICANTLY DEPENDING ON THE GEOLOGIC FORMATIONS ENCOUNTERED.

(3) TO ASSIST IN BID PREPARATION FOR EARTHWORK AND FOUNDATION CONSTRUCTION, DETAIL ROCK AND SOIL DESCRIPTION AND ON SOME PROJECTS, ROCK CORE SAMPLES ARE AVAILABLE FOR INSPECTION AT THE MATERIALS AND TESTS HEADQUARTERS AT 6601 CENTENNIAL BOULEVARD, NASHVILLE, TN OR AT THE TDOT REGION 1 BUILDING IN KNOXVILLE, TN.

(4) THE CONTRACTOR SHALL UTILIZE ALL INFORMATION PROVIDED IN THE PLANS, CROSS-SECTIONS AND CONTRACT DOCUMENTS INCLUDING ANY SPECIAL PROVISIONS AS WELL AS UTILIZING HIS PAST EXPERIENCE WITH PROJECTS OF SIMILAR NATURE, SCOPE AND LOCATION IN PREPARATION OF HIS BID FOR EARTHWORK ITEMS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE AND PROVIDE EQUIPMENT AND MEANS NECESSARY TO CONDUCT THE EXCAVATION ACTIVITIES IN ACCORDANCE WITH PLANS AND SPECIFICATIONS.

(5) EARTHWORK IS PAID FOR UNDER ITEM 203-01, ROAD AND DRAINAGE EXCAVATION (UNCLASSIFIED). NO ADDITIONAL PAYMENT WILL BE MADE FOR EARTHWORK QUANTITIES BASED SOLELY ON A CLAIM THAT THE QUANTITIES SHOWN IN THE GRADING TABULATION OR ELSEWHERE IN THE PLANS ARE INACCURATE WITH RESPECT TO THE TYPE OF MATERIALS ENCOUNTERED DURING CONSTRUCTION EXCEPT AS PROVIDED FOR BY

SECTION 104.02 IN THE CURRENT EDITION OF THE STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION OR AS AMENDED IN SUPPLEMENTAL SPECIFICATIONS.

6-250.00 PAVEMENT

6-250.02 RESURFACING

NOTE: NOTE (1) SHOULD BE ADDED TO THE SPECIAL NOTES ON INTERSTATE RESURFACING PLANS WHICH INCLUDE COLD PLANING ITEMS.

(1) TRAFFIC WILL BE ALLOWED TO TEMPORARILY DRIVE ON THE MILLED SURFACE OF THE ROADWAY UNDER THE FOLLOWING CONDITIONS ONLY:

A. THE MILLED SURFACE IS FINE TEXTURED. THE FINE TEXTURE SHALL BE OBTAINED BY A MILLING MACHINE UTILIZING A MILLING HEAD WITH TEETH SPACING 3/8" OR LESS OPERATING AT LESS THAN 80 FEET PER MINUTE.

B. THE SURFACE SHALL BE SWEPT AND CLEANED OF ALL LOOSE MATERIALS.

C. THE DIFFERENCE IN ELEVATION BETWEEN THE MILLED SURFACE AND THE ADJACENT LANE SHALL NOT EXCEED 1 1/2 INCHES.

D. THE MILLED SURFACE SHALL BE PAVED WITHIN 48 HOURS.

E. RAIN OR INCLEMENT WEATHER IS NOT EXPECTED OR FORECASTED WITHIN 48 HOURS AFTER MILLING.

F. ALL APPLICABLE SIGNING IS INSTALLED IN ACCORDANCE WITH THE MUTCD SIGNING SHALL INCLUDE MOTORCYCLE WARNING SIGNS (TN-64) PLACED IN ADVANCE OF ANY MILLED AREAS.

G. IF RAVELING OR DETERIORATION OF THE MILLED SURFACE IS OCCURRING WHILE TRAFFIC IS DRIVING ON THE MILLED SURFACE, THEN THIS PRACTICE WILL NOT BE ALLOWED AND PAVING SHALL BE COMPLETED IMMEDIATELY AFTER MILLING.

H. ONLY ONE LANE IN EACH DIRECTION SHALL HAVE A MILLED SURFACE AT ONE TIME.

6-250.03 PAVEMENT EDGE DROP-OFF TRAFFIC CONTROL

NOTE: NOTES (A) THROUGH (C) SHALL BE SHOWN IN THE FORM OF TRAFFIC CONTROL NOTES ON THE ON THE TRAFFIC CONTROL SHEETS AND NOT ON THE GENERAL NOTES SHEETS. THE DESIGNER IS TO SHOW ONLY THOSE NOTES THAT APPLY TO THE SPECIFIC PHASE OF TRAFFIC CONTROL SHOWN ON THE SHEET ON WHICH THE NOTE APPEARS. SEE SECTION 4-712.10 OF THE DESIGN GUIDELINES.

A. DIFFERENCES IN ELEVATION BETWEEN ADJACENT TRAFFIC LANES OR TRAFFIC LANE AND SHOULDER WHERE THE TRAFFIC LANE IS BEING USED BY TRAFFIC, CAUSED BY BASE, PAVING OR RESURFACING:

1. DIFFERENCES IN ELEVATION BETWEEN ADJACENT ROADWAY ELEMENTS GREATER THAN 0.75 INCH AND NOT EXCEEDING 2 INCHES:

   a. WARNING SIGNS, UNEVEN LANES (W8-11) AND/OR SHOULDER DROP-OFF WITH PLAQUE (W8-17 AND W8-17P), SHALL BE PLACED IN ADVANCE OF AND THROUGHOUT THE EXPOSED AREA. MAXIMUM SPACING BETWEEN SIGNS SHALL BE 2,000 FEET WITH A MINIMUM OF 2 SIGNS PER EXPOSED AREA. WHERE UNEVEN PAVEMENT IS ENCOUNTERED, SIGNS SHALL BE PLACED ON EACH SIDE OF THE ROADWAY.

   b. DIFFERENCES IN ELEVATION BETWEEN ADJACENT TRAFFIC LANES BEING UTILIZED BY TRAFFIC CAUSED BY ADDED PAVEMENT SHALL BE ELIMINATED WITHIN THREE WORKDAYS.

   c. DIFFERENCES IN ELEVATION BETWEEN ADJACENT TRAFFIC LANES BEING UTILIZED BY TRAFFIC CAUSED BY COLD PLANING SHALL BE ELIMINATED WITHIN THREE WORKDAYS.

   d. WHEN THE DIFFERENCE IN ELEVATION IS BETWEEN THE TRAFFIC LANE BEING UTILIZED BY TRAFFIC AND SHOULDER, THE DIFFERENCE IN ELEVATION SHALL BE ELIMINATED WITHIN SEVEN WORKDAYS AFTER THE CONDITION IS CREATED.

