

**TENNESSEE DEPARTMENT
of
TRANSPORTATION**



**DESIGN DIVISION
METRIC
ROADWAY DESIGN GUIDELINES**

APRIL 2001

TDOT - ROADWAY DESIGN GUIDELINES

Metric

Revised: 03/15/06



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FOREWORD

These guidelines establish uniform policies and 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 judgement.

As permitted under 23 CFR 625.3 (e), the roadway design policies and procedures herein do not apply for traffic engineering 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.

TDOT - ROADWAY DESIGN GUIDELINES

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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 new 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 GUIDELINES

The new 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. Index
- VI. 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 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 01-01). At the end of each calendar year the instructional bulletins for that year will be evaluated. If the practice or principle is to remain in effect for an extended period of time then the bulletin will become a part of the Guidelines. If the instructions are no longer needed then the bulletin will be discarded. There may be some rare occasions where the bulletin will need to be in effect for only a short time after the first of a calendar year. In those cases the bulletin would be reissued with a new year and sequence number.

The main text of the guidelines will have updates but the index numbers for a particular item should not change. If pages must be added they will be inserts so that the page numbers should remain constant for an item.

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.

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SECTION I - GENERAL

This section is in the process of being revised. The revised section will be added at a later date.

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- 2-105.00 ROADWAY DESIGN CHECKLIST - (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 reproducible photographic mylar sheets and cross-section sheets submitted for printing of the Right-of-Way or Construction Plans shall be of a standard size. That size is to be 914 mm x 584 mm prior to final trimming of margin along top and bottom edge. This margin is to be trimmed prior to submission of Construction Plans. Final size of sheets is to be 914 mm x 559 mm under all circumstances.

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 Transportation 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

TDOT C.E. MANAGER 1 OR
 TDOT TRANSPORTATION MANAGER 1: _____

DESIGNED BY _____ (FIRM NAME)

DESIGNER _____ (RESPONSIBLE PERSON)

P.E. NO. _____

PIN NO. _____

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

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TDOT DESIGN RIGHT-OF-WAY

TDOT ROAD SP. SV. 2 _____

DESIGNER _____

P.E. NO. _____

PIN NO. _____

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, 1995, 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 + xxx BK. = STA. xx + xxx AH.	+ xx.xxx
STA. xx + xxx BK. = STA. xx + xxx AH.	- xx.xxx
TOTAL	± xx.xxx

Figure 2-3
Equation Block Format

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

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

EXCLUSION STA. XX+XXX TO STA. XX+XXX
NET EFFECT ON ENUMERATION \pm 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 (AHV)	xx %
V	xx km/h

**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. Interstate route 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: 0.8 km SOUTH OF BANANA TOWN
TO: 2.1 km 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.

SPECIAL LOG MILE NOTE:

On Interstate plans, both Interstate log miles (based on Interstate mileposts) and stations will be required when designating the begin and end 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 begin and end 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

In order 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 Civil Engineering Manager I or Transportation Manager 1.

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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 cross roads 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 cross roads within the limits of the project.

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

NOTE: For Bridge Replacement Projects, ADL are not required for ADTs of 1000 or less and percentage trucks of 7 percent or less.

NOTE: ADTs and DHVs are not required for crossroads with ADTs of 1000 or less.

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TENNESSEE DEPARTMENT OF TRANSPORTATION TRAFFIC PLANNING AND STATISTICS OFFICE

(REV. 9/21/04)

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

DIVISION REQUESTING:

MAINTENANCE	<input type="checkbox"/>	PAVEMENT DESIGN	<input type="checkbox"/>
PLANNING	<input type="checkbox"/>	STRUCTURES	<input type="checkbox"/>
PROG. DEVELOPMENT & ADM.	<input type="checkbox"/>	SURVEY & DESIGN	<input type="checkbox"/>
PUBLIC TRANS. & AERO.	<input type="checkbox"/>	TRAFFIC SIGNAL DESIGN	<input type="checkbox"/>
		OTHER _____	<input type="checkbox"/>

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: TONY ARMSTRONG _____ DATE _____
 TRANSPORTATION MANAGER 1
 SUITE 1000, JAMES K. POLK BUILDING

APPROVED BY: STEVE ALLEN _____ DATE _____
 TRANSPORTATION MANAGER 2
 SUITE 1000, 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.

**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 4.9 m over the entire roadway width, including the usable width of shoulder. The vertical clearance to sign trusses and pedestrian overpasses shall be 5.2 m 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 5.2 m. The vertical clearance for railroad crossings from structure to top of rails shall be 7.1 m.

An allowance of 150 mm shall be added to all vertical clearances to accommodate future resurfacing.

On crossings of low volume roadways where the cost of providing 4.9 m 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 submitted to the Director of the Structures Division.

1. Floodplain sections (stream crossing)
2. Stream profiles (stream crossing)
3. Roadway and railroad profile
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

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 RDM01-SE-2 and RDM01-SE-3. 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 RDM01-SE-2 and RDM01-SE-3.

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

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

On "BRZ" projects with design speed of 50 km/h 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 designated 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% 110 km/h". Also, show transition length on non-spiraled curves.

2-135.00 THE CLEAR 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 radius 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.

2-140.00 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 kilometer 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.

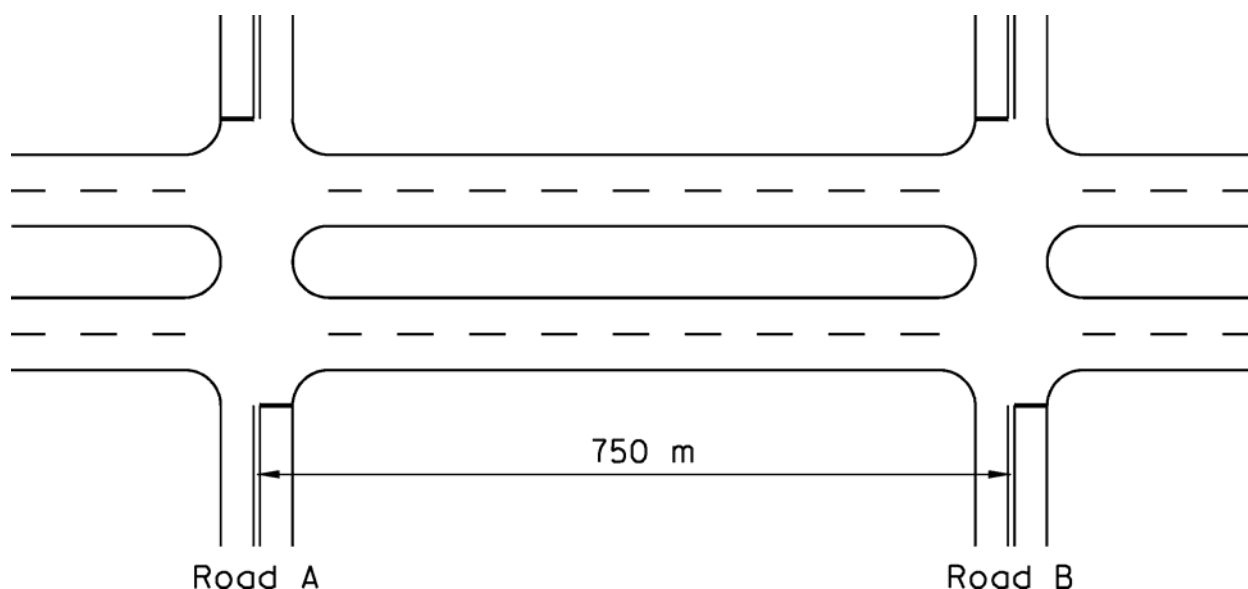
It is the policy of the Department to provide median openings at most existing city streets or county roads. It is also the policy of the Department to provide uniformly spaced openings between median openings for city streets or county roads for U-turn vehicles. The desirable uniform spacing is 400 m (a range of 268 m - 536 m is acceptable) in rural areas and 200 m (a range of 134 m - 268 m 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 23 m 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 750 m. Since this is an urban section of roadway, the appropriate median opening spacing would be that which most closely approximates 200 m. It shall not, however, be less than 134 m nor more than 268 m.

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The first step in determining the proper spacing is to divide the total distance between the intersection openings (750 m) by the desirable urban spacing (200 m). This will give the approximate number of spaces required.

$$\frac{750}{200} = 3.75$$

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

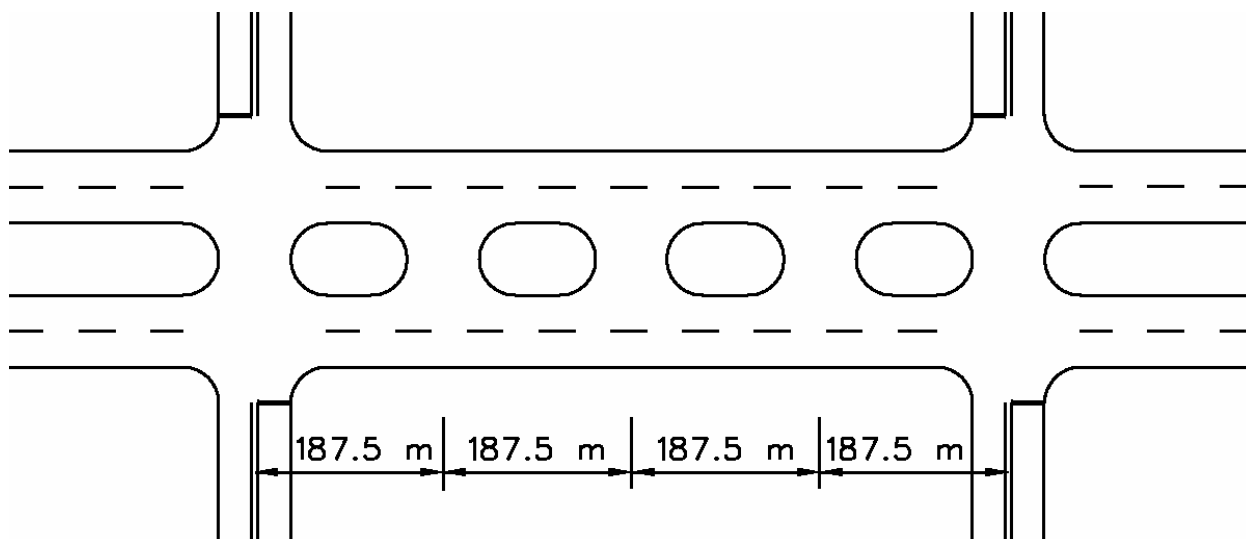
The next step is to determine which condition would result in a spacing nearest 200 m, but which is also no less than 134 m nor more than 268 m. To do this, first divide the total distance between the intersection openings (750 m) by the possible number of spacings (3 and 4). At the same time, check to see if the resulting distances are within the permissible range (134 m - 268 m) because if the resulting distance is not within this range, discard it as an alternative.

$$\frac{750}{3} = 250 \quad 134 < 250 < 268 \quad \text{OK}$$

$$\frac{750}{4} = 187.5 \quad 134 < 187.5 < 268 \quad \text{OK}$$

Both possible spacings (250 m and 187.5 m) are within the permissible range. Therefore, it must be determined which is closest to 200 m.

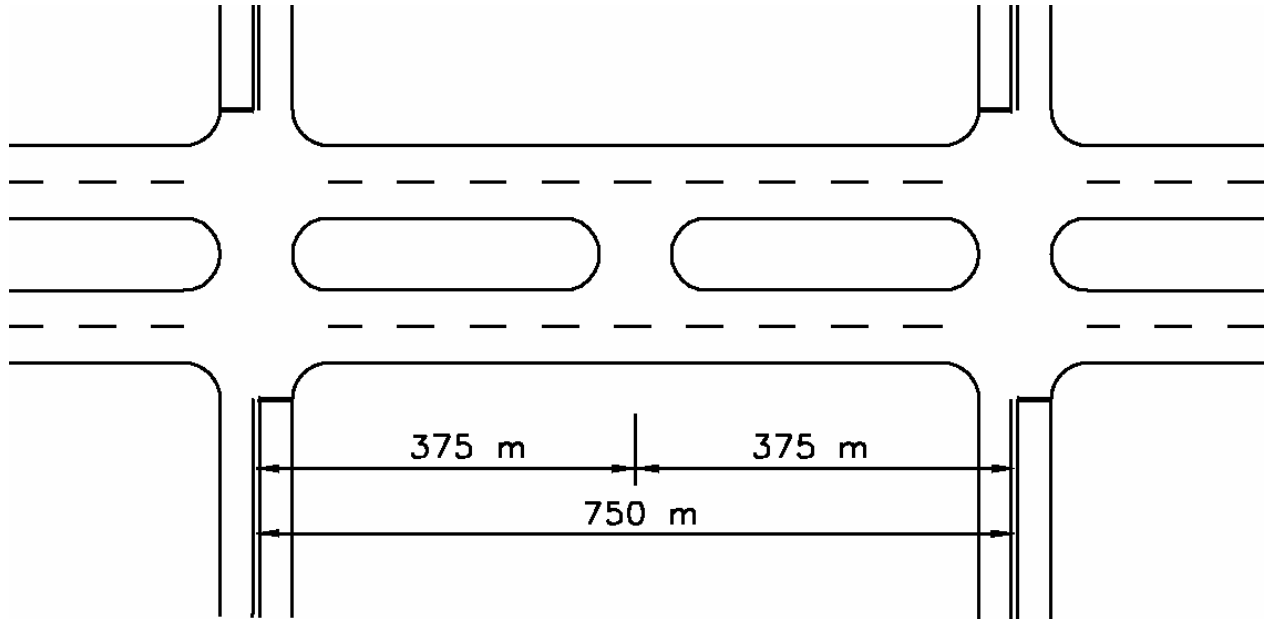
250	200
<u>-200</u>	<u>-187.5</u>
50	12.5



Since 12.5 is less than 50, the most appropriate median opening spacing between Road A and Road B would be 187.5 m. This would result in 3 midblock median openings 187.5 m 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 750 m. The desirable rural spacing is 400 m, but no less 268 m nor more than 536 m.

$$\frac{750}{400} = 1.9$$

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 400 m, but which is also no less than 268 m nor more than 536 m.

$$\frac{750}{1} = 750 \quad 268 < 750 > 536 \quad \text{not acceptable}$$

$$\frac{750}{2} = 375 \quad 268 < 375 < 536 \quad \text{OK}$$

The only acceptable median opening spacing between Road A and Road B is 375 m. Therefore, one midblock median opening shall be provided at a point 375 m from each intersection.

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Example No. 3 Urban Section

Total distance between intersection openings is 335 m.

$$\frac{335}{200} = 1.7$$

$$\frac{335}{1} = 335 \quad 134 < 335 > 268 \quad \text{not acceptable}$$

$$\frac{335}{2} = 167.5 \quad 134 < 167.5 < 268 \quad \text{OK}$$

The only acceptable spacing is 167.5 m. Therefore, one midblock median opening shall be provided at a point 167.5 m from each intersection.

Example No. 4 Rural Section

Total distance between intersection openings is 335 m.

$$\frac{335}{400} = 0.8$$

$$\frac{335}{0} = \text{infinity} \quad \text{infinity} > 536 \quad \text{not acceptable}$$

$$\frac{335}{1} = 335 \quad 268 < 335 < 536 \quad \text{OK}$$

The only acceptable spacing is 335 m and, therefore, no midblock median opening shall be installed.

Example No. 5 Urban Section

Total distance between intersection openings is 450 m.

$$\frac{450}{200} = 2.3$$

$$\frac{450}{2} = 225 \quad 134 < 225 < 268 \quad \text{OK}$$

$$\frac{450}{3} = 150 \quad 134 < 150 < 268 \quad \text{OK}$$

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$$\begin{array}{r} 200 \\ -150 \\ \hline 50 \end{array} \qquad \begin{array}{r} 225 \\ -200 \\ \hline 25 \end{array}$$

Since 25 m is less than 50 m, the most appropriate median opening spacing would be 225 m. Therefore, 1 midblock median opening shall be installed.

Example No. 6

Rural Section

Total distance = 450 m

$$\frac{450}{400} = 1.1$$

$$\frac{450}{1} = 450 \qquad 268 < 450 < 536 \text{ OK}$$

$$\frac{450}{2} = 225 \qquad 225 < 268 \text{ not acceptable}$$

The only acceptable spacing is 450 m. Therefore, no midblock opening shall be installed.

Example No. 7

Urban Section

Total distance = 1790 m

$$\frac{1790}{200} = 8.9$$

$$\frac{1790}{8} = 224 \qquad 134 < 224 < 268 \text{ OK}$$

$$\frac{1790}{9} = 199 \qquad 134 < 199 < 268 \text{ OK}$$

$$\begin{array}{r} 224 \\ -200 \\ \hline 24 \end{array} \qquad \begin{array}{r} 200 \\ -199 \\ \hline 1 \end{array}$$

Since 1 is less than 24, the appropriate spacing is 199 m resulting in 8 midblock median openings.

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Example No. 8 Rural Section

Total distance = 1790 m

$$\frac{1790}{400} = 4.4$$

$$\frac{1790}{4} = 448 \qquad 268 < 448 < 536 \text{ OK}$$

$$\frac{1790}{5} = 358 \qquad 268 < 358 < 536 \text{ OK}$$

$$\begin{array}{r} 448 \quad 400 \\ -400 \quad -358 \\ \hline 48 \quad 42 \end{array}$$

Since 42 is less than 48, the most appropriate spacing is 358 m resulting in 4 midblock median openings.

Example No. 9 Urban Section

Total distance = 1800 m

$$\frac{1800}{200} = 9.0$$

Therefore, the appropriate spacing would be 200 m resulting in 8 midblock median openings.