2. DIFFERENCES IN ELEVATION BETWEEN ADJACENT ROADWAY ELEMENTS GREATER THAN 2 INCHES AND NOT EXCEEDING 6 INCHES, TRAFFIC IS NOT TO BE ALLOWED TO TRAVERSE THIS DIFFERENCE IN ELEVATION:

   a. SEPARATION SHALL BE ACCOMPLISHED BY DRUMS, BARRICADES OR OTHER APPROVED DEVICES IN ACCORDANCE WITH THE FOLLOWING:

      (1) WHERE POSTED SPEEDS ARE 50 MPH OR GREATER, SPACING OF THE PROTECTIVE DEVICES SHALL NOT EXCEED 100 FEET.

      (2) WHERE POSTED SPEEDS ARE LESS THAN 50 MPH, THE MAXIMUM SPACING OF THE PROTECTIVE DEVICES IN FEET SHALL NOT EXCEED TWICE THE POSTED SPEED IN MILES PER HOUR OR 50 FEET, WHICHEVER SPACING IS GREATER.

b. IF THE DIFFERENCE IN ELEVATION IS ELIMINATED OR DECREASED TO 2 INCHES OR LESS BY THE END OF EACH WORKDAY, CONES MAY BE USED DURING DAYLIGHT HOURS IN LIEU OF DRUMS, BARRICADES OR OTHER APPROVED PROTECTIVE DEVICES MENTIONED IN PARAGRAPH a, PROVIDED WARNING SIGNS ARE ERECTED. WARNING SIGNS (UNEVEN LANES AND/OR SHOULDER DROP-OFF) SHALL BE PLACED IN ADVANCE OF AND THROUGHOUT THE EXPOSED AREA. MAXIMUM SPACING BETWEEN SIGNS SHALL BE 2,000 FEET WITH A MINIMUM OF TWO SIGNS PER EXPOSED AREA. WHERE UNEVEN PAVEMENT IS ENCOUNTERED, SIGNS SHALL BE PLACED ON EACH SIDE OF THE ROADWAY.

c. WHEN THE DIFFERENCE IN ELEVATION IS BETWEEN THE THROUGH TRAFFIC LANE AND THE SHOULDER, AND THE ELEVATION DIFFERENCE IS LESS THAN 3.5 INCHES, THE CONTRACTOR MAY USE WARNING SIGNS AND/OR PROTECTIVE DEVICES AS APPLICABLE AND APPROVED BY THE ENGINEER. SEE PARAGRAPH a REGARDING USE OF DRUMS, BARRICADES OR OTHER APPROVED PROTECTIVE DEVICES. WARNING SIGNS (UNEVEN LANES AND/OR SHOULDER DROP-OFF) WILL BE PLACED IN ADVANCE OF AND THROUGHOUT THE EXPOSED AREA. MAXIMUM SPACING BETWEEN SIGNS SHALL BE 2,000 FEET WITH A MINIMUM OF 2 SIGNS PER EXPOSED AREA. WHERE UNEVEN PAVEMENT IS ENCOUNTERED, SIGNS SHALL BE PLACED ON EACH SIDE OF THE ROADWAY.

IN THESE SITUATIONS THE CONTRACTOR SHALL LIMIT HIS OPERATIONS TO ONE WORK ZONE NOT EXCEEDING 2 MILES IN LENGTH UNLESS OTHERWISE NOTED ON THE PLANS OR APPROVED BY THE ENGINEER. ONCE THE CONTRACTOR BEGINS WORK IN A WORK ZONE, A CONTINUOUS OPERATION SHALL BE MAINTAINED UNTIL THE DIFFERENCE IN ELEVATION IS ELIMINATED. SIMULTANEOUS WORK ON SEPARATE ROADWAYS OF DIVIDED HIGHWAYS WILL BE CONSIDERED INDEPENDENTLY IN REGARD TO RESTRICTION OF WORK ZONE ACTIVITY.

3. DIFFERENCES IN ELEVATION BETWEEN ADJACENT ROADWAY ELEMENTS GREATER THAN 6 INCHES, BUT NOT EXCEEDING 18 INCHES, THE CONTRACTOR, WITH THE ENGINEER'S APPROVAL, MAY UTILIZE ONE OF THE FOLLOWING:

a. THE CONTRACTOR SHALL ACCOMPLISH SEPARATION BY DRUMS, BARRICADES OR OTHER APPROVED DEVICES IN ACCORDANCE WITH THE FOLLOWING:

   (1) WHERE POSTED SPEEDS ARE 50 MPH OR GREATER, SPACING OF THE PROTECTIVE DEVICES SHALL NOT EXCEED 100 FEET.

   (2) WHERE POSTED SPEEDS ARE LESS THAN 50 MPH, THE MAXIMUM SPACING OF THE PROTECTIVE DEVICES IN FEET SHALL NOT EXCEED TWICE THE POSTED SPEED IN MILES PER HOUR OR 50 FEET, WHICHEVER SPACING IS GREATER.

IN ORDER TO USE THIS METHOD, THE CONTRACTOR MUST REDUCE THE DIFFERENCE IN ELEVATION TO 6 INCHES OR LESS BY THE END OF THE WORK DAY THAT THE CONDITION IS CREATED.

b. THE CONTRACTOR SHALL PROVIDE DRUMS, BARRICADES OR OTHER APPROVED SEPARATION DEVICES AS SPECIFIED IN PARAGRAPH a, AND CONSTRUCT A STONE WEDGE WITH A 4:1 SLOPE, OR FLATTER, TO ELIMINATE THE VERTICAL OFFSET IF THE LOWER ELEVATION IS AT OR BELOW SUBGRADE AT THE END OF EACH DAY.

c. THE CONTRACTOR SHALL PROVIDE DRUMS, BARRICADES OR OTHER APPROVED SEPARATION DEVICES AS SPECIFIED IN PARAGRAPH a, AND IF THE LOWER ELEVATION IS BASE STONE OR ASPHALT PAVEMENT, PLACEMENT OF SUBSEQUENT LAYERS OF PAVEMENT MUST BEGIN THE NEXT WORK DAY AND PROGRESS CONTINUOUSLY UNTIL THE DIFFERENCE IN ELEVATION IS ELIMINATED OR REDUCED TO 6 INCHES OR LESS.

d. THE CONTRACTOR SHALL PROVIDE SEPARATION BY PORTABLE BARRIER RAIL.

FOR PROCEEDING CONDITIONS a, b, AND c, THE CONTRACTOR SHALL USE THE SHOULDER DROP-OFF WARNING SIGN WITH PLAQUE (W8-17 AND W8-17P). IT SHALL BE PLACED IN ADVANCE OF AND THROUGHOUT THE EXPOSED AREA. MAXIMUM SPACING BETWEEN SIGNS SHALL BE 2,000 FEET WITH A MINIMUM OF 2 SIGNS PER EXPOSED AREA. IN THESE SITUATIONS THE CONTRACTOR SHALL LIMIT HIS OPERATIONS TO ONE WORK ZONE NOT EXCEEDING 1 MILE IN LENGTH, UNLESS OTHERWISE NOTED ON THE PLANS OR APPROVED BY THE ENGINEER. ONCE THE CONTRACTOR BEGINS WORK IN A WORK ZONE, A CONTINUOUS OPERATION SHALL BE MAINTAINED UNTIL THE DIFFERENCE IS ELIMINATED.

SIMULTANEOUS WORK ON SEPARATE ROADWAYS OF DIVIDED HIGHWAYS WILL BE CONSIDERED INDEPENDENTLY IN REGARD TO RESTRICTION OF WORK ZONE ACTIVITY.

4. FOR DIFFERENCES IN ELEVATION BETWEEN ADJACENT ROADWAY ELEMENTS GREATER THAN 18 INCHES:

   SEPARATION WILL BE PROVIDED BY THE USE OF PORTABLE BARRIER RAIL.

IN THIS SITUATION THE CONTRACTOR SHALL LIMIT HIS OPERATIONS TO ONE WORK ZONE NOT EXCEEDING 1 MILE IN LENGTH UNLESS OTHERWISE NOTED ON THE PLANS OR APPROVED BY THE ENGINEER. ONCE THE CONTRACTOR BEGINS WORK IN A WORK ZONE A CONTINUOUS OPERATION SHALL BE MAINTAINED UNTIL THE DIFFERENCE IN ELEVATION IS ELIMINATED. SIMULTANEOUS WORK ON SEPARATE ROADWAYS OF DIVIDED HIGHWAYS WILL BE CONSIDERED INDEPENDENTLY IN REGARD TO RESTRICTION OF WORK ZONE ACTIVITY.

B. IF THE DIFFERENCE IN ELEVATION IS WITHIN 30 FEET OF THE NEAREST TRAFFIC LANE BEING USED BY TRAFFIC CAUSED BY GRADING, EXCAVATION FOR UTILITIES, DRAINAGE STRUCTURES, UNDERCUTTING, ETC:

   1. IF THE DIFFERENCE IN ELEVATION IS WITHIN 8 FEET OF THE NEAREST TRAFFIC LANE WITH DIFFERENCE IN ELEVATION GREATER THAN 3/4 INCH AND NOT EXCEEDING 2 INCHES:

      WARNING SIGNS (UNEVEN LANES AND/OR SHOULDER DROP-OFF) SHALL BE PLACED IN ADVANCE OF AND THROUGHOUT THE EXPOSED AREA. MAXIMUM SPACING BETWEEN SIGNS SHALL BE 2,000 FEET WITH A MINIMUM OF 2 SIGNS PER EXPOSED AREA. WHERE UNEVEN PAVEMENT IS ENCOUNTERED, SIGNS SHALL BE PLACED ON EACH SIDE OF THE ROADWAY.

   2. IF THE DIFFERENCE IN ELEVATION IS WITHIN 8 FEET OF THE NEAREST TRAFFIC LANE WITH DIFFERENCE IN ELEVATION GREATER THAN 2 INCHES AND NOT EXCEEDING 6 INCHES:

      a. SEPARATION SHALL BE ACCOMPLISHED BY DRUMS, BARRICADES OR OTHER APPROVED DEVICES IN ACCORDANCE WITH THE FOLLOWING:

         (1) WHERE POSTED SPEEDS ARE 50 MPH OR GREATER, SPACING OF THE PROTECTIVE DEVICES SHALL NOT EXCEED 100 FEET.

         (2) WHERE POSTED SPEEDS ARE LESS THAN 50 MPH, THE MAXIMUM SPACING OF THE PROTECTIVE DEVICES IN FEET SHALL NOT EXCEED TWICE THE POSTED SPEED IN

MILES PER HOUR OR 50 FEET, WHICHEVER SPACING IS GREATER.

3. IF THE DIFFERENCE IN ELEVATION IS WITHIN 8 FEET OF THE NEAREST TRAFFIC LANE WITH DIFFERENCE IN ELEVATION GREATER THAN 6 INCHES:

   a. SEPARATION SHALL BE ACCOMPLISHED BY DRUMS, BARRICADES OR OTHER APPROVED DEVICES IN ACCORDANCE WITH THE FOLLOWING:

      (1) WHERE POSTED SPEEDS ARE 50 MPH OR GREATER, SPACING OF THE PROTECTIVE DEVICES SHALL NOT EXCEED 100 FEET.

      (2) WHERE POSTED SPEEDS ARE LESS THAN 50 MPH, THE MAXIMUM SPACING OF THE PROTECTIVE DEVICES IN FEET SHALL NOT EXCEED TWICE THE POSTED SPEED IN MILES PER HOUR OR 50 FEET, WHICHEVER SPACING IS GREATER.

   b. ELIMINATE VERTICAL OFFSET BY CONSTRUCTING A STONE WEDGE OR GRADING TO A 4:1 SLOPE, OR FLATTER, OR USE PORTABLE BARRIER RAIL.

   THE CONTRACTOR SHALL SCHEDULE THE WORK SO AS TO MINIMIZE THE TIME TRAFFIC IS EXPOSED TO AN ELEVATION DIFFERENCE. ONCE THE CONTRACTOR BEGINS AN ACTIVITY THAT CREATES AN ELEVATION DIFFERENCE WITHIN 8 FEET OF A TRAFFIC LANE, THE ACTIVITY SHALL BE PURSUED AS A CONTINUOUS OPERATION UNTIL THE ELEVATION DIFFERENCE IS ELIMINATED.

C. IF THE DIFFERENCE IN ELEVATION IS FARTHER THAN 8 FEET FROM THE NEAREST TRAFFIC LANE BUT NOT MORE THAN 30 FEET FROM THE NEAREST TRAFFIC LANE:

   SEPARATION SHALL BE ACCOMPLISHED BY DRUMS, BARRICADES OR OTHER APPROVED DEVICES IN ACCORDANCE WITH THE FOLLOWING:

   1. WHERE POSTED SPEEDS ARE 50 MPH OR GREATER, SPACING OF THE PROTECTIVE DEVICES SHALL NOT EXCEED 100 FEET.

   2. WHERE POSTED SPEEDS ARE LESS THAN 50 MPH, THE MAXIMUM SPACING OF THE PROTECTIVE DEVICES IN FEET SHALL NOT EXCEED TWICE THE POSTED SPEED IN MILES PER HOUR OR 50 FEET, WHICHEVER SPACING IS GREATER.