Example No. 10 Rural Section

Total distance = 1810 m

$$\frac{1810}{400} = 4.5$$

$$\frac{1810}{4} = 452.5 \qquad 268 < 452.5 < 536 \text{ OK}$$

$$\frac{1810}{5} = 362 \qquad 268 < 362 < 536 \text{ OK}$$

$$\begin{array}{r} 452.5 \quad 400 \\ -400 \quad -362 \\ \hline 52.5 \quad 38 \end{array}$$

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Since 38 is less than 52.5, the most appropriate median opening spacing is 362 m resulting in 4 midblock median openings.

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

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

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.

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 and 3-315.10)

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:

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1. Light cuts and fills

0.3 m - 0.6 m cuts and fills

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

0.6 m - 1.2 m cuts and fills

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

1.2 m - 1.8 m 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 3.6 m +, Fills 0.3 m - 0.6 m (average)

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

Cuts 3.6 m +, Fills 0.6 m - 1.2 m (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 0.9 m in height unless requested by the Soils and Geology Office.

2-150.00 TRUCK CLIMBING LANES

The term “critical length of grade” is used to indicate the maximum length of a designated upgrade on which a loaded truck can operate without an unreasonable reduction in speed. When lengths are less than the critical length shown on Figure 2-8, the designer has achieved an acceptable design. When lengths are greater than the critical length shown on Figure 2-8, the designer must either modify the design or add an additional climbing lane. On all truck climbing lanes used on TDOT Projects, the designer shall adhere to the AASHTO recommended guidelines for the 15 km/h (10 mph) reduction criterion.

Figure 2-8, which shows a 15 km/h (10 mph) speed reduction curve, was taken from Figure 3-59 on page 242 of *A Policy on Geometric Design of Highways and Streets* 2004. Please read and thoroughly understand the related text in this publication prior to attempting to establish a truck climbing lane.

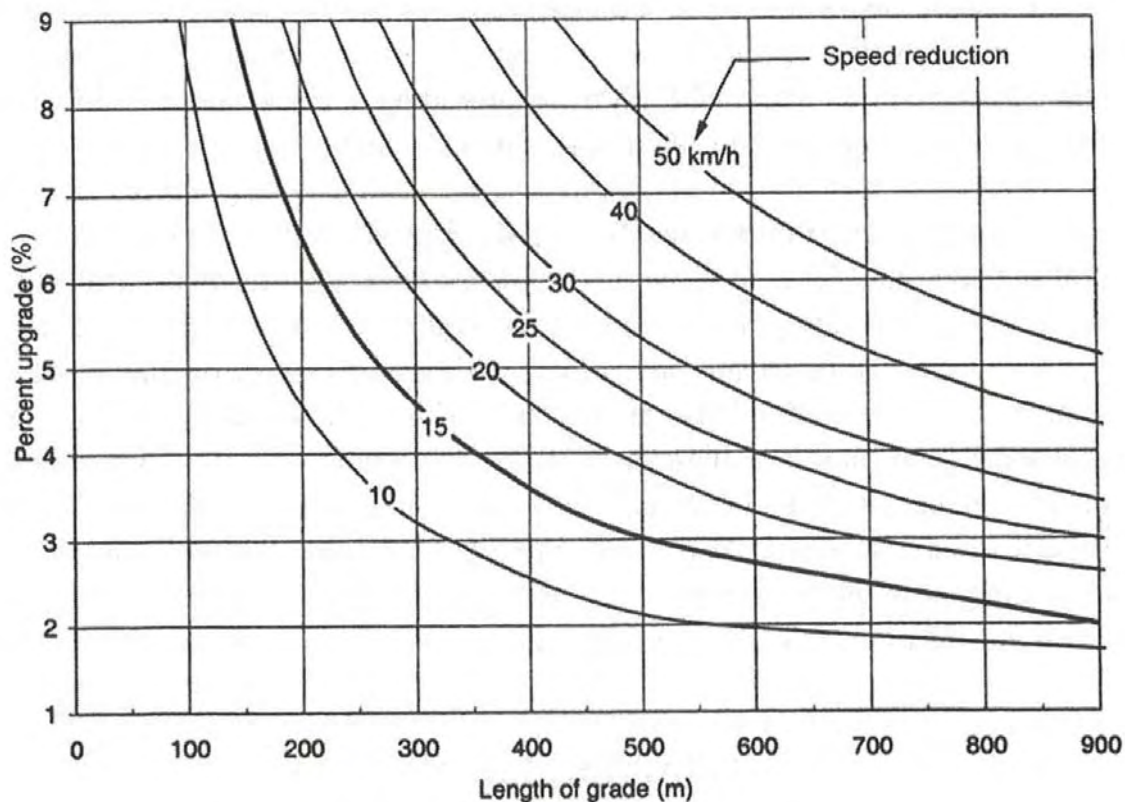


Figure 2-8
Critical Lengths of Grade for Design, Assumed Typical Heavy Truck of 120 kg/kW (200 lb/hp), Entering Speed = 110km/h (70 mph)

2-155.00 WETLANDS BOUNDARY DESIGNATION

When a designer receives a project survey showing wetland involvement or the designer suspects wetland involvement, the designer shall send a half-size set of plans two weeks prior to the printing for the Preliminary Field Review (See Activity and Estimated Completion Schedule, A & E) to the Technical Studies Section of the Environmental Division. That division will mark the wetland boundaries on the plans and return them to the designer. The designer will then show the wetland boundaries on the plans.

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

The word "WETLANDS" shall be placed inside the boundary.

Wetlands located immediately adjacent to the project shall be identified on the plans, if wetlands will be affected by the roadway construction or possible wetland impacts are identified by the Environmental Division. 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 meters or hectares) of any wetlands impacted by the project or any right-of-way taken for wetland replacement shall be indicated on the present layout sheet.

2-155.02 HAZARDOUS MATERIAL STUDY

The designer shall send a half-size set of plans for all projects requiring right-of-way acquisition two weeks prior to the printing for the Preliminary Field Review (See Activity and Estimated Completion Schedule, A & E) to the Environmental Impact Studies Section of the Environmental Planning Office. That office will use these plans to make a hazardous material 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 2-9.

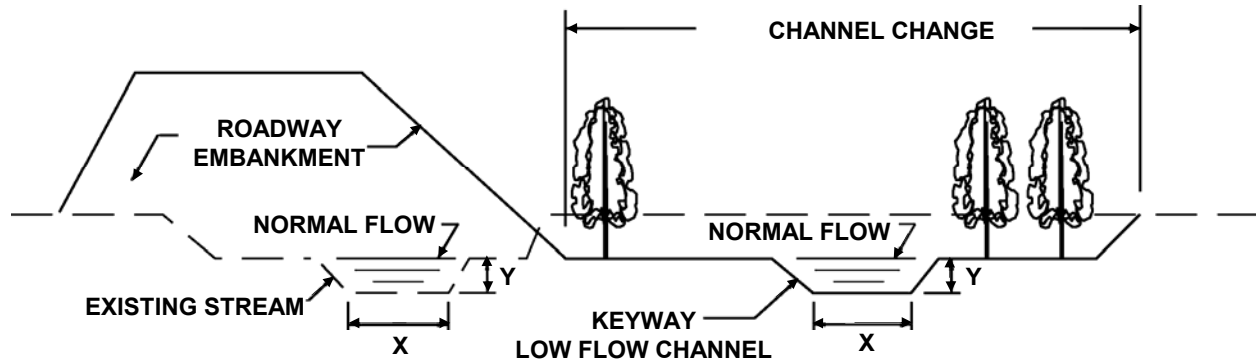


Figure 2-9
Channel Changes

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

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 2-10 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.

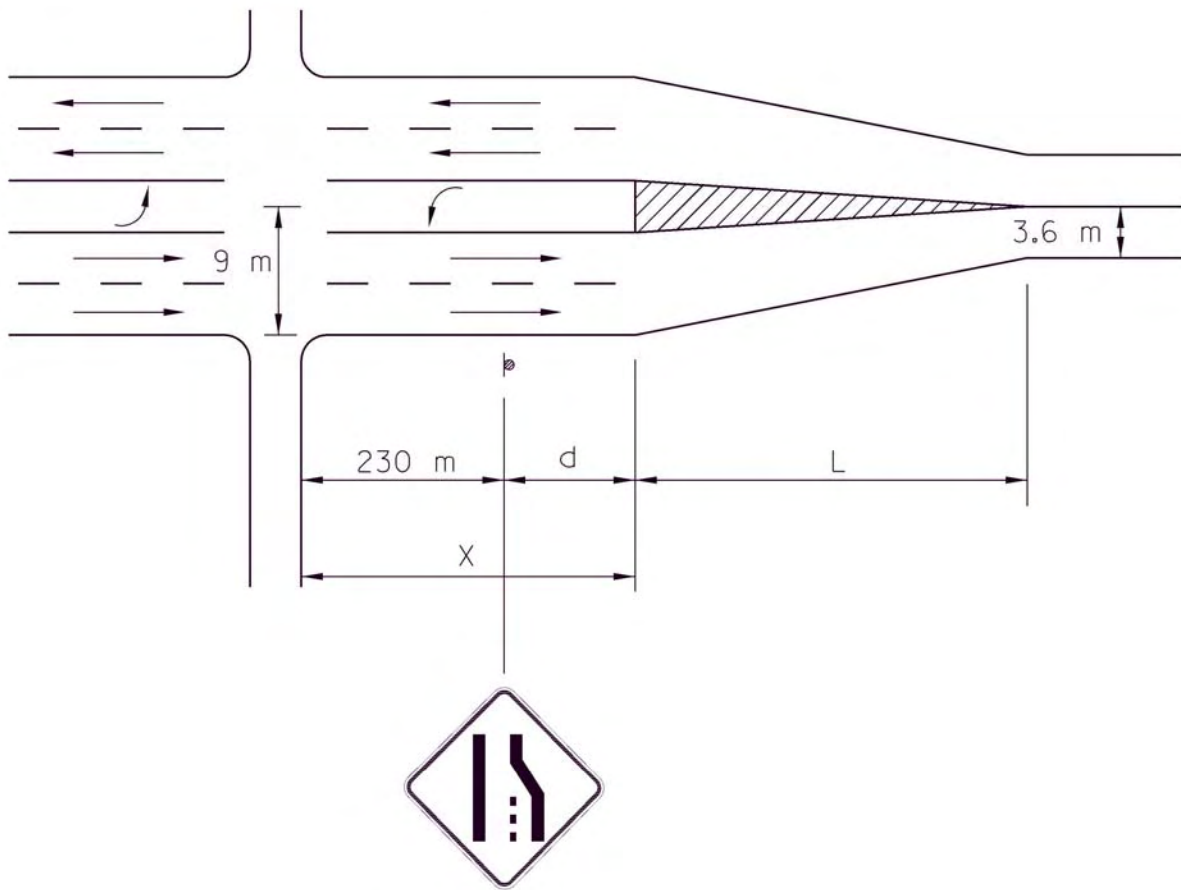


Figure 2-10
Minimum Length (X) through Lane Extensions

230 m- 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-3, Table II-1, Condition A.

L - Transition length, as required by *M.U.T.C.D.*, Sec. 3B-8, Fig. 3-10.

Note: 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.

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To find "d" use Table 2-1.

Posted or 85 th Percentile Speed (km/h)	Advance Placement Distance ¹ (m)												
	Condition A: Speed Reduction and Lane Changing in Heavy Traffic ²	Condition B: Deceleration to the listed advisory speed (km/h) for the condition ⁴											
		0 ³	10	20	30	40	50	60	70	80	90	100	110
30	60 m	N/A ⁵	N/A ⁵	N/A ⁵	-	-	-	-	-	-	-	-	-
40	100 m	N/A ⁵	N/A ⁵	N/A ⁵	N/A ⁵	-	-	-	-	-	-	-	-
50	150 m	N/A ⁵	N/A ⁵	N/A ⁵	N/A ⁵	N/A ⁵	-	-	-	-	-	-	-
60	180 m	30	N/A ⁵	N/A ⁵	N/A ⁵	N/A ⁵	N/A ⁵	-	-	-	-	-	-
70	220 m	50	40	30	N/A ⁵	N/A ⁵	N/A ⁵	N/A ⁵	-	-	-	-	-
80	260 m	80	60	55	50	40	30	N/A ⁵	N/A ⁵	-	-	-	-
90	310 m	110	90	80	70	60	40	N/A ⁵	N/A ⁵	N/A ⁵	-	-	-
100	350 m	130	120	115	110	100	90	70	60	40	N/A ⁵	-	-
110	380 m	170	160	150	140	130	120	110	90	70	50	N/A ⁵	-
120	420 m	200	190	185	180	170	160	140	130	110	90	60	40
130	460 m	230	230	230	220	210	200	180	170	150	120	100	70

Table 2-1

Guidelines for Advance Placement of Warning Signs

Reference: Metric Converted *M.U.T.C.D.* 2003 Manual (Table 2C-4 of Section 2C.05)

Notes:

¹The distances are adjusted for a sign legibility distance of 50 m for Condition A. The distances for Condition B have been adjusted for a sign legibility distance of 75 m, which is appropriate for an alignment warning symbol sign.

²Typical 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 PIEV time of 14.0 to 14.5 seconds for vehicle maneuvers (2004 AASHTO Policy, Exhibit 3-3, Decision Sight Distance, Avoidance Maneuver E) minus the legibility distance of 50 m for the appropriate sign.

³Typical 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 2004 AASHTO Policy, Stopping Sight Distance, Exhibit 3-1, providing a PIEV time of 2.5 seconds, a deceleration rate of 3.4 m/second², minus the sign legibility distance of 50 m.

⁴Typical 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 PIEV time, a vehicle deceleration rate of 3 m/second², minus the sign legibility distance of 75 m.

⁵No suggested distances are provided for these speeds, as the placement location is dependent on site conditions and other signing to provide an adequate advance warning for the driver.

EXAMPLE:

Posted speed = 90 km/h

$X = 230 \text{ m} + d = 230 \text{ m} + 218 \text{ m} = 448 \text{ m}$

$L = \frac{S \times W}{1.6}$ (for speed 70 km/h or more) = $\frac{90 \times 5.4}{1.6} = 304 \text{ m}$

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

Designer 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, 2004, Pages 816 and 858 (Exhibits 10-52, A2 and 10-76, 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*, 2004 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.

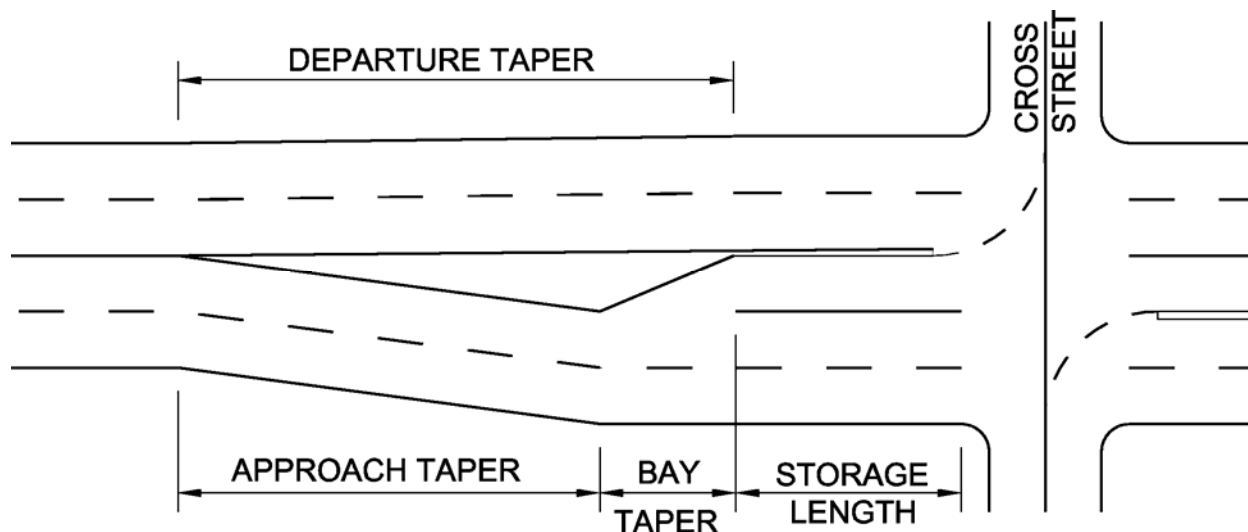


Figure 2-11
Turning Lane Terminology

1) **APPROACH TAPER**

a) $L = W \times S / 1.6$, Speed ≥ 70 km/h

b) $L = \frac{WS^2}{155}$, Speed < 70 km/h

Where L = Length of Taper in meters

W = Width of Offset in meters

S = Design Speed in kilometers per hour

2) **BAY TAPER**

$L = \frac{WSL}{4.8}$, 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 2-13 through 2-16f) by M. D. Harmelink. (See also *A Policy of Geometric Design of Highways and Streets 2004*, 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.

Enter the appropriate chart for design speed and percentage of left turns. Use the total advancing volume for the approach (lefts, thrus, and rights) 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 (km/h)	Deceleration Length to Stop Condition for Less Than 3% Grade (m)
50	50
60	70
70	95
80	120
90	150

Table 2-2

Approximate Total Lengths Needed for Deceleration to a Stop from Design Speed

Reference: AASHTO, *A Policy on Geometric Design of Highways and Streets* (2004)

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* (HCM), 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 thru 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 two-lane divided highways with a maximum median width of 14.4 m. For median widths greater than 14.4 m 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 2-10).

The attached ADT criteria can be used to estimate if a traffic signal will be warranted within five years of project opening (see Table 2-3).

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 Traffic Engineering Section, Signal and Lighting Office can provide assistance.