THE CONTRACTOR SHALL SCHEDULE THE WORK SO AS TO MINIMIZE THE TIME TRAFFIC IS EXPOSED TO AN ELEVATION DIFFERENCE. ONCE THE CONTRACTOR BEGINS AN ACTIVITY THAT CREATES AN

ELEVATION DIFFERENCE, THE ACTIVITY SHALL BE PURSUED AS A CONTINUOUS OPERATION UNTIL THE ELEVATION DIFFERENCE IS ELIMINATED.

6-270.00 SIGNALIZATION

NOTE: NOTE (1) SHALL BE ADDED TO ALL PLANS WITH PROPOSED SIGNAL POLES, MAST ARMS, STRAIN POLES, ETC. NOTE (2) SHALL BE ADDED TO THE PLANS FOR ANY PROJECT IN METRO NASHVILLE-DAVIDSON COUNTY THAT INCLUDE CANTILEAVERED TRAFFIC SIGNAL SUPPORT POLES OR ANY OTHER POLE TYPE AS SPECIFIED BY THE ITS, TRAFFIC AND STANDARDS SECTION.

(1) THE DESIGN OF TRAFFIC SIGNAL SUPPORT POLES, MAST ARMS, STRAIN POLES, ETC. SHALL BE IN CONFORMANCE WITH THE AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS, CURRENT EDITION. OVERHEAD CANTILEVERED TRAFFIC SIGNAL STRUCTURES SHALL BE DESIGNED FOR FATIGUE CATEGORY 1.

(2) THE TRAFFIC SIGNAL SUPPORT POLES SHALL BE DESIGNED IN ACCORDANCE WITH THE AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRIES, AND TRAFFIC SIGNALS (CURRENT EDITION WITH ADDENDA). WIND LOADS SHALL BE BASED ON A BASIC WIND SPEED OF 90 MPH WITH A RECURRENCE INTERVAL OF 50 YEARS. OVERHEAD CANTILEVERED TRAFFIC SIGNAL STRUCTURES SHALL BE DESIGNED FOR FATIGUE CATEGORY I. FATIGUE LOADS ARE BASED ON THE REQUIREMENTS OF SECTION 11.7 OF THE SUBJECT AASHTO DOCUMENT AND THE FOLLOWING LOADS:

GALLOPING – NO DESIGN NECESSARY. VIBRATION DAMPENERS SHALL BE USED ON ALL CANTILEVERED ARMS THAT ARE 50’ OR LONGER.

VORTEX SHEDDING – NOT APPLICABLE ON TRAFFIC SIGNAL SUPPORTS WITH A TAPER OF AT LEAST 0.14 IN/FT.

NATURAL WIND GUSTS – THE YEARLY MEAN WIND SPEED FOR NATURAL WIND GUSTS SHALL BE 11.2 MPH.

THE TRAFFIC SIGNAL SUPPORT POLES SHALL BE POLES WITH CURVED CANTILEVERED ARM(S) IN ACCORDANCE WITH METRO PUBLIC WORKS. FOR POLE AND ARM DETAILS, CONTACT MIKE HIRTZER AT 615-880-3261.

6-290.00 EROSION PREVENTION AND SEDIMENT CONTROL

NOTE: REFER TO SECTION 3-305.08 SPECIAL EPSC NOTES.

6-290.01 STREAM/WETLAND

NOTE: NOTE (1) SHALL BE INCLUDED IN THE EPSC SPECIAL NOTES ON THE FIRST SHEET OF THE EPSC PLAN SET FOR ALL PROJECTS WITH MULTI-BARREL CULVERTS AND BRIDGES THAT INCLUDE PROPOSED WORK WITHIN A STREAM CHANNEL AREA. THIS NOTE PERTAINING TO WORK WITHIN THE STREAM CHANNEL AREA FOR CONSTRUCTION HAS BEEN DEVELOPED TO ELIMINATE SUPPLEMENTS AND PAYMENT CONCERNS FOR EROSION PREVENTION AND SEDIMENT CONTROL ITEMS USED FOR THIS PURPOSE. THE STRUCTURES DIVISION SHALL INCLUDE A SIMILAR NOTE IN THE STRUCTURES PLANS FOR BRIDGES.

(1) ANY WORK WITHIN THE STREAM CHANNEL AREA (E.G., FOR PIER FOOTING, RIP-RAP PLACEMENT, MULTI-BARREL CULVERT/BRIDGE CONSTRUCTION, ETC.) SHALL BE SEPARATED FROM FLOWING WATER OR EXPECTED FLOW PATH AND PERFORMED DURING LOW FLOW CONDITIONS. ALL ITEMS USED WITHIN THE STREAM CHANNEL AREA FOR DIVERSION OF FLOW (OR EXPECTED FLOW), UNLESS SPECIFIED IN THE PLANS, SHALL NOT BE PAID FOR DIRECTLY BUT SHALL BE INCLUDED IN THE COST OF OTHER ITEMS. THIS NOTE EXCLUDES ANY ITEMS SPECIFIED IN THE PLANS FOR THE TEMPORARY DIVERSION CHANNELS, EC-STR-31 AND TEMPORARY DIVERSION CULVERTS, EC-STR-32 FOR SINGLE BARREL CULVERT CONSTRUCTION.

NOTE: NOTE (2) SHALL BE INCLUDED IN THE EPSC SPECIAL NOTES ON THE FIRST SHEET OF THE EPSC PLAN SET FOR ALL PROJECTS CROSSING OR ADJACENT TO A STREAM.

(2) A 30 FOOT NATURAL RIPARIAN BUFFER ZONE ADJACENT TO AND ON BOTH SIDES OF THE RECEIVING STREAM SHALL BE PRESERVED, TO THE MAXIMUM EXTENT PRACTICABLE, DURING CONSTRUCTION ACTIVITIES AT THE SITE. BUFFER ZONES ARE NOT SEDIMENT CONTROL MEASURES AND SHOULD NOT BE RELIED UPON AS PRIMARY SEDIMENT CONTROL MEASURES. THE RIPARIAN BUFFER ZONE SHALL BE ESTABLISHED BETWEEN THE TOP OF THE STREAM BANK AND THE DISTURBED CONSTRUCTION AREA. THE 30 FOOT CRITERION FOR THE WIDTH OF THE BUFFER ZONE CAN BE ESTABLISHED ON AN AVERAGE WIDTH BASIS AT A PROJECT, AS LONG AS THE MINIMUM WIDTH OF THE BUFFER ZONE IS MORE THAN 15 FEET AT ANY MEASURED LOCATION. EVERY ATTEMPT SHALL BE MADE FOR CONSTRUCTION ACTIVITIES NOT TO TAKE PLACE WITHIN THE BUFFER ZONES. BEST MANAGEMENT PRACTICES (BMPS) PROVIDING EQUIVALENT PROTECTION AS THE NATURAL RIPARIAN ZONE MAY BE USED. A JUSTIFICATION FOR USE AND DESIGN EQUIVALENCY SHALL BE DOCUMENTED WITHIN THE SWPPP. THE ENVIRONMENTAL AND DESIGN DIVISIONS SHALL REVIEW AND APPROVE THIS REVISION OF THE SWPPP BEFORE DISTURBANCE OF THE SITE PROCEEDS, UNLESS

PREVIOUSLY EXEMPT IN THE NPDES CONSTRUCTION GENERAL PERMIT. WHERE ISSUED, ARAP/401 REQUIREMENTS WILL PREVAIL IF IN CONFLICT WITH THESE BUFFER ZONE REQUIREMENTS.