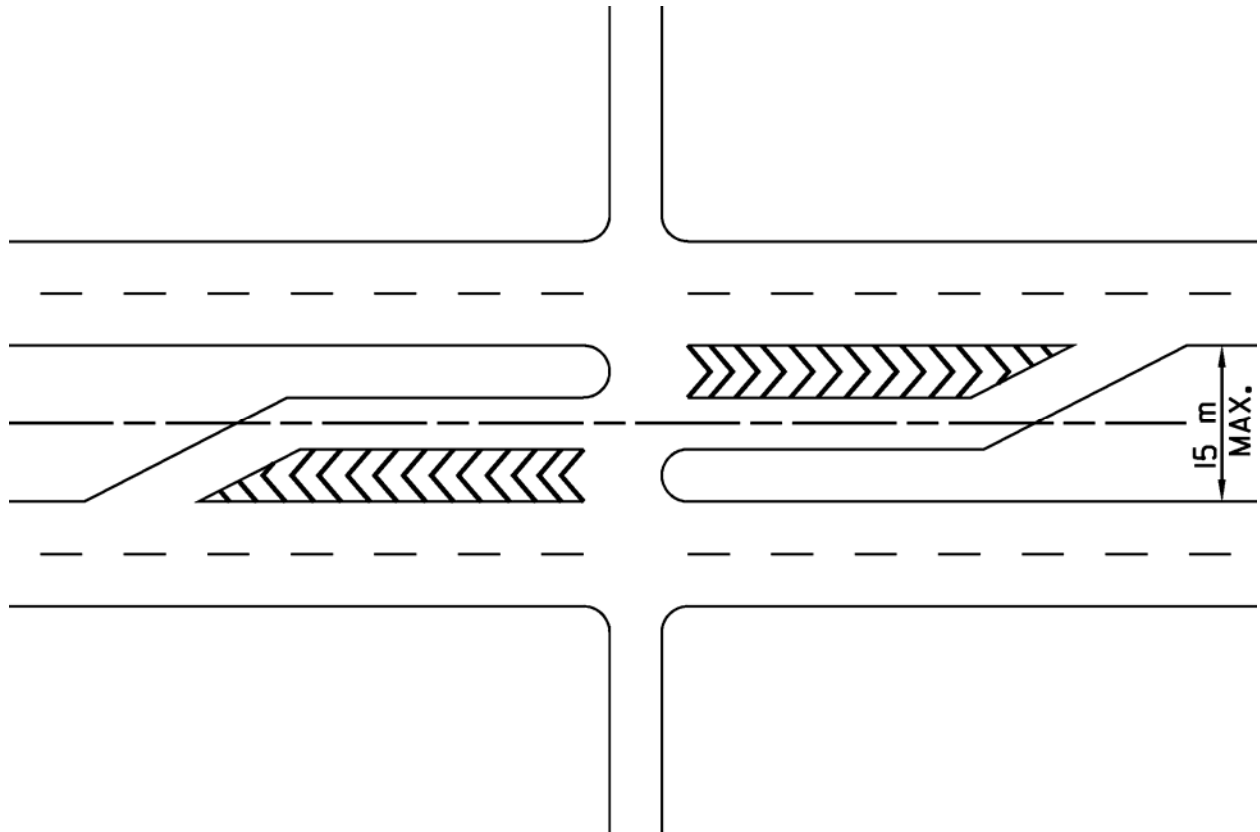


Figure 2-12
Left Turn Lane Alignment

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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 2-3
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%
23 m	0	8 m	8 m	8 m	15 m	15 m
30 m	0	8 m	8 m	15 m	15 m	15 m
38 m	0	8 m	8 m	15 m	15 m	23 m
45 m	0	8 m	15 m	15 m	23 m	23 m
53 m	0	8 m	15 m	23 m	23 m	30 m
60 m	0	8 m	15 m	23 m	30 m	30 m
75 m	0	8 m	15 m	23 m	30 m	38 m
90 m	0	15 m	23 m	30 m	38 m	45 m
105 m	0	15 m	23 m	38 m	45 m	53 m
120 m	0	15 m	30 m	38 m	53 m	60 m
135 m	0	15 m	30 m	45 m	60 m	68 m
150 m	0	15 m	30 m	45 m	60 m	75 m

**Table 2-4
Storage Length To Be Added To Chart Values Of
Left-Turn Lane Storage Lengths**

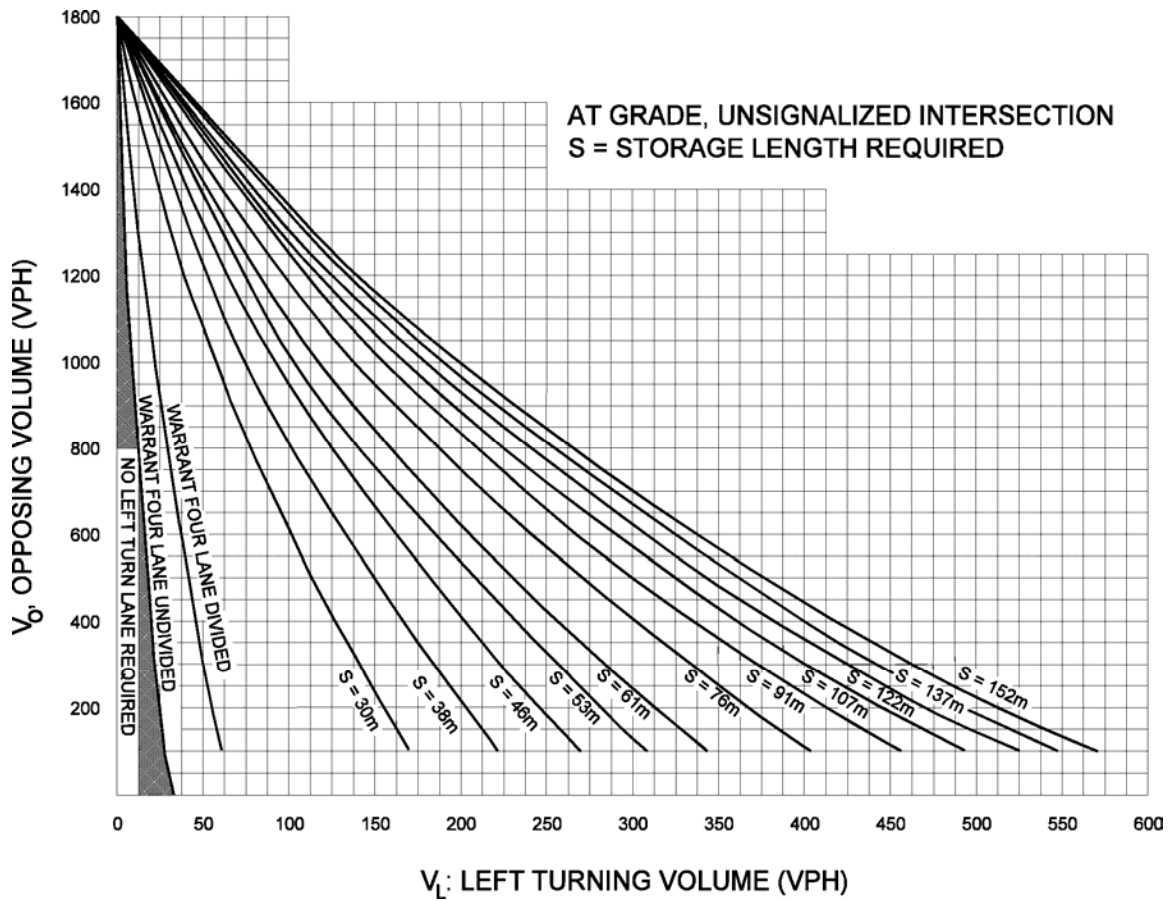


Figure 2-13
Warrant for Left-Turn Storage Lanes on Four-Lane Highways

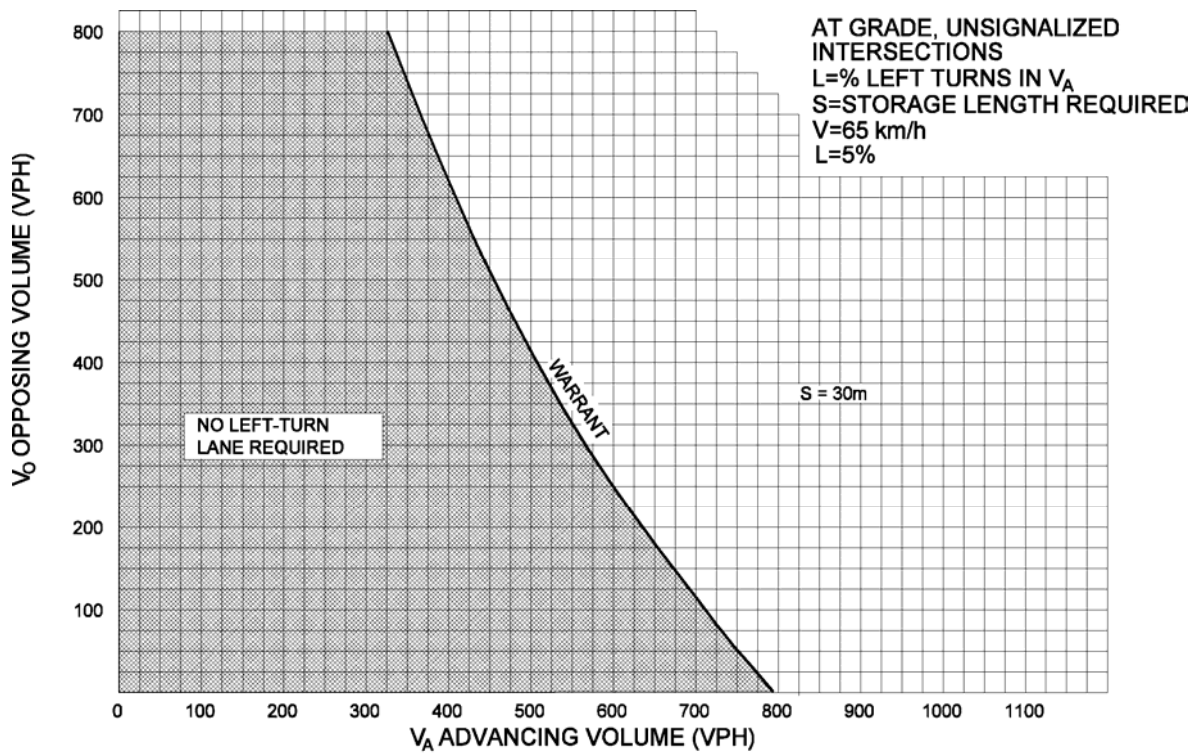


Figure 2-14a

Warrant for Left-Turn Storage Lanes on Two-Lane Highways ($V = 65 \text{ km/h}$ and $L = 5\%$)

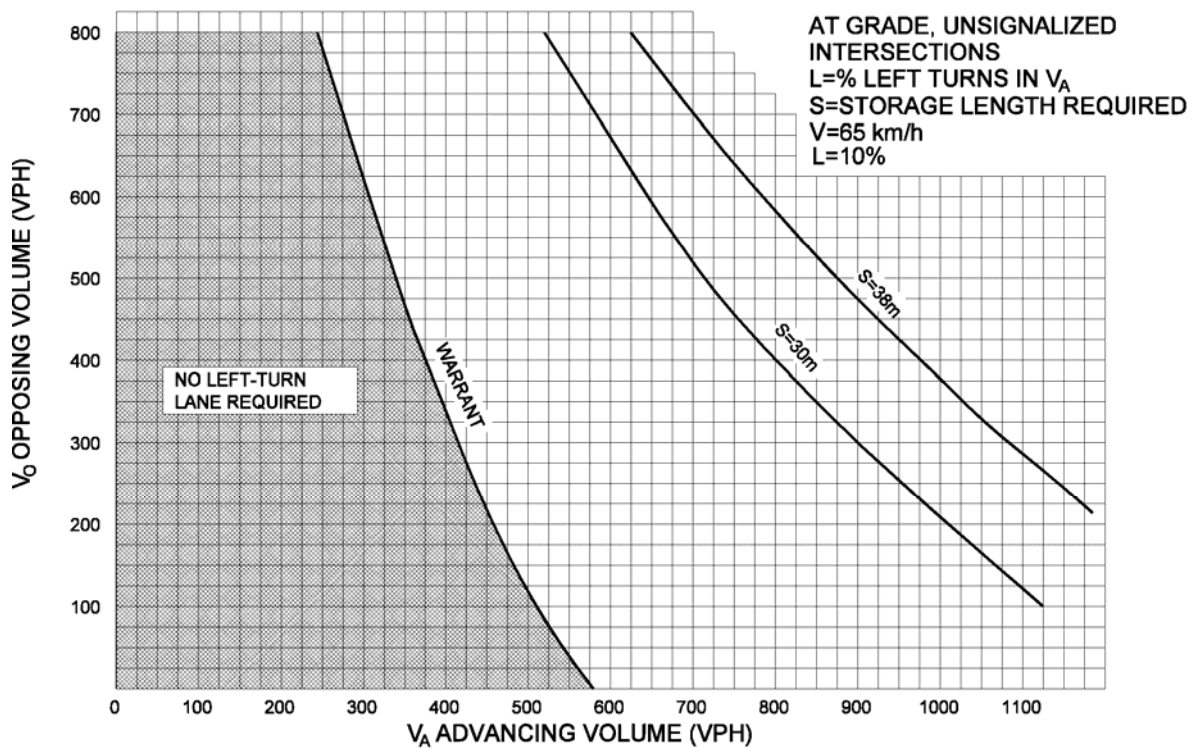


Figure 2-14b

Warrant for Left-Turn Storage Lanes on Two-Lane Highways ($V = 65 \text{ km/h}$ and $L = 10\%$)

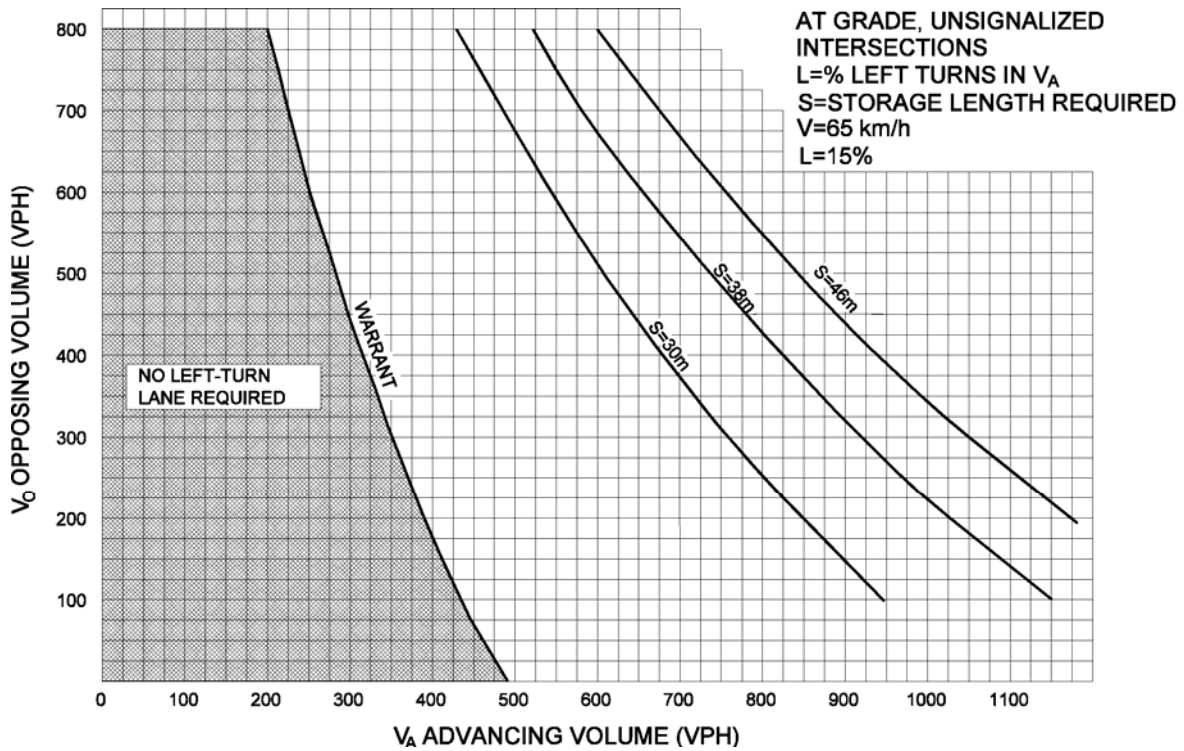


Figure 2-14c

Warrant for Left-Turn Storage Lanes on Two-Lane Highways ($V = 65 \text{ km/h}$ and $L = 15\%$)

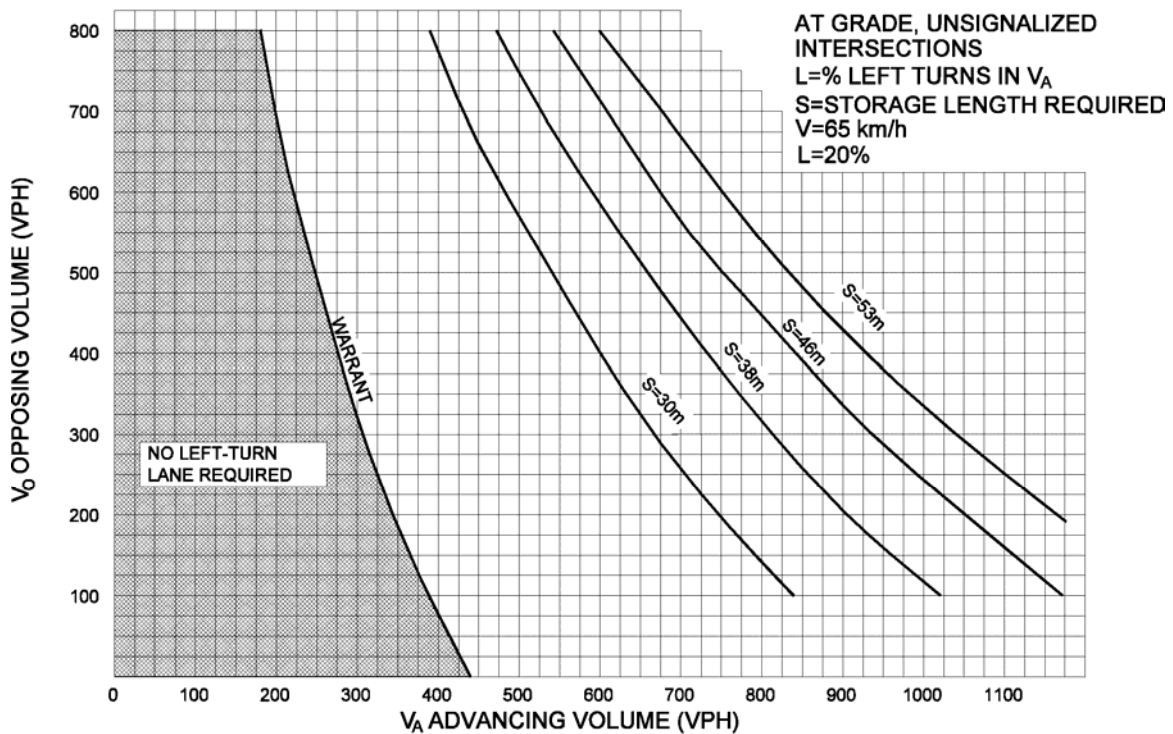


Figure 2-14d

Warrant for Left Turn Storage Lanes on Two-Lane Highways ($V = 65 \text{ km/h}$ and $L = 20\%$)