6-290.02 KNOWN EXCEPTIONAL TENNESSEE WATERS

NOTE: NOTES (3) AND (4) SHALL BE INCLUDED IN THE EPSC SPECIAL NOTES ON THE FIRST SHEET OF THE EPSC PLAN SET FOR ALL PROJECTS WITH KNOWN EXCEPTIONAL TENNESSEE WATERS OR WATERS IMPAIRED BY SILTATION.

(3) FOR PROJECTS THAT DISCHARGE INTO KNOWN EXCEPTIONAL TENNESSEE WATERS OR WATERS IMPAIRED BY SILTATION, AN OUTFALL IN A DRAINAGE AREA OF 5 ACRES OR MORE, A TEMPORARY (OR PERMANENT) SEDIMENT BASIN THAT PROVIDES STORAGE FOR A CALCULATED VOLUME OF RUNOFF FROM A 5-YEAR/ 24-HOUR STORM EVENT AND RUNOFF FROM EACH ACRE DRAINED, OR EQUIVALENT CONTROL MEASURES, SHALL BE PROVIDED UNTIL FINAL STABILIZATION OF THE SITE. THE ENVIRONMENTAL AND DESIGN DIVISIONS MAY BE CONTACTED TO REVIEW AND CONCUR WITH ANY REVISION OF THE SWPPP BEFORE DISTURBANCE OF THE OUTFALL PROCEEDS, UNLESS PREVIOUSLY EXEMPT IN THE NPDES CONSTRUCTION GENERAL PERMIT.

(4) FOR PROJECTS THAT DISCHARGE INTO KNOWN EXCEPTIONAL TENNESSEE WATERS OR WATERS IMPAIRED BY SILTATION, A 60 FOOT NATURAL RIPARIAN BUFFER ZONE ADJACENT TO AND ON BOTH SIDES OF THE RECEIVING STREAM WITH THIS DESIGNATION SHALL BE PRESERVED, TO THE MAXIMUM EXTENT PRACTICABLE, DURING CONSTRUCTION ACTIVITIES AT THE SITE. BUFFER ZONES ARE NOT SEDIMENT CONTROL MEASURES AND SHOULD NOT BE RELIED UPON AS PRIMARY SEDIMENT CONTROL MEASURES. THE RIPARIAN BUFFER ZONE SHALL BE ESTABLISHED BETWEEN THE TOP OF THE STREAM BANK AND THE DISTURBED CONSTRUCTION AREA. THE 60 FOOT CRITERION FOR THE WIDTH OF THE BUFFER ZONE CAN BE ESTABLISHED ON AN AVERAGE WIDTH BASIS AT A PROJECT, AS LONG AS THE MINIMUM WIDTH OF THE BUFFER ZONE IS MORE THAN 30 FEET AT ANY MEASURED LOCATION. EVERY ATTEMPT SHALL BE MADE FOR CONSTRUCTION ACTIVITIES NOT TO TAKE PLACE WITHIN THE BUFFER ZONES. BEST MANAGEMENT PRACTICES (BMPS) PROVIDING EQUIVALENT PROTECTION AS THE NATURAL RIPARIAN ZONE MAY BE USED. A JUSTIFICATION FOR USE AND DESIGN EQUIVALENCY SHALL BE DOCUMENTED WITHIN THE SWPPP. THE ENVIRONMENTAL AND DESIGN DIVISIONS SHALL REVIEW AND APPROVE THIS REVISION OF THE SWPPP BEFORE DISTURBANCE OF THE SITE PROCEEDS, UNLESS PREVIOUSLY EXEMPT IN THE NPDES CONSTRUCTION GENERAL PERMIT. WHERE ISSUED, ARAP/401 REQUIREMENTS WILL PREVAIL IF IN CONFLICT WITH THESE BUFFER ZONE REQUIREMENTS.

6-290.03 NPDES

NOTE: NOTES (5) THROUGH (10) SHALL BE INCLUDED IN THE EPSC SPECIAL NOTES ON THE FIRST SHEET OF THE EPSC PLAN SET FOR ALL PROJECTS WHICH REQUIRE A NPDES PERMIT. REFER TO SECTION 3-305.06.

(5) NO WORK SHALL BE STARTED UNTIL THE CONTRACTOR'S PLAN FOR THE STAGING OF THEIR OPERATIONS, INCLUDING THE PLAN FOR STAGING OF TEMPORARY AND PERMANENT EPSC MEASURES, HAS BEEN ACCEPTED BY THE ENGINEER. THE CONTRACTOR'S EPSC PLAN SHALL INCORPORATE AND SUPPLEMENT, AS ACCEPTABLE, THE BASIC EPSC DEVICES ON THE EPSC PLAN CONTAINED IN THE APPROVED SWPPP.

(6) THE EPSC MEASURES AND/OR PLAN SHALL BE MODIFIED AS NECESSARY SO THAT THEY ARE EFFECTIVE AT ALL TIMES THROUGHOUT THE COURSE OF THE PROJECT.

(7) THE ACCEPTED EPSC PLAN SHALL REQUIRE THAT EPSC MEASURES BE IN PLACE BEFORE CLEARING, GRUBBING, EXCAVATION, GRADING, CUTTING OR FILLING OCCURS, EXCEPT AS SUCH WORK MAY BE NECESSARY TO INSTALL EPSC MEASURES, INCLUDING WITHOUT LIMITATION AS FOLLOWS:

A. INITIAL CLEARING AND GRUBBING SHALL BE LIMITED TO THAT NECESSARY FOR THE INSTALLATION OF APPLICABLE EPSC MEASURES IN ACCORDANCE WITH THE ACCEPTED EPSC PLAN INCORPORATED INTO THE SWPPP.

B. NO OTHER CLEARING AND GRUBBING OPERATIONS SHALL BE STARTED BEFORE APPLICABLE EPSC MEASURES ARE IN PLACE IN ACCORDANCE WITH THE ACCEPTED EPSC PLAN INCORPORATED INTO THE SWPPP.

C. NO CULVERT OR BRIDGE CONSTRUCTION SHALL BE STARTED BEFORE APPLICABLE EPSC MEASURES ARE IN PLACE IN ACCORDANCE WITH THE ACCEPTED EPSC PLAN INCORPORATED INTO THE SWPPP.