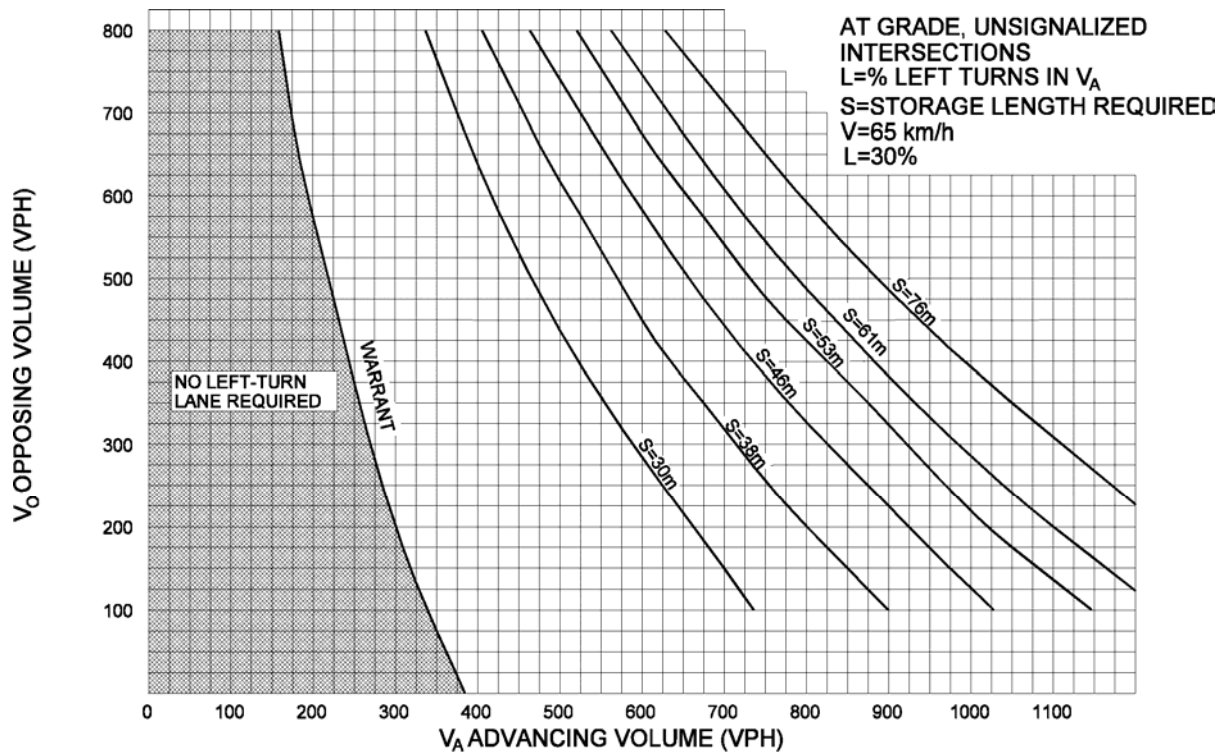


Figure 2-14e

Warrant for Left-Turn Storage Lanes on Two-Lane Highways ($V = 65 \text{ km/h}$ and $L = 30\%$)

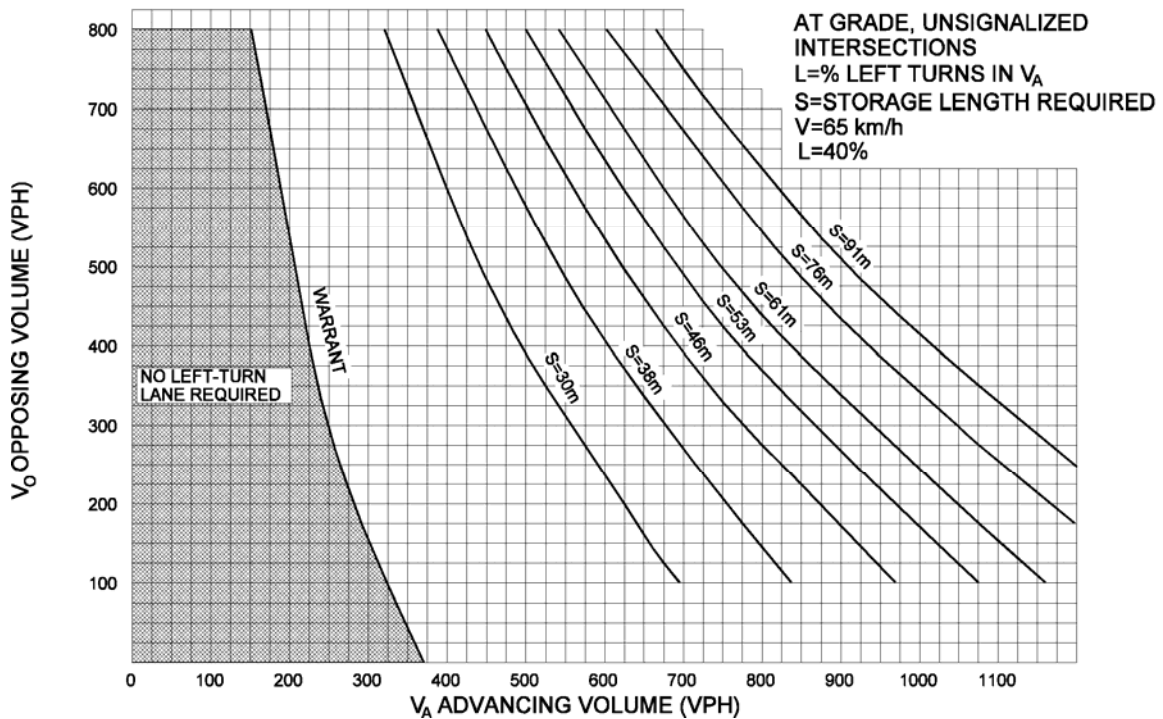


Figure 2-14f

Warrant for Left-Turn Storage Lanes on Two-Lane Highways ($V = 65 \text{ km/h}$ and $L = 40\%$)

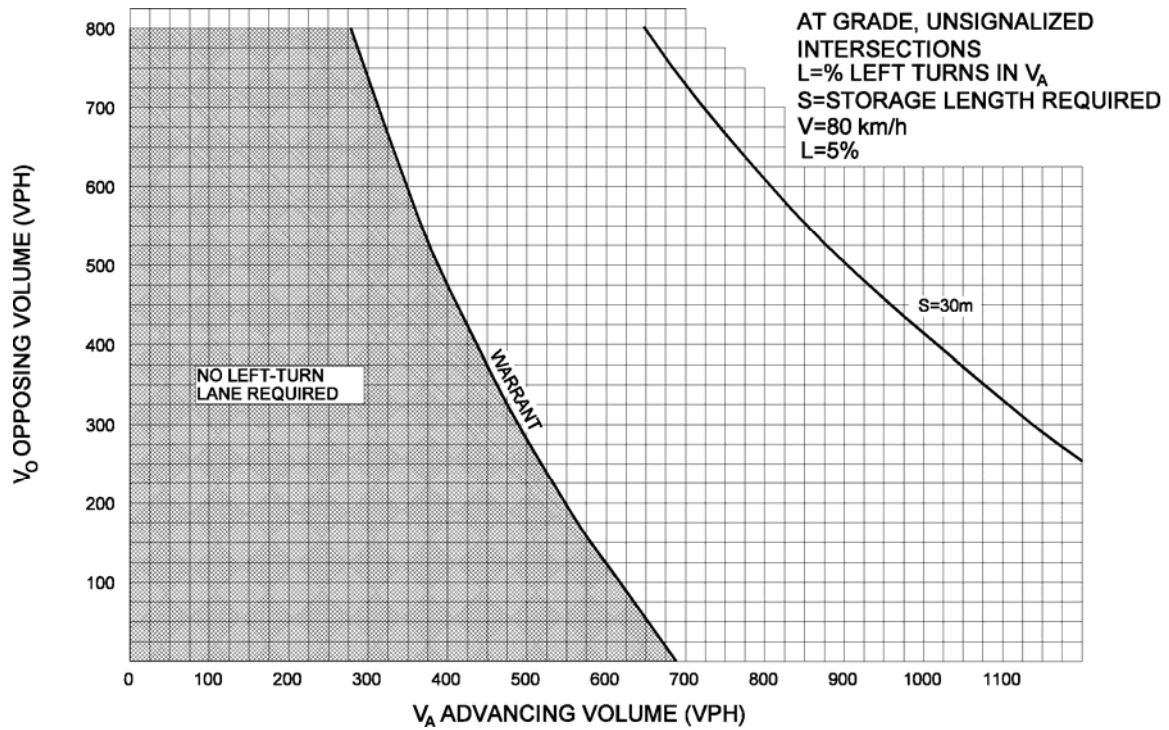


Figure 2-15a

Warrant for Left-Turn Storage Lanes on Two-Lane Highways ($V = 80 \text{ km/h}$ and $L = 5\%$)

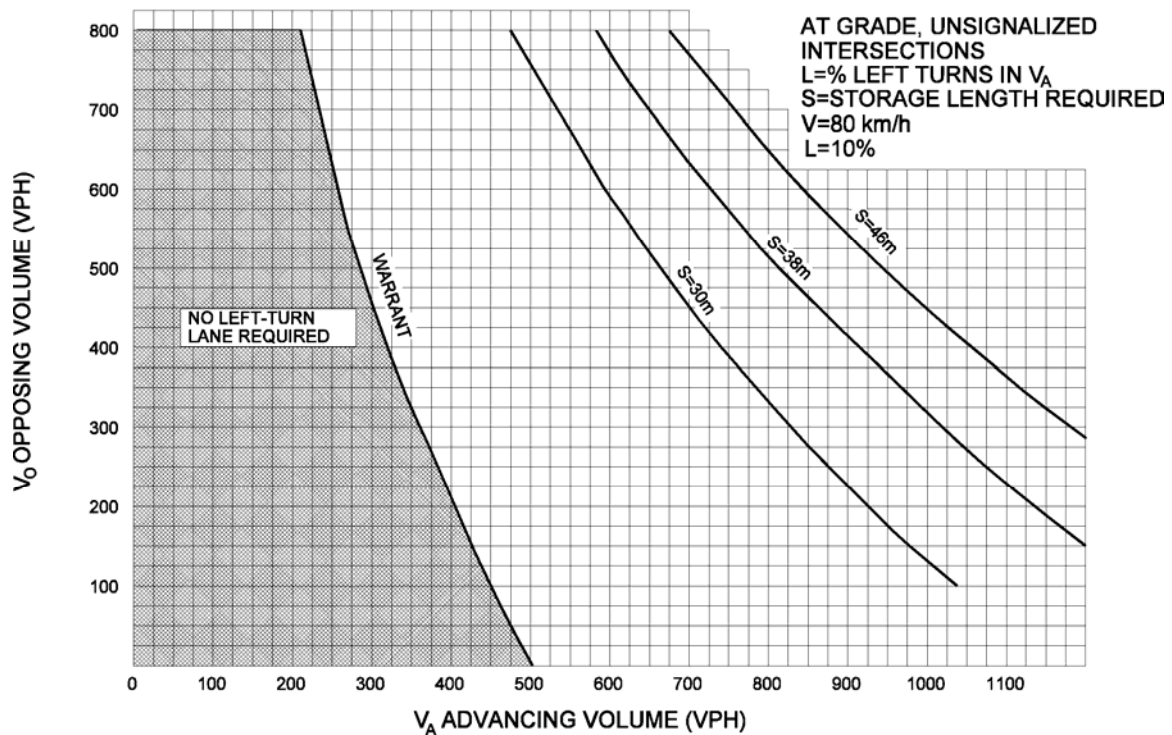


Figure 2-15b

Warrant for Left-Turn Storage Lanes on Two-Lane Highways ($V = 80 \text{ km/h}$ and $L = 10\%$)

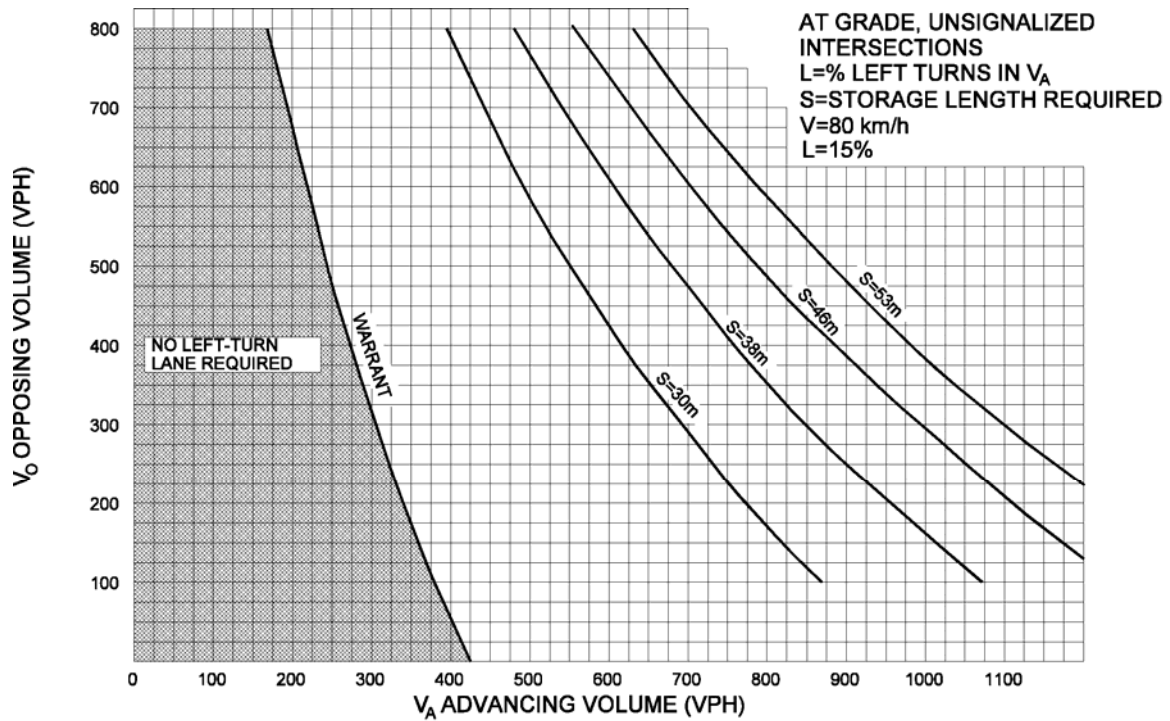


Figure 2-15c

Warrant for Left-Turn Storage Lanes on Two-Lane Highways ($V = 80 \text{ km/h}$ and $L = 15\%$)

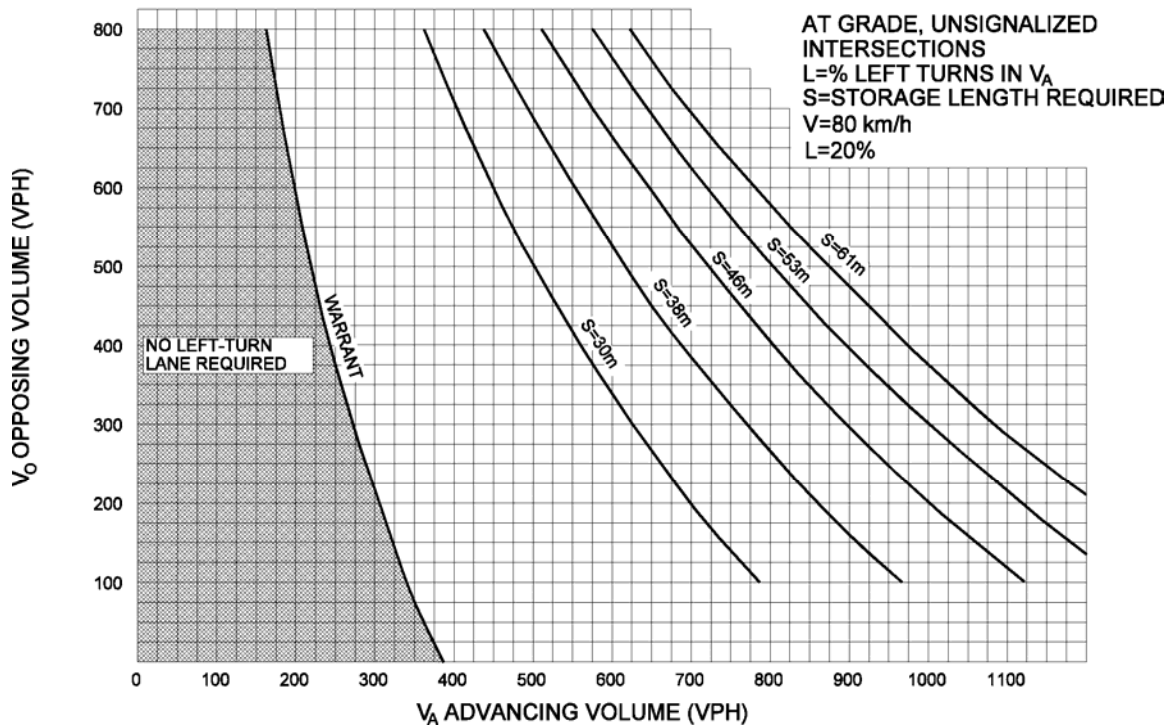


Figure 2-15d

Warrant for Left-Turn Storage Lanes on Two-Lane Highways ($V = 80 \text{ km/h}$ and $L = 20\%$)