D. NO GRADING, EXCAVATION, CUTTING, FILLING, OR OTHER EARTHWORK SHALL BE STARTED BEFORE EPSC MEASURES ARE IN PLACE IN ACCORDANCE WITH THE ACCEPTED EPSC PLAN INCORPORATED INTO THE SWPPP.

(8) PERMANENT EPSC MEASURES SHALL BE INITIATED WITHIN 14 CALENDAR DAYS AFTER FINAL GRADING OF ANY SEQUENCE OR PHASE. TEMPORARY OR PERMANENT STABILIZATION SHALL BE INITIATED WITHIN 14 CALENDAR DAYS AFTER FINAL GRADING OR WHEN CONSTRUCTION ACTIVITIES ON A PORTION OF THE SITE ARE TEMPORARILY CEASED AND EARTH DISTURBING ACTIVITIES WILL NOT RESUME UNTIL AFTER 14 CALENDAR DAYS. PERMANENT STABILIZATION WITH PERENNIAL VEGETATION OR OTHER PERMANENTLY STABLE NON-ERODING SURFACE

SHALL REPLACE ANY TEMPORARY MEASURES AS SOON AS PRACTICABLE. UNPACKED GRAVEL CONTAINING FINES (SILT AND CLAY SIZED PARTICLES) OR CRUSHER-RUN WILL NOT BE CONSIDERED A NON-ERODIBLE SURFACE.

(9) STEEP SLOPES (A NATURAL OR CREATED SLOPE OF 35% GRADE (2.8H:1V) OR GREATER REGARDLESS OF HEIGHT) SHALL BE TEMPORARILY STABILIZED NO LATER THAN 7 CALENDAR DAYS AFTER CONSTRUCTION ACTIVITY ON THE SLOPE HAS TEMPORARILY OR PERMANENTLY CEASED.

(10) FOR STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION SUPPORT ACTIVITIES; TDOT PROJECTS ARE COVERED UNDER THE “WASTE AND BORROW” MANUAL PER THE SSWMP.

NOTE: FOR ALL PROJECTS WHICH REQUIRE A NPDES PERMIT, THE EPSC PLAN SHALL ADDRESS PERIODS OF THE YEAR DURING WHICH CLEARING, GRUBBING, EXCAVATION, GRADING, CUTTING OR FILLING WILL NOT OCCUR AND LIMITATIONS ON THE TOTAL AREA OF EXPOSED SOIL (AREAS THAT DO NOT HAVE TEMPORARY OR PERMANENT STABILIZATION) AT ANY TIME DURING CONSTRUCTION. AS SUCH, THE FOLLOWING GUIDANCE SHALL BE FOLLOWED.

IF THE COMBINED EARTHWORK QUANTITIES FOR COMMON EXCAVATION (NOT ROCK) AND UNCLASSIFIED BORROW EXCAVATION IS GREATER THAN 1,000,000 CY, OR THE PROJECT IS 1 MILE OR CLOSER TO THE NEAREST DESIGNATED TIER II STREAM, THE DESIGN MANAGER SHALL NOTIFY THE APPROPRIATE DESIGN DIVISION ASSISTANT DIRECTOR. THE DESIGN DIVISION ASSISTANT DIRECTOR SHALL IN TURN REQUEST ADDITIONAL GUIDANCE FROM THE ENVIRONMENTAL DIVISION PERMITS SECTION AND THE CONSTRUCTION DIVISION REGARDING APPROPRIATENESS OF SEASONAL LIMITATIONS AND LIMITATIONS ON THE TOTAL AREA OF EXPOSED SOIL.

IF THE COMBINED EARTHWORK QUANTITIES FOR COMMON EXCAVATION (NOT ROCK) AND UNCLASSIFIED BORROW EXCAVATION IS LESS THAN 1,000,000 CY OR THE PROJECT IS FURTHER THAN 1 MILE FROM THE NEAREST DESIGNATED TIER II STREAM, THE DESIGNER SHALL INCLUDE NOTE (11) IN THE EPSC SPECIAL NOTES ON THE FIRST SHEET OF THE EPSC PLAN SET.

(11) EXCEPT AS OTHERWISE SPECIFIED, THERE ARE NO KNOWN SPECIAL ENVIRONMENTAL FACTORS PRESENT ON THIS PROJECT THAT INDICATE A NEED FOR SEASONAL LIMITATIONS ON THE CLEARING, GRUBBING, EXCAVATION, GRADING, CUTTING OR FILLING OPERATIONS OR ON THE TOTAL AREA OF EXPOSED SOIL.

NOTE: NOTE (12) SHALL BE INCLUDED IN THE PROJECT SPECIAL NOTES ON THE SECOND SHEETS OF THE ROADWAY PLANS FOR ALL PROJECTS WHICH REQUIRE A NPDES PERMIT. FILL IN THE BLANK WITH THE APPROPRIATE SHEET NUMBER.

(12) REFER TO THE EROSION PREVENTION AND SEDIMENT CONTROL PLAN, SHEET ___, FOR NOTES REGARDING SEASONAL WORK LIMITATION OR LIMITATION ON THE TOTAL AREA OF EXPOSED SOIL.

6-290.04 UTILITY RELOCATION

NOTE: NOTES (13) THROUGH (22) SHALL BE INCLUDED IN THE EPSC SPECIAL NOTES ON THE FIRST SHEET OF THE EPSC PLAN SET FOR ALL PROJECTS IN WHICH UTILITIES ARE IN THE CONTRACT. REFER TO SECTION 3-305.07.

(13) RAIN WATER WHICH COLLECTS IN THE UTILITY TRENCH SHALL BE PUMPED INTO A DEWATERING STRUCTURE OR SEDIMENT FILTER BAG AND MAINTAINED.

(14) SILT FENCE SHALL BE INSTALLED ON THE DOWNSTREAM SIDE OF STOCKPILED SOIL. TRENCHING ACROSS WET WEATHER CONVEYANCES SHALL BE DONE DURING NO FLOW CONDITIONS AND STABILIZED BY THE END OF THE WORK DAY.

(15) UTILITY CROSSINGS FOR PERENNIAL STREAMS SHALL BE CONSTRUCTED IN ACCORDANCE WITH TDOT STANDARDS AND NO WORK SHALL BE CONDUCTED IN FLOWING WATERS. TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION (TDEC) REGULATIONS APPLY TO UTILITIES IN THIS PROJECT IN REGARD TO EROSION PREVENTION AND SEDIMENT CONTROL (EPSC). THE STATE CONTRACTOR SHALL COMPLY WITH ALL REQUIREMENTS OF THE STORM WATER POLLUTION PREVENTION PLANS (SWPPP).