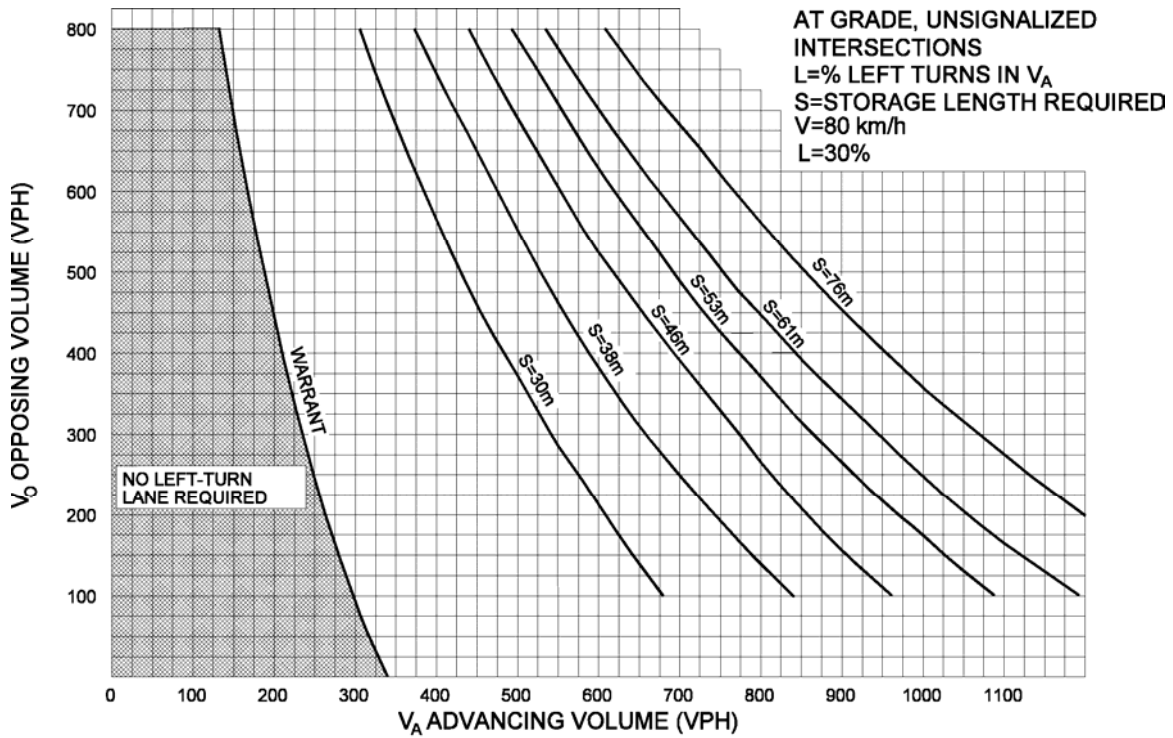


Figure 2-15e

Warrant for Left-Turn Storage Lanes on Two-Lane Highways ($V = 80 \text{ km/h}$ and $L = 30\%$)

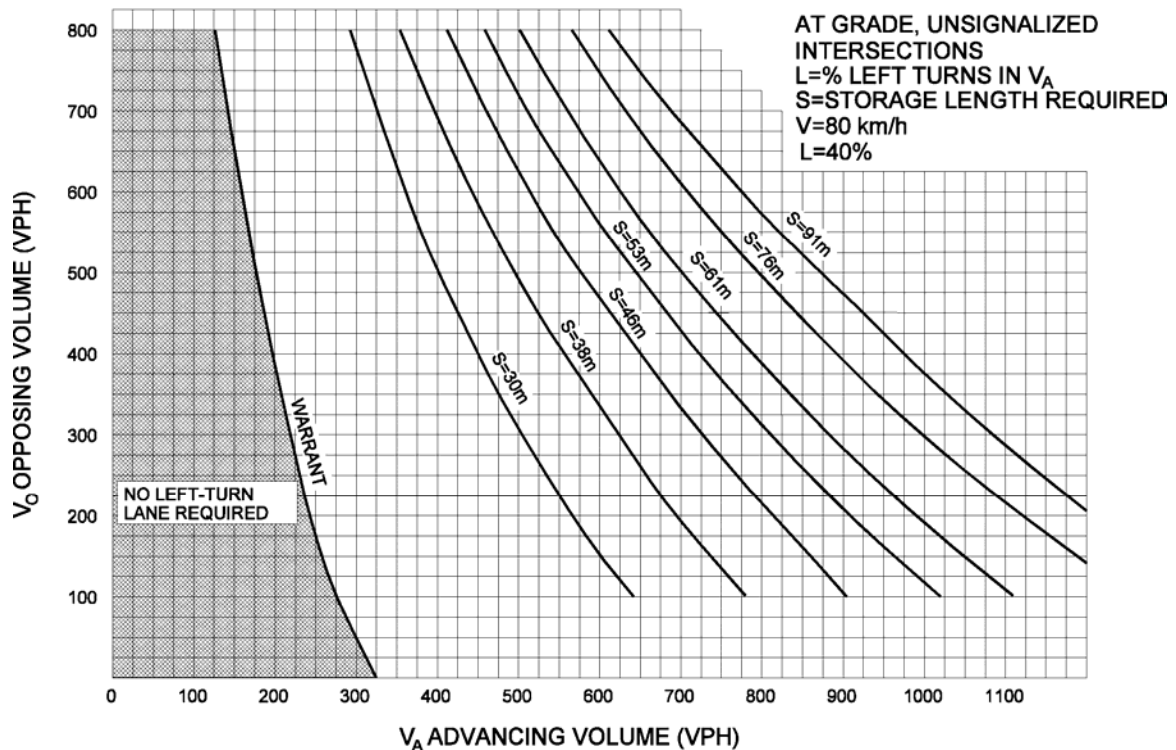


Figure 2-15f

Warrant for Left-Turn Storage Lanes on Two-Lane Highways ($V = 80 \text{ km/h}$ and $L = 40\%$)

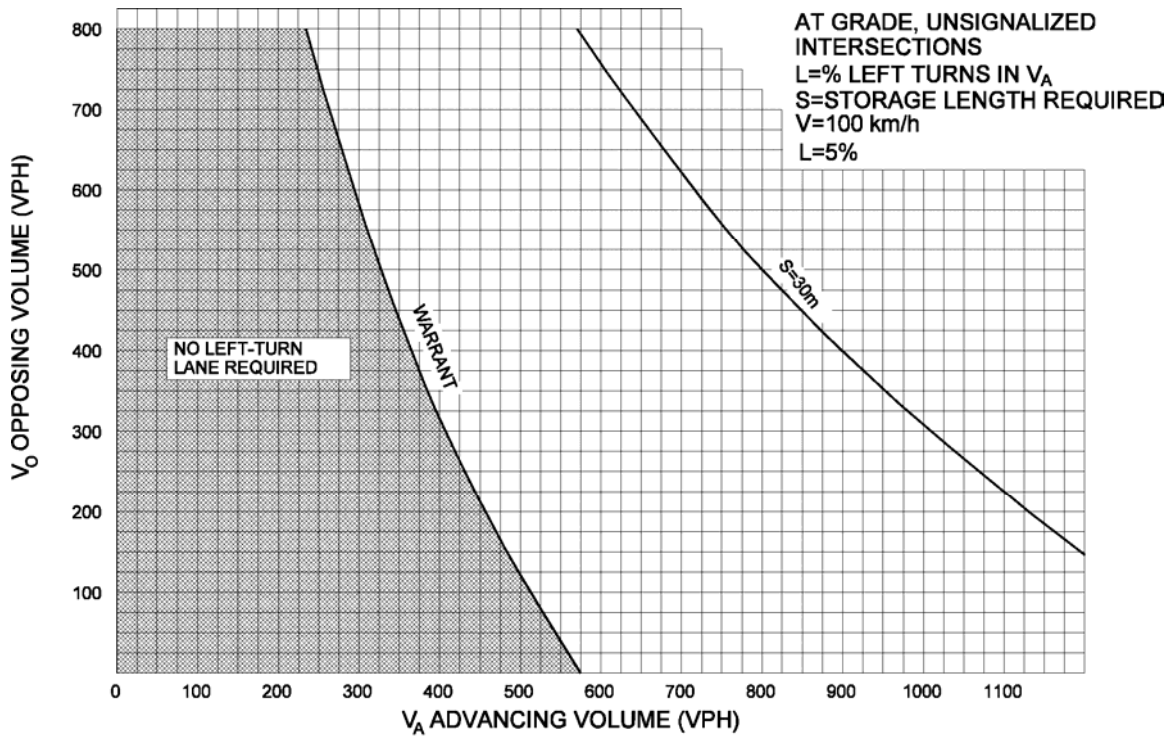


Figure 2-16a

Warrant for Left-Turn Storage Lanes on Two-Lane Highways ($V = 100 \text{ km/h}$ and $L = 5\%$)

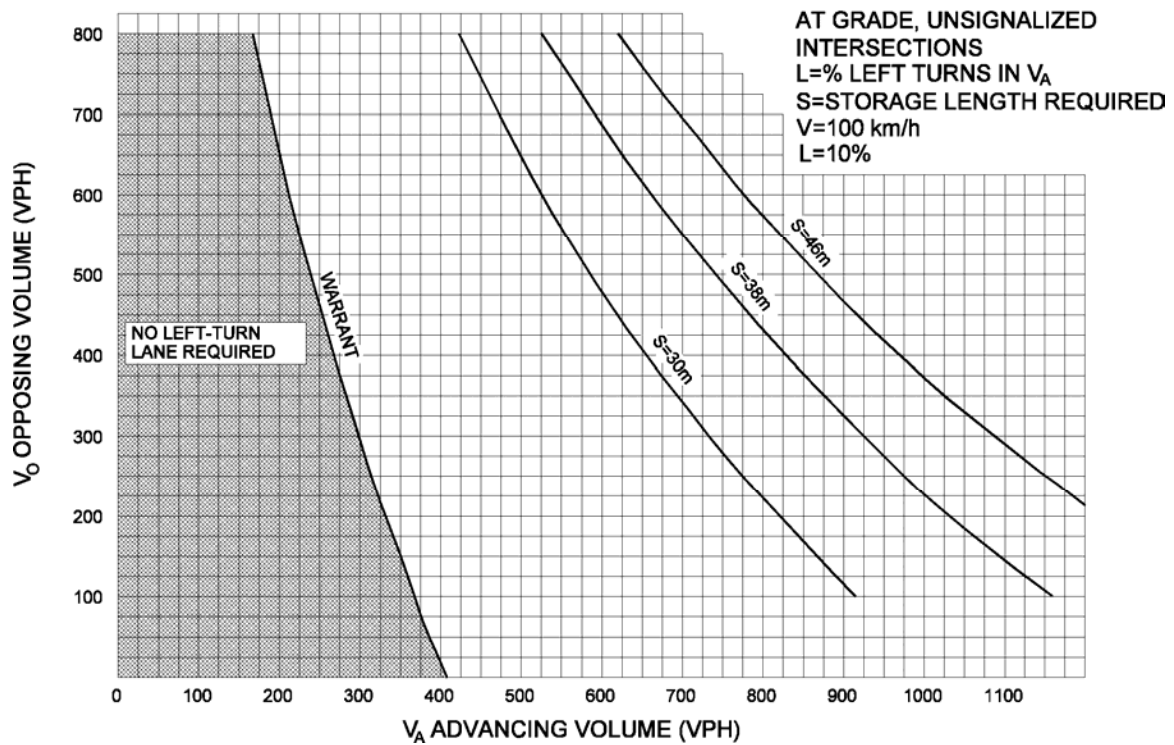


Figure 2-16b

Warrant for Left-Turn Storage Lanes on Two-Lane Highways ($V = 100 \text{ km/h}$ and $L = 10\%$)

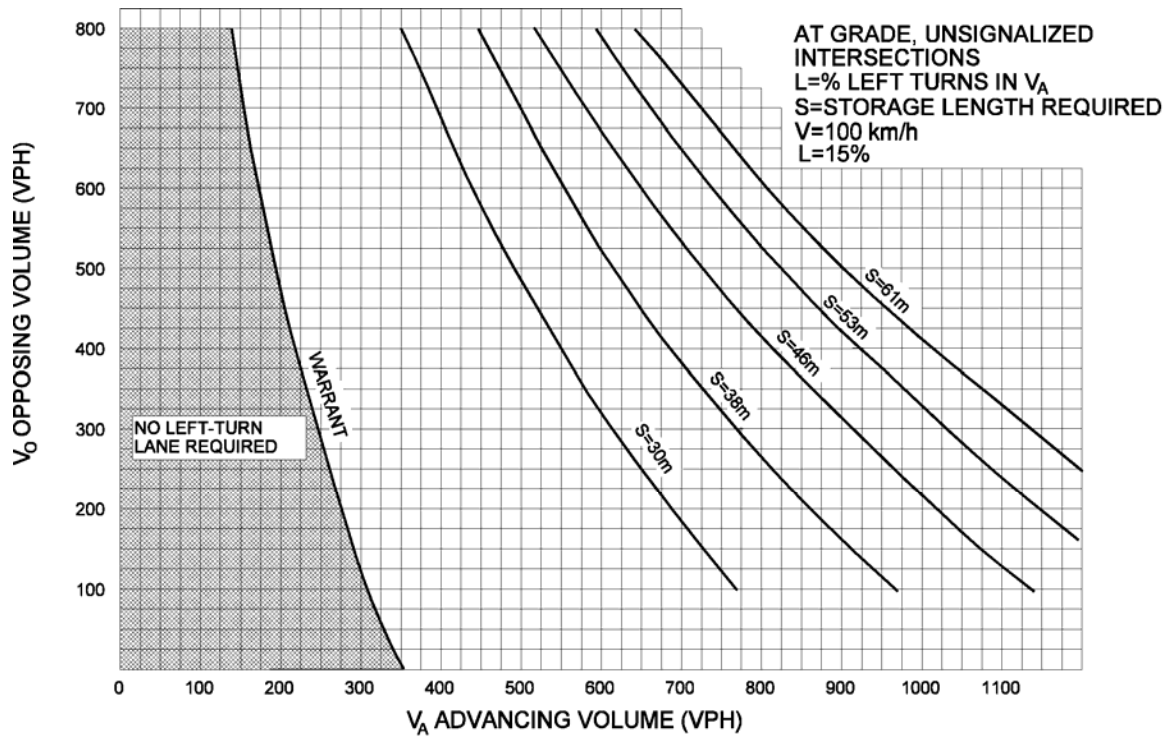


Figure 2-16c

Warrant for Left-Turn Storage Lanes on Two-Lane Highways ($V = 100 \text{ km/h}$ and $L = 15\%$)

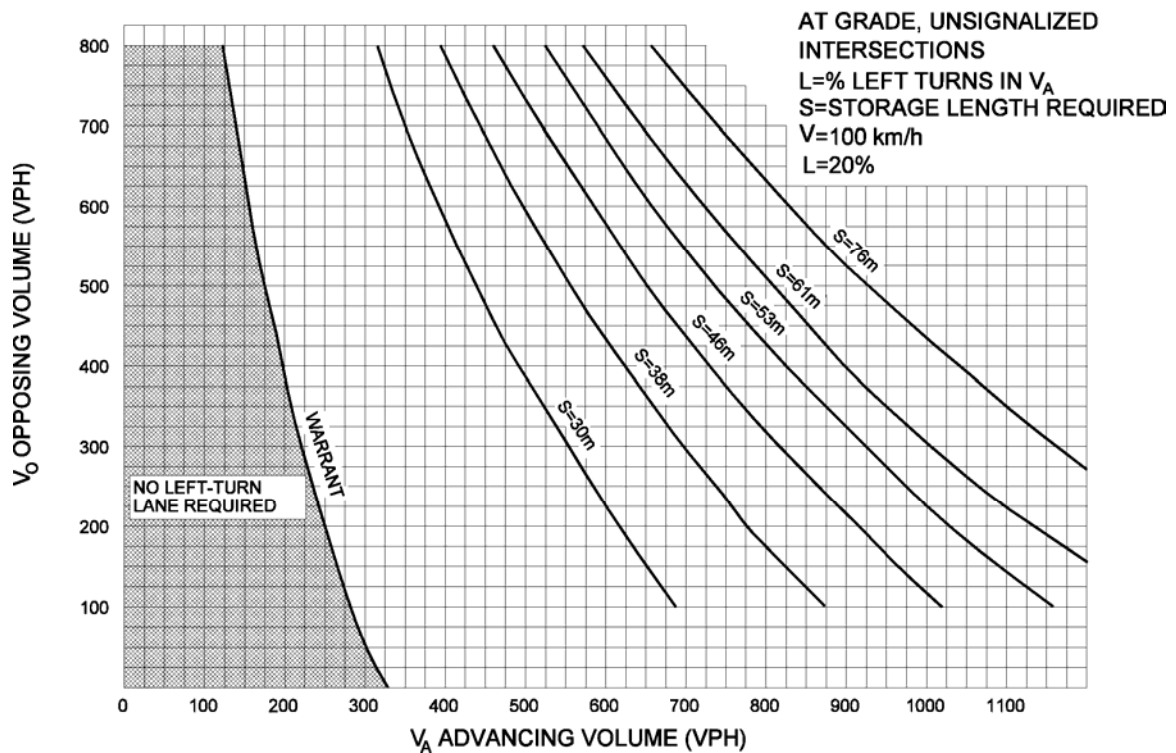


Figure 2-16d

Warrant for Left-Turn Storage Lanes on Two-Lane Highways ($V = 100 \text{ km/h}$ and $L = 20\%$)