(16) IT IS THE RESPONSIBILITY OF THE STATE UTILITY CONTRACTOR INSTALLER TO PROTECT FROM EROSION EXPOSED EARTH RESULTING FROM THEIR OPERATIONS AND TO PROVIDE FOR CONTAINMENT OF SEDIMENT THAT MAY RESULT FROM THEIR WORK. PRIOR TO BEGINNING WORK, ADEQUATE MEASURES MUST BE IN PLACE TO TRAP ANY SEDIMENT THAT MAY TRAVEL OFF-SITE IN THE EVENT OF RAIN. DURING THE PROGRESSION OF THEIR WORK, EXPOSED EARTH AREAS SHALL BE STABILIZED AS SOON AS POSSIBLE TO PREVENT EROSION. AT NO TIME SHALL EXPOSED EARTH RESULTING FROM THEIR OPERATIONS HAVE UNPROTECTED ACCESS TO FLOWING OFF-SITE AND ENTERING WATERS OF THE STATE/U.S.

(17) FOR THE INSTALLATION OF BURIED UTILITIES (PIPES AND CABLES), TRENCHES SHALL BE BACKFILLED DAILY AS CONSTRUCTION PROCEEDS. BACKFILLED TRENCHES SHALL BE SEEDED AND MULCHED OR SODDED DAILY IF POSSIBLE, BUT NO LATER THAN SEVEN DAYS AFTER BEING BACKFILLED. ANY TEMPORARY SPOIL OF EXCAVATED EARTH SHALL BE LOCATED WITHIN TDOT EROSION PREVENTION AND SEDIMENT CONTROL (EPSC) MEASURES OR RECEIVE SEPARATE EPSC MEASURES. IF TRENCHES ARE NOT BACKFILLED OVERNIGHT, APPROPRIATE EPSC MEASURES WILL BE INSTALLED BY THE STATE UTILITY CONTRACTOR UNTIL SUCH TIME AS THE TRENCH IS BACKFILLED.

(18) IN REGARD TO EROSION PREVENTION AND SEDIMENT CONTROL (EPSC), TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION (TDEC)

REGULATIONS APPLY TO THE STATE UTILITY CONTRACTORS IN THIS PROJECT, THEREFORE, THE STATE CONTRACTOR SHALL COMPLY WITH ALL REQUIREMENTS OF THE STORM WATER POLLUTIONS PREVENTION PLANS (SWPPP). THE STATE CONTRACTOR IS RESPONSIBLE FOR EPSC MEASURES RELATED TO UTILITY CONSTRUCTION INCLUDED IN THE STATE CONTRACT WORK.

(19) TRENCHES FORMED FOR THE INSTALLATION OF BURIED UTILITIES MAY CAUSE STORM WATER RUNOFF TO CONCENTRATE AT THE TRENCH LINE. ADDITIONAL EROSION PREVENTION AND SEDIMENT CONTROL (EPSC) MEASURES MAY BE REQUIRED TO BE INSTALLED AS APPROVED BY THE TDOT PROJECT ENGINEER.

(20) FOR THE INSTALLATION OF UNDERGROUND UTILITIES OUTSIDE OF THE TDOT RIGHT-OF-WAY, EROSION PREVENTION AND SEDIMENT CONTROL (EPSC) SHALL BE INSTALLED PRIOR TO CLEARING (TRENCHING AND ASSOCIATED BLASTING) IN THOSE AREAS NECESSARY TO PREVENT SEDIMENT FROM LEAVING THE CONSTRUCTION AREA. THESE EPSC MEASURES SHALL REMAIN UNTIL THE BACKFILLED TRENCH IS STABILIZED WITH FINAL VEGETATIVE COVER.

(21) THE UTILITY CONTRACTOR SHALL RESTORE ALL AFFECTED WET WEATHER CONVEYANCES TO THE EXISTING TOPOGRAPHIC CONDITIONS (AS APPROVED BY THE TDOT PROJECT ENGINEER).

(22) THE UTILITY CONTRACTOR WILL PROVIDE APPROPRIATE EROSION PREVENTION AND SEDIMENT CONTROL (EPSC) MEASURES TO REPLACE IN-PLACE EPSC MEASURES REMOVED TO FACILITATE THE INSTALLATION OF UTILITIES. REPLACEMENT OF EPSC MEASURES WILL BE COORDINATED WITH THE TDOT PROJECT ENGINEER BEFORE COMMENCING WORK.

6-290.05 LITTER, DEBRIS, WASTE, PETROLEUM

NOTE: NOTE (23) SHALL BE INCLUDED IN THE EPSC SPECIAL NOTES ON THE FIRST SHEET OF THE EPSC PLAN SET FOR ALL PROJECTS WHERE A BRIDGE IS BEING WIDENED, REPLACED, OR REHABILITATED OVER RAILROAD RIGHT-OF-WAY. FILL IN THE BLANK WITH THE NAME(S) OF THE APPROPRIATE RAILROAD(S) INVOLVED IN THE PROJECT.

(23) THE CONTRACTOR SHALL MAINTAIN A COMPLETE AND COMPREHENSIVE EROSION PREVENTION AND SEDIMENT CONTROL PLAN TO PREVENT ROADWAY AND/OR CONSTRUCTION SEDIMENT OR DEBRIS AND ANY PETROLEUM BASED PRODUCTS OR CHLORINATED SOLVENTS, PAINTS OR COATINGS ETC. FROM FALLING ONTO THE RAILROAD'S RIGHTS-OF-WAY AND/OR FROM ENTERING THE DRAINAGE DITCHES OR DRAINAGE STRUCTURES OF THE RAILROAD, AND ANY SEDIMENT OR DEBRIS OR PETROLEUM BASED PRODUCTS OR CHLORINATED SOLVENTS, ETC. THAT DO ENTER SUCH DRAINAGE AREAS OF THE RAILROAD'S RIGHTS-OF-WAY

ARE TO BE REMOVED IN ACCORDANCE WITH RULES SET FORTH BY _____ AND AT THE CONTRACTOR'S EXPENSE.

6-290.06 POLYACRYLAMIDE

NOTE: NOTES (24) THROUGH (35) SHALL BE INCLUDED IN THE EPSC SPECIAL NOTES ON THE FIRST SHEET OF THE EPSC PLAN SET FOR ALL PROJECTS WHERE POLYACRYLAMIDE (PAM) IS USED.

(24) ENSURE POLYACRYLAMIDE (PAM) EMULSIONS AND POWDERS ARE OF THE ANIONIC TYPE AND MEET THE FOLLOWING REQUIREMENTS:

(25) MEETS THE EPA AND FDA ACRYLAMIDE MONOMER LIMITS OF EQUAL TO OR GREATER THAN 0.005% ACRYLAMIDE MONOMER.

(26) HAS A DENSITY OF 10% TO 55% BY WEIGHT AND A MOLECULAR WEIGHT OF 16 TO 24 MG/MOLE.

(27) MIXTURE IS NON-COMBUSTIBLE.

(28) CONTAINS ONLY MANUFACTURER'S RECOMMENDED ADDITIVES.

(29) PAM SHALL BE MIXED AND APPLIED IN ACCORDANCE WITH ALL OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) MATERIAL SAFETY DATA SHEET (MSDS) REQUIREMENTS AND THE MANUFACTURER'S RECOMMENDATIONS FOR THE SPECIFIED USES CONFORMING TO ALL FEDERAL, STATE, AND LOCAL LAWS, RULES, AND REGULATIONS.

(30) ALL VENDERS AND SUPPLIERS OF PAM, PAM MIX, OR PAM BLENDS SHALL PRESENT OR SUPPLY A WRITTEN TOXICITY REPORT WHICH VERIFIES THAT THE PAM, PAM MIX, PAM BLEND EXHIBITS ACCEPTABLE TOXICITY PARAMETERS WHICH MEET OR EXCEED THE EPA REQUIREMENTS FOR THE STATE AND FEDERAL WATER QUALITY STANDARDS. WHOLE EFFLUENT TESTING DOES NOT MEET THIS REQUIREMENT AS PRIMARY REACTIONS HAVE OCCURRED AND TOXIC POTENTIALS HAVE BEEN REDUCED. CATIONIC FORMS OF PAM ARE NOT ALLOWED FOR UNDER THIS GUIDELINE DUE TO THEIR HIGH LEVELS OF TOXICITY TO AQUATIC ORGANISMS. PAM EMULSIONS SHALL NEVER BE APPLIED DIRECTLY TO STORMWATER RUNOFF OR RIPARIAN WATERS DUR TO SURFACTANT TOXICITY. CONTRACTOR MUST SEEK THE APPROVAL OF THE EPSC DESIGN ENGINEER AND TDOT IF CHITOSAN IS PROPOSED FOR USE ON THIS PROJECT.

(31) ALL VENDORS AND SUPPLIERS OF PAM, PAM MIX, OR PAM BLENDS SHALL SUPPLY WRITTEN "SITE SPECIFIC" TESTING RESULTS DEMONSTRATING THAT A PERFORMANCE OF 95% OR GREATER REDUCTION OF NTU OR TSS FROM STORMWATER DISCHARGES.

(32) EMULSION BATCHES SHALL BE MIXED FOLLOWING RECOMMENDATIONS OF A TESTING LABORATORY THAT DETERMINES THE PROPER PRODUCT AND RATE TO MEET SITE REQUIREMENTS. APPLICATION METHOD SHALL

ENSURE UNIFORM COVERAGE TO THE TARGET AREA. EMULSIONS SHALL NEVER BE APPLIED DIRECTLY TO STORMWATER RUNOFF OR RIPARIAN WATERS.

(33) PAM POWDER MAY BE APPLIED BY A HAND SPREADER OR A MECHANICAL SPREADER. MIXING PAM POWDER WITH DRY ~~DILICA~~ SILICA SAND WILL AID IN SPREADING.

(34) PREMIXING OF PAM POWDER INTO FERTILIZER, SEED, OR OTHER SOIL AMENDMENTS IS ALLOWED WHEN SPECIFIED IN THE DESIGN PLAN. APPLICATION METHOD SHALL ENSURE UNIFORM COVERAGE TO THE TARGET AREA.

(35) PAM LOGS OR BLOCKS SHALL BE APPLIED FOLLOWING SITE TESTING RESULTS TO ENSURE PROPER PLACEMENT AND PERFORMANCE AND SHALL MEET OR EXCEED STATE AND FEDERAL WATER QUALITY REQUIREMENTS.

6-295.00 ENVIRONMENTAL

6-295.01 ECOLOGY

NOTE: NOTES (1) THROUGH (3) SHALL BE INCLUDED IN THE PROJECT SPECIAL NOTES ON THE SECOND SHEETS OF THE ROADWAY PLANS FOR ALL PROJECTS WHICH HAVE THREATENED OR ENDANGERED SPECIES OR CRITICAL HABITAT IDENTIFIED FOR BRIDGES.

(1) STAFF FROM THE TDOT ENVIRONMENTAL DIVISION OR A DESIGNEE WILL ADVISE THE CONTRACTOR DURING THE PRE-CONSTRUCTION MEETING CONCERNING WHEN ENVIRONMENTAL DIVISION PERSONNEL OR DESIGNATED CONSULTANT WILL NEED TO BE ON-SITE FOR WORK BEING DONE WHICH COULD AFFECT THE STREAM OR SPECIES.

(2) STAFF FROM THE TDOT ENVIRONMENTAL DIVISION OR A DESIGNEE WILL ATTEND THE PRE-CONSTRUCTION MEETING FOR ALL PROJECTS WHICH HAVE THREATENED OR ENDANGERED SPECIES OR CRITICAL HABITAT PROXIMAL TO SCHEDULED BRIDGE WORK. THIS WILL PROVIDE THE OPPORTUNITY TO ENSURE THAT PERSONNEL INCLUDING THE CONTRACTOR'S PERSONNEL AND SUBCONTRACTORS ARE MADE AWARE OF THE NECESSARY PRECAUTIONS WHICH MUST BE FOLLOWED.

(3) ALL BRIDGE PROJECTS WITH THREATENED OR ENDANGERED SPECIES OR CRITICAL HABITAT IDENTIFIED MUST HAVE MEASURES IN PLACE TO CONTAIN CONCRETE DUST, CEMENT DUST AND ALL OTHER MATERIALS. THESE MATERIALS ARE NOT ALLOWED TO ENTER THE STREAM.

6-295.02 STREAM RELOCATION

NOTE: NOTE (4) SHALL BE INCLUDED IN THE PROJECT SPECIAL NOTES ON THE SECOND SHEETS OF THE ROADWAY PLANS FOR ALL PROJECTS WHICH CONTAIN A STREAM RELOCATION.

(4) ONCE WATER IS DIVERTED INTO A NEWLY CONSTRUCTED AND STABILIZED RELOCATED STREAM / CHANNEL THE ECOLOGY SECTION MUST BE NOTIFIED. THE STREAM NAME, STREAM NUMBER, AND DATE THE WATER WAS DIVERTED INTO THE STREAM / CHANNEL IS TO BE SUPPLIED WITH THE NOTIFICATION.

SECTION VII – INDEX

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ITEM NUMBER INDEX

SECTION VIII – INSTRUCTIONAL BULLETINS

Instructional Bulletins will be issued as the need arises throughout the year. They will have a number that designates the year and the sequence of bulletins for that year (for example 08-01). The practice or principle is to remain in effect for an extended period of time then the bulletin will contain the necessary pages to insert into the guidelines. If the instructions are no longer needed then the bulletin will be voided.

The list of effective Instructional Bulletins is available at:
http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/Instructional_Bulletins.htm