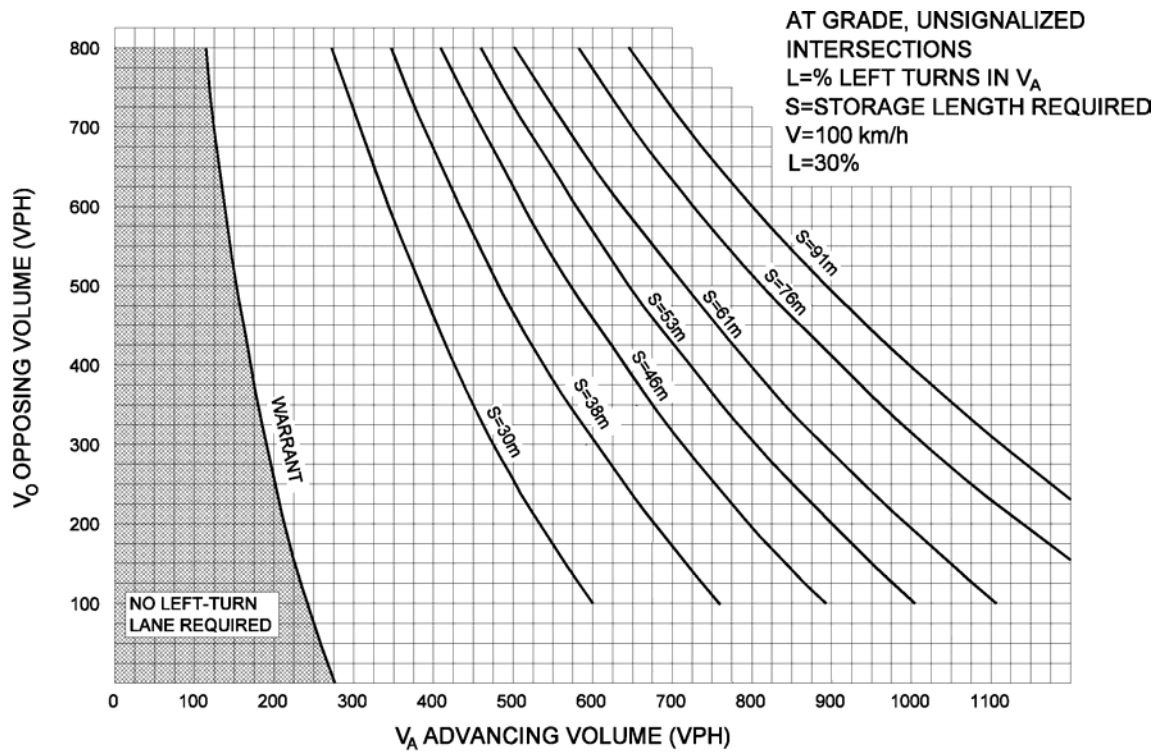


Figure 2-16e

Warrant for Left-Turn Storage Lanes on Two-Lane Highways ($V = 100$ km/h and $L = 30\%$)

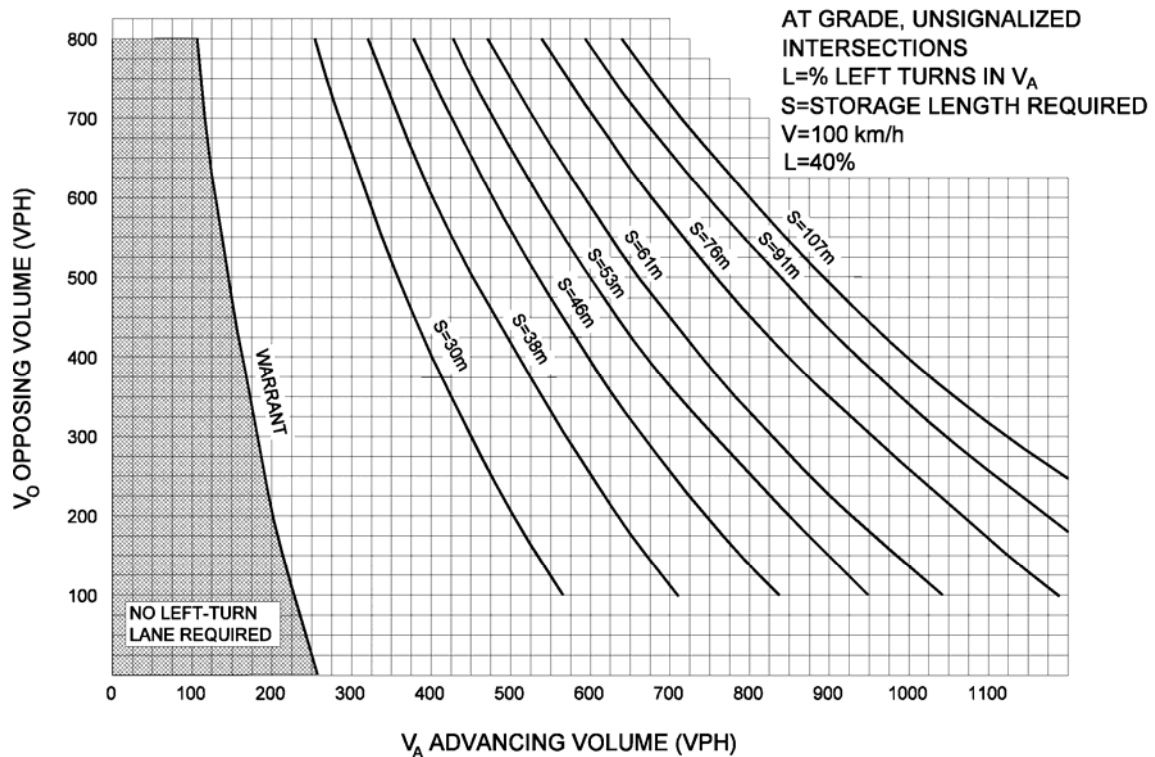


Figure 2-16f

Warrant for Left-Turn Storage Lanes on Two-Lane Highways ($V = 100$ km/h and $L = 40\%$)

CHAPTER 2 – DRAINAGE

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.

Effective March 1, 2005, designers shall begin using Chapters 1-9 of the Design Division Drainage Manual for all projects designed or constructed by TDOT. Projects currently under development are exempt from this requirement. 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

An additional chapter pertaining to Erosion Prevention and Sediment Control is currently under development and will be added to the manual when completed.

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%201-9.htm

2-200.00 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)

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 therefrom 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 Civil Engineering Manager 1, 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 Highways Right-of-Way*, Standard Drawing RPM-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)

See Figures 2-17 through 2-19 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 drawn on reproducible photographic mylar cross-section 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.

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- E. Tract remainders not having an existing driveway will be provided a 15 m 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.

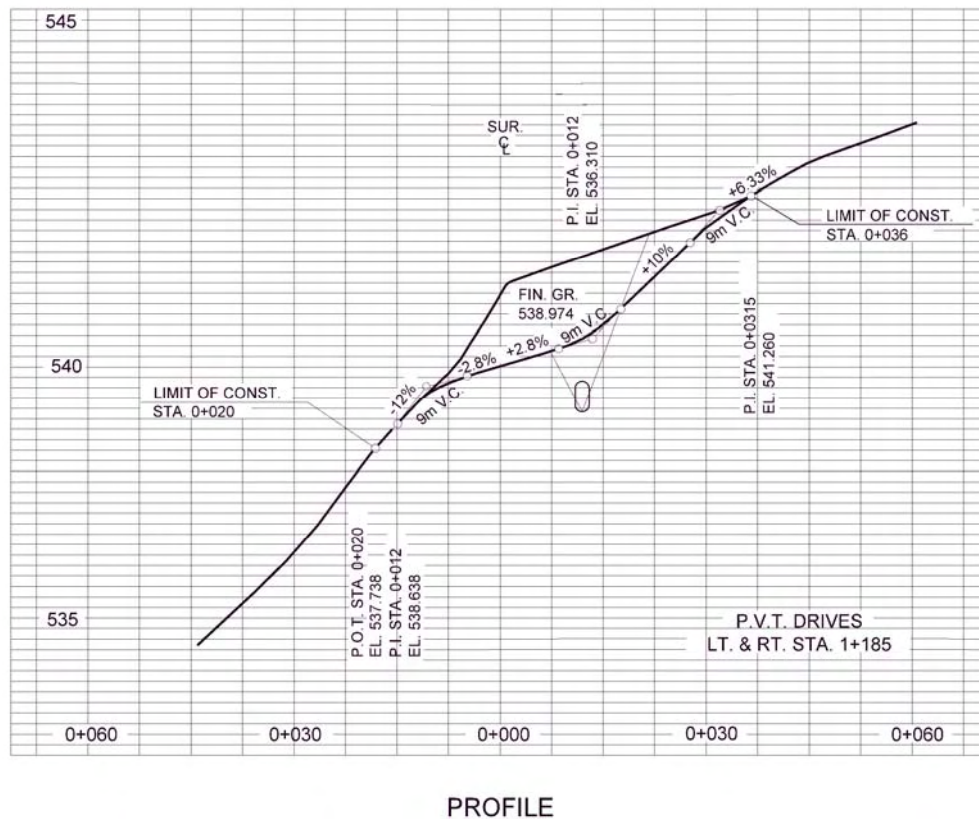
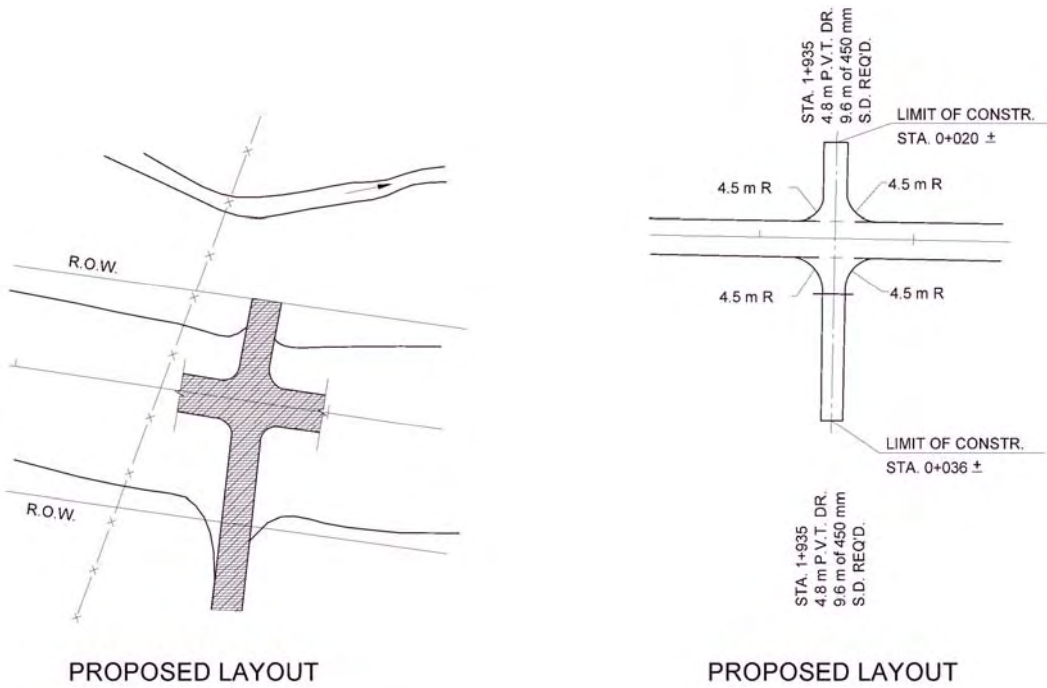
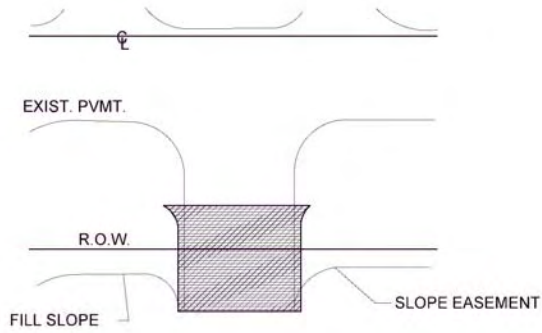
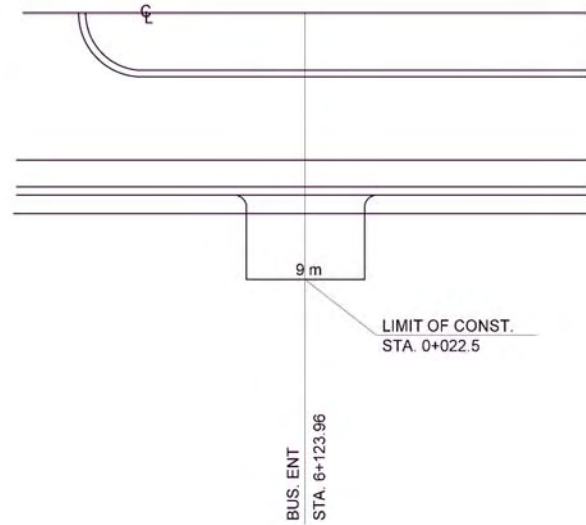


Figure 2-17
Rural Type Projects Typical Driveway Notation

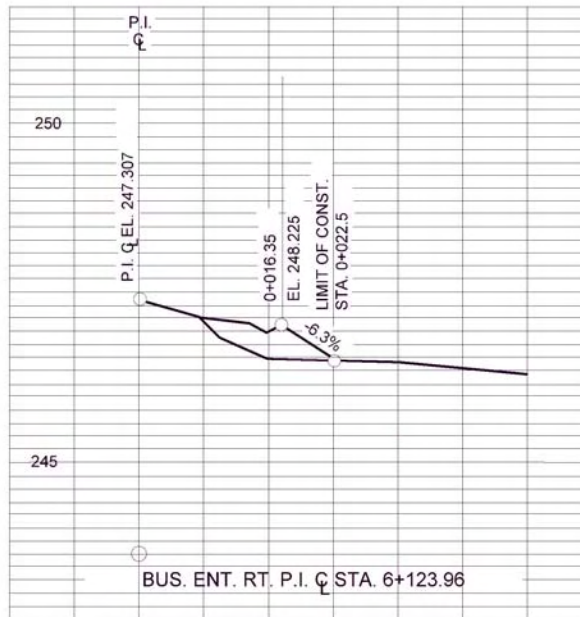
Note: This figure is for layout procedure purposes only. Please refer to manuals and standards for design information.



PRESENT LAYOUT



PROPOSED LAYOUT



PROFILE

Figure 2-18
Urban Type Projects Typical Driveway Notation

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

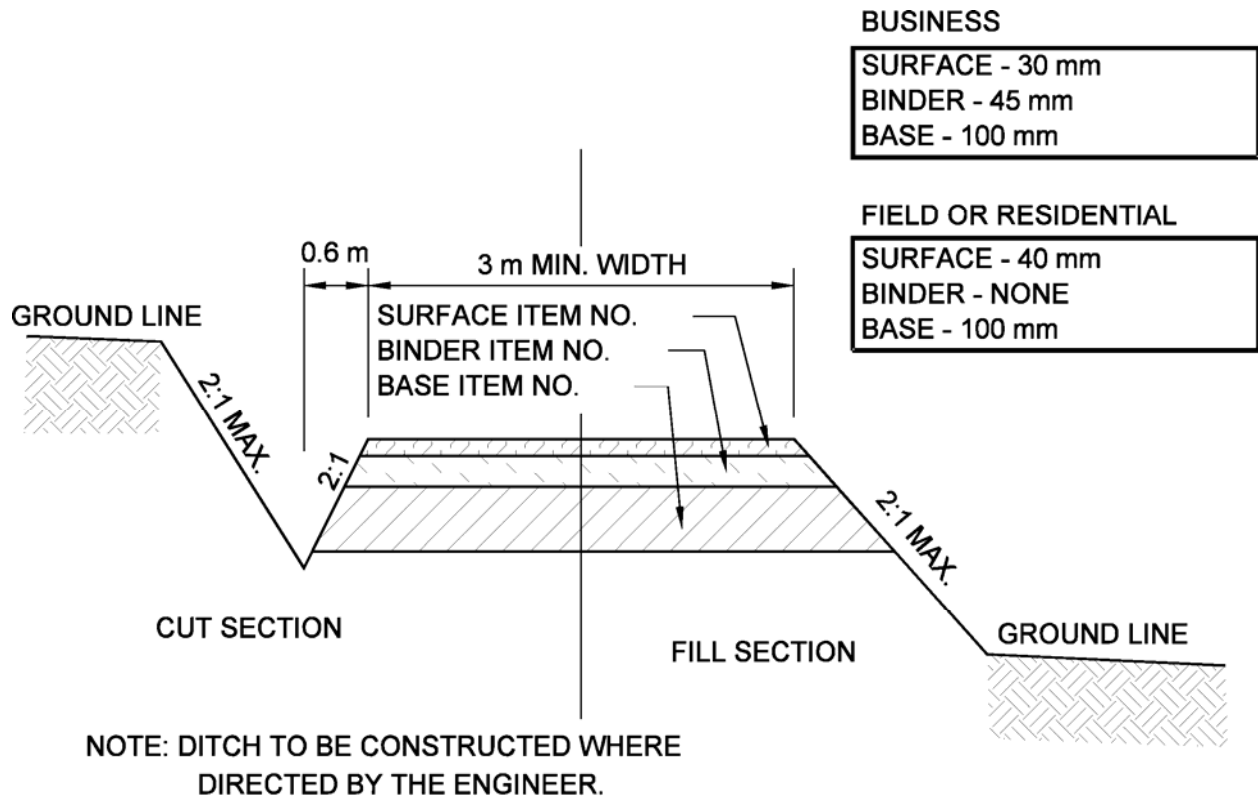


Figure 2-19
Typical Section Private Drive to Business, Field, or Residential Property

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 150 mm 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 Drawing RPM-D-14 for design of drives from curb line to back of sidewalk.
4. If an existing drive is greater than 3 m, 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 3.6 m 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 300 mm of width per 25 mm 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.

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- 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 300 mm 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 15 m 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.

2-310.00 ACCESS CONTROL - CROSSROADS AT INTERCHANGES

The extent of the access control for rural highways will be 90 m 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 90 m from the ramp terminal which governs. For urban highways, the extent of access control shall be 30 m.

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 Design Traffic Engineering Section in providing signalization and lighting designs in a timely manner as well as to allow the Design Traffic Engineering Section to schedule its work efficiently.

- A. When the APR indicates that signalization and/or lighting is required on a project, or if signalization and/or lighting is not included in the APR, but there is suspicion that signals and/or lighting may be involved in a project, the Design Traffic Engineering Section shall receive plans two weeks prior to the Preliminary Field Review in order to schedule this work with other duties. 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 Design Traffic Engineering Section 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 or Utility Plans, the designer shall submit electronic files through disks or E-mail no later than four weeks prior to the Right-of-Way Field Review or Utility Plans Submittal. These electronic files shall adhere to the following stipulations:
 - 1. These files shall consist of a Centerline File, a Survey File, and a Work File.
 - 2. No other files shall be submitted unless specifically requested by the Design Traffic Engineering Section, Signal and Lighting Office.
 - 3. All files shall follow the naming convention set forth in the *Survey and Design Computer-Aided Drafting Standards*.
 - 4. The working units of all these files shall coincide with the working units set forth in the *Survey and Design Computer-Aided Drafting Standards*.
 - 5. All files shall be in DGN format.

The Design Traffic Engineering Section, Signal and Lighting Office will provide support pole and lighting pole locations and related information for the Right-of-Way Plans (or Utility Plans).

- C. For Construction Plans the designer shall resubmit the Work File through disks or E-mail no later than four weeks prior to the Construction Field Review to ensure that the latest changes will be reflected on the signal and/or lighting layout. The previously stated stipulations shall apply to the submittal of the new Work File to be used for the Construction Plans.
- D. The Design Traffic Engineering Section, Signal and Lighting 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 Advance Planning Report (APR) indicates that lighting is required on a project, the designer shall furnish the Design Traffic Engineering Section, Signal and Lighting 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 Design Traffic Engineering Section, Signal and Lighting 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.

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 2-20 is a model R.O.W. Acquisition Table.

Figure 2-21 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.

Rip-rap, 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 HECTARES (ACRES)			AREA TO BE ACQUIRED HECTARES (ACRES)			AREA REMAINING HECTARES (ACRES)		EASEMENT SQUARE METERS (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											① 0.0558ha (0.138 AC)
2	GINGER BURCHETT	42	9	24	216											② 75.0 (807) ③ 9.0 (97)
3	GLENN LADD	42	10	30	123	16.9993 (42.006)		16.9993 (42.006)	1.3270 (3.279)		1.3270 (3.279)	15.6723 (38.727)				
4	IRENE S. MONK	42	11	77	289		21.0834 (52.098)	21.0834 (52.098)		195.0 m ² (2099 S.F.)	195.0 m ² (2099 S.F.)		21.0648 (52.052)			
5	ROBERT L. BRYANT	42	12	63	352	14.8516 (36.699)	23.8624 (58.965)	38.7140 (95.664)	4.1060 (10.146)	3.7409 (9.244)	7.8469 (19.390)	10.7457 (26.553)	20.1214 (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 HECTARES AND NOTED AS SUCH WHEN GREATER THAN 500 SQUARE METERS. AREAS ACQUIRED AND REMAINING SHOULD BE SHOWN IN SQUARE METERS AND NOTED AS SUCH WHEN LESS THAN 0.05 HECTARE. IN URBAN PROJECTS THE PREDOMINANT UNITS FOR AREA ACQUIRED AND REMAINING SHOULD BE SHOWN IN SQUARE METERS.

Figure 2-20
Typical R.O.W. Acquisition Table

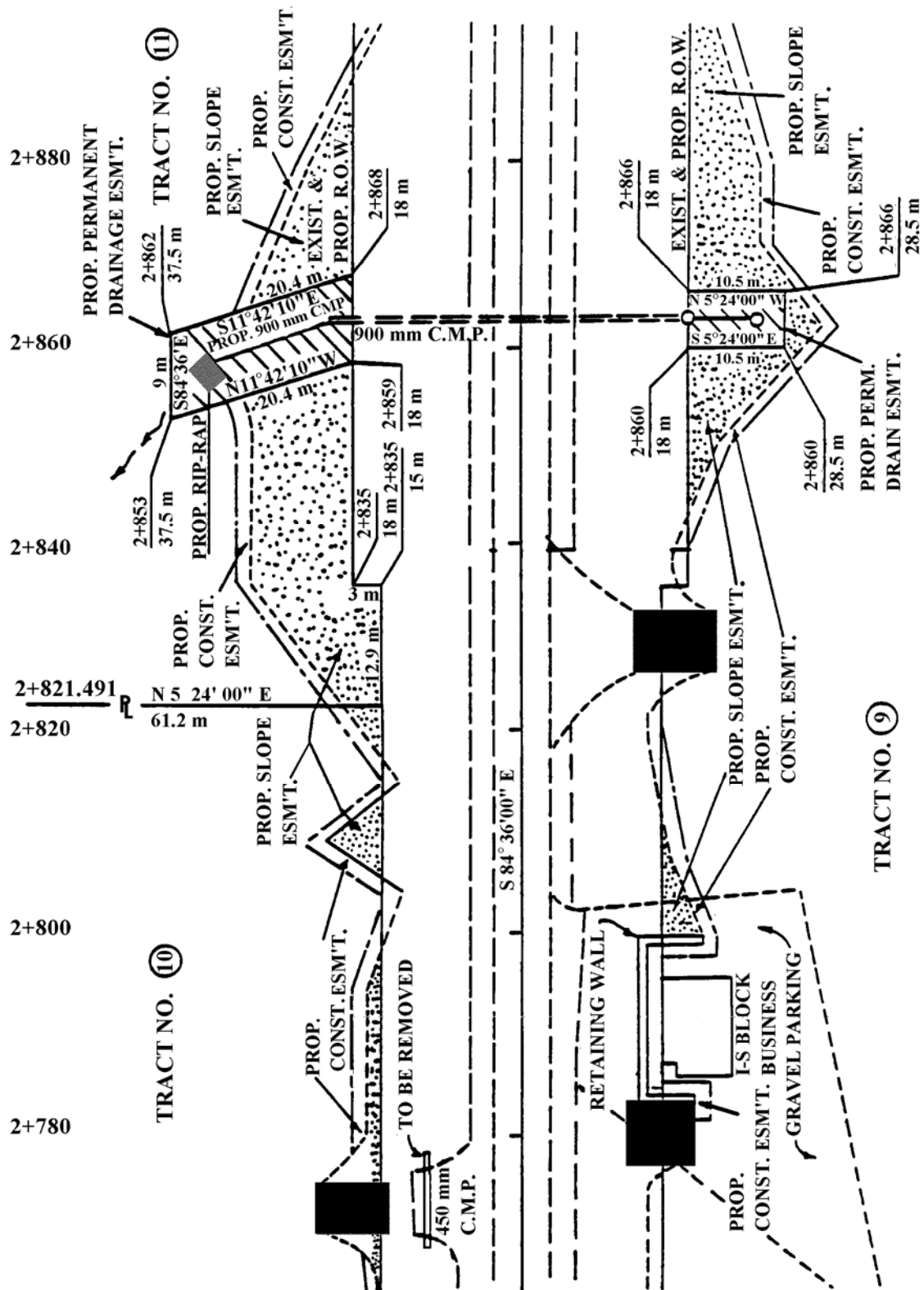


Figure 2-21
Guide for Showing Various Easements in Plans

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 Easements or Slope Easements columns, such as detours, some drainage ditches and channel improvements (such as widening or bank stabilization with rip-rap), locations where a ditch or channel already exists, temporary detention basins and other erosion 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 3 m 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.

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

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

SECTION III - RIGHT-OF-WAY PLANS

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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)

See Instructional Bulletin regarding signatures.

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

When a consultant submits plans for R.O.W. Appraisals and Acquisition, the consultant's seal and signature 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.

TDOT - ROADWAY DESIGN GUIDELINES

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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 C. E. Manager 1 or Transportation Manager 1, Design Office who is responsible for the design of the project for which the design exception request is being made.

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.

Approved design exceptions **shall** be noted, with approval date, in the lower right corner of the title sheet.

TDOT - ROADWAY DESIGN GUIDELINES

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Revised: 03/15/06



STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
NASHVILLE, TENNESSEE 37243-0350

DESIGN EXCEPTION REQUEST AND JUSTIFICATION FORM

TO: _____, Division Administrator, FHWA
(Director, Design Division, TDOT)

FROM: _____, Director, Design Division, TDOT (C. E. Manager 1 or
Transportation Manager 1, Design Office)

DATE: _____

SUBJECT: Design Exception Request
Project No. _____
Project Description: _____

DESIGN DATA:

Highway Functional Classification: _____

Appropriate Standards for the Above Classification: _____

Traffic Data: ADT (19____): _____ D: _____
ADT (20____): _____ T: _____
DHV: _____ V: _____

Existing Posted Speed: _____ Proposed Posted Speed: _____

Type of Terrain: _____ Rural or Urban Area: _____

Figure 3-1
Design Exception and Justification Form

TDOT - ROADWAY DESIGN GUIDELINES

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Revised: 03/15/06

DESIGN FEATURES:				
	Standard	Existing	Proposed	N/A
Cross Slope:	_____	_____	_____	_____
Superelevation:	_____	_____	_____	_____
Minimum Radius of Curvature:	_____	_____	_____	_____
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)	_____	_____	_____	_____
Graded Shoulder Widths:				
Outside Shoulders:	_____	_____	_____	_____
Inside Shoulders:	_____	_____	_____	_____
Stabilized Shoulder Widths:				
Outside Shoulders:	_____	_____	_____	_____
Inside Shoulders:	_____	_____	_____	_____
Lane Width:				
Mainline:	_____	_____	_____	_____
Auxiliary Lanes:	_____	_____	_____	_____
Turn Lanes:	_____	_____	_____	_____
Parking Lanes:	_____	_____	_____	_____
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

TDOT - ROADWAY DESIGN GUIDELINES

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Revised: 03/15/06

DESIGN EXCEPTION AND JUSTIFICATION:

(Note: This section shall be in narrative description of the design exception request, which includes with a recommendation for approval)

ATTACHMENTS: (appropriate items, such as: plan prints, accident data, estimates, sketches, etc.)

APPROVED: _____
Division Administrator, FHWA
(Director, Design Division, TDOT)

Date

cc: _____

File: _____

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 requesting the Preliminary Plans Field review. Two (2) half-size sets of prints of the plans **with existing contours** on the present layout sheets and two (2) half-size sets of prints of the cross-sections will be submitted to the Geotechnical Engineering Section of the Materials and Tests Division for a Soils and Geology Report. 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, the Civil Engineering/Transportation Manager 1 will submit one (1) half size set of plans and one (1) half size set of cross-sections to the Geotechnical Engineering Section for review and approval. On projects with major geotechnical considerations, the Geotechnical Engineering Section may request additional prints of the plans and/or cross-sections for review at other stages of plan development.

A copy of the Request for Soils Survey Form is shown in Figure 3-2.

TDOT - ROADWAY DESIGN GUIDELINES

Metric

Revised: 03/15/06

SOILS REQUEST FORM

TO: Mr. Bill Trolinger
Civil Engineering Manager 2
Materials and Tests Office
6601 Centennial Boulevard
Nashville, TN 37243-0360

FROM: Civil Engineering Manager 1 or Transportation Manager 1
Design Division

DATE OF REQUEST:

DATE REQUESTED BACK:

WE REQUEST SOILS SURVEY DATA, C.B.R. & WATER SAMPLE RESULTS, IF NEEDED ON:

PROJECT NO. :

COUNTY:

ROUTE NO. :

PROJECT LENGTH:

DESCRIPTION OF PROJECT:

THE FOLLOWING DATA RELATIVE TO THE PROJECT IS SUBMITTED HEREWITH:

NO. OF SETS	DESCRIPTION
2	Half-size prints
2	Half-size cross-sections

REMARKS:

Figure 3-2
Request for Soils Survey Form

3-115.00 UPDATING SURVEYS

All additional survey information requests will be sent to the Regional Survey Supervisor responsible for the survey. An e-mail 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 section will contact the environmental section 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

A plan change request will be submitted by the Regional Office adding the uneconomic remnant acquisition to the plans. The parent (original) tract will be left as it appears in the table of acquisition. 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 BRZ, BRS, BRM projects with an ADL (Average Daily Loading) of 150 or less, or an ADT (Average Daily Traffic) less than 1000 and percent trucks less than seven, pavement sections shall be designed as in Section 3-125.05.

The project designer will request a pavement design from the Pavement Design Section by submitting the form shown in Figure 3-3. This form will be submitted at the same time as distribution of plans for the Preliminary Field Review. This request will include a half-size copy of the title sheet, typical section sheet(s), proposed layout sheet(s), and a traffic report which includes an ADL for the mainline and any other major roads or streets within the limits of the project. These sheets are all needed to better analyze the needs of side roads, overlays, pavement alternates and other pavement design features.

If major changes (as determined by Manager 1 and/or Roadway Specialist Supervisor 2) are made in grade and/or alignment, it shall be necessary to submit a new set of half-sizes.

For bridge replacement projects which have an ADT of less than 11500 (average daily traffic), only a half-size copy of the title sheet showing traffic data and typical section sheet(s) will be required.

TDOT - ROADWAY DESIGN GUIDELINES

Metric

Revised: 03/15/06



TENNESSEE DEPARTMENT OF TRANSPORTATION
PAVEMENT DESIGN SECTION

REQUEST FOR PAVEMENT DESIGN

TO: Design Division
Pavement Design Section
Suite 1000 James K. Polk Bldg.
Nashville, TN 37243-0350

DATE: _____ DESIGNER: _____
COUNTY: _____ ROUTE: _____
PROJECT NO. _____ PROJECT PIN NO. _____
DESCRIPTION: _____

PROPOSED LETTING DATE: _____

PLEASE CHECK THE BOX FOR ALL DESIGN ITEMS THAT APPLY TO YOUR PROJECT.

SAVE FOR FORM

TRAFFIC TO BE MAINTAINED DURING CONSTRUCTION ☐
NEW ALIGNMENT ☐ WIDENING ☐ INTERSECTING RDS. ☐
RESURFACING ☐ DETOUR ROAD ☐

OTHER COMMENTS: _____

ATTACHMENTS:

TRAFFIC W/ADL'S ☐ SOILS ☐ 1/2 SIZE PLANS ☐

PLEASE EXPLAIN ANY MISSING ATTACHMENTS (include date requested for soils and traffic): _____

cc: Program Scheduling Section RETURN TO: _____

file initial

Figure 3-3
Request for Pavement Design Form

3-125.05 PAVEMENT DESIGN - SELECTED BRS, BRZ, BRM AND BRF (See 3-125.00)

For BRZ, BRS, BRM and BRF 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 1000 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 1000.

Two examples are given as follows:

The designer has a BRZ 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 (30 mm "D" mix, 50 mm "B-M2", 75 mm "A" mix, and 200 mm "303M01").

The designer has a BRZ 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 (30 mm "D" mix, 50 mm "B-M2", 75 mm "A" mix, and 200 mm "303M01").

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 1.2 m or less, the designer will distinguish on the field review whether the shoulder shall be stone and double bituminous surface treatment or paved with 30 mm 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.

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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	Maurry	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**

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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 Numbers**

MIX TYPE	PAVEMENT DESIGN NUMBER			
	I	II	III	IV
"D"	30 mm	30 mm	30 mm	30 mm
"B-M2"	50 mm	50 mm	50 mm	50 mm
"A"	75 mm	75 mm	----	----
303-01 or 02	200 mm	250 mm	300 mm	200 mm

**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 National Pollutant Discharge Elimination System (NPDES) Permit. This is required for any project which has an area of 0.40 hectares (1 acre) or more disturbed by the proposed construction. The NOI form should be completed by the Storm Water Pollution Prevention Plan (SWPPP) consultant.

CHAPTER 2 - DRAINAGE

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.

Effective March 1, 2005, designers shall use Chapters 1-9 of the Design Division Drainage Manual for all projects designed or constructed by TDOT. Projects currently under development are exempt from this requirement. 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

An additional chapter pertaining to Erosion Prevention and Sediment Control is currently under development and will be added to the manual when completed.

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%201-9.htm

3-200.00 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 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 0.0500 ha or more shall be shown in hectares to 4 decimal places. Areas less than 0.0500 ha shall be shown to the nearest 0.1 square meter.

3-300.05 EASEMENT AREAS (See 2-320.00)

Right-of-way areas left and right shall be based on the centerline used for construction. If a paper located centerline is used, it shall be necessary to recompute the areas left and right supplied with the survey and appearing in the right hand columns of Table 2-20 of the guidelines.

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)

3-305.10 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

Show locations of handicap ramps at all crosswalks, islands, raised median strips, et cetera in both business and residential areas when making new installations of sidewalks, curbs or gutters, or improving or replacing existing sidewalks, curbs or gutters.

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 Standard Drawings RPM-H for details.

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 225 mm \pm of common material before placing topsoil and seeding.

3-315.05 TOPSOIL REQUIREMENTS FOR EARTHWORK BALANCES
(See 4-203.30 and 2-145.05)

In areas to be seeded, compute the quantity of topsoil required based on a 75 mm ± thickness with a 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)

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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.)	[COMMON	250000 m ³	(INCL. 13000 m ³ FROM EXCAVATION AREAS AND 5000 m ³ FROM EMBANKMENT AREAS; 12500 m ³ FROM COUNTY ROADS AND PRIVATE DRIVES)
		ROCK	45000 m ³	
]				

EXC.
EMB.

[EMB.	253489 m ³	(INCL. 5490 m ³ FOR COUNTY ROADS AND PRIVATE DRIVES; 5000 m ³ TO REPLACE STRIPPED TOPSOIL)
]			

SHR. 15%
SW. 15%

B. Calculation procedure for balanced section

250000 m ³	Exc. (Common)
-13000 m ³	Topsoil from exc. areas
<u>- 5000 m³</u>	Topsoil from emb. areas
232000 m ³	Exc. (Common) available for balance

Exc. (Com) + [Exc. (Rock) x 1.15] vs. Emb.

1.15

232000 + (45000 x 1.15) vs. 253489 m³

1.15

201739 + 51750 vs. 253489 m³

253489 m³ = 253489 m³

Balanced

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2. Earthwork unbalanced.

A. Show on profile sheet.

EXC. (UNCL.)	[COMMON	350000 m ³	(INCL. 13000 m ³ TOPSOIL EXCAVATION AREAS AND 5000 m ³ FROM EMBANKMENT AREAS; 12500 m ³ FROM COUNTY ROADS AND PRIVATE DRIVES; 100000 m ³ EXCESS MATERIAL.)
		ROCK	45000 m ³	
]				

EXC.
EMB.

[EMB.	253489 m ³	(INCL. 5490 m ³ FOR COUNTY ROADS AND PRIVATE DRIVES; 5000 m ³ TO REPLACE STRIPPED TOPSOIL)
]			

SHR. 15%
SW. 15%

B. Calculation procedure for unbalanced section

350000 m³ Exc. (Common)
 -13000 m³ Topsoil from exc. areas
 - 5000 m³ Topsoil for emb. area
 332000 m³ Exc. (Common) available for balance

Exc. (Com) + [Exc. (Rock) x 1.15] vs. Emb.
 1.15
232000 + (45000 x 1.15) vs. 253489 m³
 1.15
 340446 m³ vs. 253489 m³

The 86957 m³ 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 "unshrink" it, the excess becomes 100000 m³

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)

The Design Division, Signals, Signing and Lighting Section will develop pavement marking and signing plans for all projects involving Interstate and full-access control roadways and interchanges, except resurfacing projects.

The Design Division, Signals, Signing and Lighting Section will review the plans a minimum of two weeks prior to the Right-of-Way Field Review in order to determine whether the proposed design can be marked and signed in accordance with the *M.U.T.C.D.* The designer shall furnish the Design Division, Signals, Signing and Lighting Section with one full-size print of the title sheet and proposed layouts a minimum of two weeks prior to the Right-of-Way Field Review.

The designer shall provide proposed layout sheets on reproducible mylar at either 1:500 or 1:1000 scale at the beginning of the Construction Plans preparation period. These layouts shall only include: construction centerline, edge of pavement, pavement widths, the P.C. and P.T. (or the T.S., S.C., C.S. and S.T.) of any curves, guardrail and retaining walls. Prints of the typical sections shall also be included with the proposed layouts.

For those projects designed with TDOT's accepted CADD format, the designer shall provide computer disks (or an e-mail) with signing and marking sheet files with the same information as above within the file (not a reference file). **No other files** are to be sent unless specifically requested by the Design Division, Signals, Signing and Lighting Section. All files must be submitted in a DGN format. Working units of these files must coincide with the working units guidelines set forth in the *Survey and Design Computer Aided Drafting Standards*. Following these guidelines will help ensure that signing and marking plans and details are done in a timely manner. Any submittals straying from the above guidelines will be returned to the C.E. Manager 1 or Transportation Manager 1 in charge of the design project.

CHAPTER 4 - PLANS SUBMITTALS

3-400.00 PRINTING FOR INCIDENTALS

Print plans for "All Incidentals Except Appraisals" if the project has more than 10 tracts. (See distribution list below.) It shall only be necessary to print the title sheet, typical sections, property maps (with Right-of-Way Acquisition Table with property owners 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 print 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 5 mm (0.2") lettering, ink "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.

Prints for "Incidentals"

1. T.D.O.T. Regional Design Office (In house and consultant design)
Prints of the plans shall be furnished to the Quality Assurance Section, Design Standards Section as follows:

1 Set of Half-Size

State in submittal letter when prints were sent to Regional Right-of-Way Office.

T.D.O.T. Regional Design Office (In-house and consultant design)

Prints of the plans shall be furnished to the Regional Right-of-Way Office as follows:

Region 1	10	Sets Full-Size
Region 2	6	Sets Full-Size
Region 3	6	Sets Full-Size
Region 4	6	Sets Full-Size

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2. T.D.O.T. Headquarters Design Office (In-house and consultant design) Prints of the plans shall be furnished to the Quality Assurance Section, Design Standards Section as follows:

Region 1	10	Sets Full-Size and 1 Set Half-Size
Region 2	6	Sets Full-Size and 1 Set Half-Size
Region 3	6	Sets Full-Size and 1 Set Half-Size
Region 4	6	Sets Full-Size and 1 Set Half-Size

3-400.05 PRINTING 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 will submit one (1) half-size sets of prints to the Quality Assurance Section, Design Standards Office to be used for utility investigation and funding by headquarters personnel. In addition, the designer will submit two (2) full-size sets of prints for each utility involved plus one (1) full-size and one (1) half-size set of prints for the regional utilities engineer to the Quality Assurance Section, Design Standards Office. These sets of prints will be used for utility investigation by the regional utilities engineer and the utilities themselves. Submission shall be made as soon as the plans are complete enough to show what work is to be done. If the Utilities Section needs a different number of prints, the designer will be advised.

3-400.10 ADVANCE ACQUISITION PROJECTS

Once "Advance Acquisition" has begun, tract numbers may not be changed.

3-400.15 PRELIMINARY CONSTRUCTION QUANTITY ESTIMATE (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 Civil Engineering Manager 1 or Transportation Manager 1 responsible for the project will forward one (1) half-size set of prints of the right-of-way plans and the quantity data to the Estimating and Bid Analysis Office. This submission should be done concurrently with the right-of-way finding 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 e-mail transmitted to the Estimating and Bid Analysis Office.
2. The TDOT designer or consultant shall give the Civil Engineering Manager 1 or Transportation Manager 1 responsible for the project one (1) half-size set of

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prints and the preliminary construction quantities estimate data via e-mail 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 not 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 at 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.

SUBMITTAL OF PRELIMINARY CONSTRUCTION QUANTITIES ESTIMATES

For in-house and consultant design projects, the Civil Engineering Manager 1, Transportation Manager 2, or designer shall forward the completed construction estimate Excel file via e-mail to the following Groupwise e-mail address: Name: **Estimates, TDOT Preliminary** (User Id: JJPRELIM). A copy of the e-mail shall be placed in the project folder to document the submittal of the construction quantities.

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 to be printed 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," send one (1) half-size print of the title sheet with right-of-way funding approval request transmittal

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letter, example shown in Figure 3-4, to the Program Operations Office, Federal Aid Section. Furnish a copy of the request to the Quality Assurance Section, Design Standards Office.

An approved signed and dated copy of the right-of-way funding request approval transmittal letter shall be included with the Right-of-Way Project Plans turn-in assembly. See Section 3-400.25 for further details.

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STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
NASHVILLE, TENNESSEE 37243-0350

MEMORANDUM

TO: Programs Operations Office
Attn: Federal Aid Section
Suite 600, James K. Polk Bldg.
Nashville, TN 37243-0341

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: _____

Attachment

cc: Quality Assurance Section, Design Standards Office

Figure 3-4
Right-of-Way Funding Approval Request Transmittal Letter Example

3-400.25 PRINTING FOR APPRAISALS (See 2-315.00, 2-315.05, and 3-400.00)

When submitting a project for right-of-way “appraisals and acquisition,” the TDOT Civil Engineering Manager 1 or Transportation Manager 1 in charge of the project is to send one full-size set of the Right-of-Way Project Plans and cross-sections, a copy of the Right-of-Way Plans Request Form, three (3) CD’s with Microstation and Geopak files, and a copy of the Right-of-Way Funding Request Approval Transmittal Letter (see Section 400.20) to the Quality Assurance Section, Design Division. To insure the proper and rapid processing of Right-of-Way Plans, the following transmittal letter, shown in Figure 3-5, shall accompany the Right-of-Way or Utilities Only Plans submittal to the Standards and Quality Assurance Section. The title sheet shall be plotted on 4 mil double matte finish reproducible photographic mylar. The other right-of-way sheets may be plotted on reproducible vellums or paper as directed by the TDOT Design Manager. Cross sections shall be plotted on paper.

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 TDOT C.E. Manager 1 or Transportation Manager 1 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 and signature shall be placed on the right side of the mylar 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.

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6. Traffic signal pole locations including attachment heights and footing details.
7. Street light pole locations.
8. Erosion control devices (Erosion Control Plan)
9. Other details which might affect utilities.



STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
NASHVILLE, TENNESSEE 37243-0348

MEMORANDUM

TO: Standards and Quality Assurance Section, Design Division
Attn: ROW Plans Submittal
Suite 1300, J.K. Polk Bldg.
Nashville, TN. 37243-0348

FROM: Paul Beebe
Civil Engineering Manager 1
Region 1 Design Office

DATE: February 3, 2006

SUBJECT: Project No. BH-STP-131(4), 47027-2214-94
Pin No. 100500.00
SR 131, Bridge over Meadow Creek @ L.M. 5.78
Knox County

The subject project is being submitted for right-of-way plans submittal. The following information is being forwarded to initiate printing and plans distribution:

<u> x </u>	Right-of-Way Plans (<u>20</u> Sheets)
<u> x </u>	Cross-Sections (<u>10</u> Sheets)
<u> x </u>	Right-of-Way Plans Request Form
<u> x </u>	CD's Containing CADD files (<u>3</u> CD's)
<u> x </u>	Right-of-Way Funding Approval Request
	Funding Approval Date <u>January 31, 2006</u>
<u> x </u>	Preliminary construction estimate quantities e-mailed to Estimating and Bid Analysis Office on <u>January 20, 2006</u>

Comments: 30 Full size plans, 10 Half-size plans and 6 full size cross-sections sent directly to the Region 1 Right-of-Way and Utilities Office.

For further information, please contact Maysoon Haddad Phone: (865) 555 - 1234.

cc: Program Operations Office

Figure 3-5
Right-of-Way "Appraisals and Acquisition" Transmittal Letter Example

3-400.30 DGN FILE DISTRIBUTION OF RIGHT-OF-WAY PLANS

When a project is issued for Right-of-Way acquisition, the design manager Civil Engineer Manager 1 or Transportation Manager 1 in charge of the project will be responsible for seeing that the DGN File is posted at the FTP site. The Department has set up a file transfer protocol (FTP) server for transferring large files. This process was started for three reasons:

1. The number of persons wanting copies of our .dgn files has increased.
2. The requirement (by OIR) that size of attachments to outgoing mail be limited to 15 MB.
3. Consultant firms that need electronic files often use Internet Service Providers (ISP) which have even smaller email limitations than the State's

The Department recently adopted the "CAD Plan Files Disclaimer and Limitation of Liability Agreement" form in order to provide protection for unauthorized and/or potentially harmful reuse of the data contained in the files. In compliance, we have developed a protocol that will extend this protection and make use of dual security.

In order to have access to the FTP server, each person must have an account with a username and password. The Information Technology Division (IT) will be responsible for establishing accounts and issuing the user name and password for all persons desiring access to the server. We must submit requests for employees if we want them to have permissions to access the server. We must also request user names and passwords for consultants and others who need access to the site. Since consultants work for many managers, Mary Ogden is assigned to coordinate the efforts to insure that we aren't duplicating efforts. Please email Mary the name of consultants that you want to have permissions on the list. **This is important in that only one user account will be assigned to each consultant regardless of the number of offices that they might have.**

The second security measure involves password protection of the files placed on the server. To accomplish this measure, the files placed on the server will be archived (compressed, zipped, etc.) with a software program having the ability to password protect the archive and capable of making a self-extracting (.exe) file. The Department has available WinZip which can be loaded by our IT staff. The password should be at least eight (8) characters and/or numbers in a nonsensical sequence. Each person who will be creating the archive will be responsible for setting the archive password and maintaining the password in the project design folder. There are several suitable archiving programs that can be downloaded for free on the Internet.

In order to post and retrieve files from the server, an FTP client is recommended. The State has Ws_ftp LE which can be loaded by our IT staff through the help desk. There are several free FTP clients available on the Internet which consultants can download.

The primary use of the site was to make .dgn files available to utilities. Therefore, the Department has adopted the following in conjunction with the Utilities Section:

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When a project is issued for Right-of-Way acquisition, the Design Civil Engineering Manager 1 or Transportation Manager 1 in charge of the project will be responsible for seeing that an archive file is created and loaded onto the FTP server under the \download\utility\folder (directory).

- The sequence for creating the files is as follows:
 1. Creating an archive file (see naming convention below).
 2. Add the needed files. These should be the sheet layouts, the files needed to create the sheets (reference files), and cross-sections. Files created by software such as alignments (.alg), digital terrain models (.dtm), etc. need not be included.
 3. Password protect the files.
 4. Create a self-extracting executable file (.exe).
- The password for extracting the files will be emailed to the Regional Utility Coordinator with a copy to the State Utilities Coordinator in the Headquarters Utility Office. Utilities will be responsible for establishing accounts for the utility companies, obtaining the "CAD Plan Files Disclaimer and Limitation of Liability Agreement", and distributing the password.
- Archive files for utilities will be named using the State Right-of-Way project number (i.e. 76001223104.exe). If dual counties are involved, use the project number for the county where the project begins.
- The printed plan sheets are the Official State records and these files are for drafting purposes only. Therefore, updates to the archive files will only be made if significant changes are made to the plans (see "CAD Plan Files Disclaimer and Limitation of Liability Agreement"). The manager in charge of design will make the determination of significance and insure that the appropriate utility personnel are notified.

For transferring files to others, the manager will be responsible for obtaining signed "CAD Plan Files Disclaimer and Limitation of Liability Agreement" and placing the files in the \download\ directory under a suitable folder name. Files sent to consultants and others performing work as part of the overall project, will not need to sign an agreement but will need password-protected files.

The email system can still be used for transferring files internally (within the Department). In addition, we can still receive large email attachments if sent from the outside. However, consultants with ISP's that limit the attachment size can use the FTP method to upload or download files. **Consultants will only have write privileges in the \upload\ directory and read privileges from the \download\ directory.**

Setting for accessing the FTP site:

Profile Name:	Design FTP Site
Host Address:	170.142.50.9
User ID:	As Assigned by IT
User Password:	As Assigned by IT

3-400.35 ADDITION OF EROSION AND SEDIMENT CONTROL PLANS INTO FIELD REVIEW AND FINAL ROW PLANS

Erosion and Sediment Control Plans sheets shall be included in the plans submitted for Right-of-Way Appraisals and Acquisition. Erosion and Sediment Control Plan Sheets shall also be included in right-of-way field review and construction field review plans. Erosion and Sediment Control Plan sheets shall immediately follow the Culvert Cross Sections. The Erosion and Sediment Control 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 Erosion and Sediment Control Plan sheets due to design revision, right-of-way revision, permit requirements, mitigation requirements, ecological evaluation requirements, erosion control 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 Erosion and Sediment Control Plans are revised to determine if revised plan sheets or other information is needed.

3-405.00 RIGHT-OF-WAY REVISIONS

When a project has been printed 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 TDOT C.E. Manager 1 or Transportation Manager 1 responsible for the project in an accurate and timely manner.

In the Regional Design Offices, the TDOT C.E. Manager 1 or Transportation Manager 1 responsible for the project will distribute the right-of-way revision prints to the appropriate Regional personnel. They will submit right-of-way revision prints for the appropriate Headquarters personnel through the Plans Sales Office.

In the Headquarters Design Offices, the TDOT C.E. Manager 1 or Transportation Manager 1 responsible for the project will distribute the right-of-way revision prints through the Plans Sales Office.

3-410.00 ENVIRONMENTAL PERMIT REQUIREMENTS

Projects involving the placement, extension or removal of pipes, bridges or culverts and/or channel changes, or other work causing environmental impacts to water bodies will require a review by the Designer. The Designer shall review the project for possible impacts to streams, drainage ways, and/or water bodies which support aquatic life at the location of the project. This review will utilize the appropriate USGS Quadrangle maps to determine if blue line streams are present and/or the ecology report that is supplied by the Technical Studies Office in the Environmental Division.

For any project meeting the above criteria, Designers shall submit one half size set of Right-of-Way Field Review Plans to the Environmental Division for permit evaluation. After the Environmental Division receives both the half size set of Right-of-Way Field Review Plans 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.

Consultants and Designers shall submit **all submittals** to the Design Manager in the Design Division for submittal to the C.E. Manager 1 in the Environmental Division.

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 the information and sketches required for the Environmental Division to apply for the required permits. The permit sketches and applicable information shall be submitted as indicated in the project schedule. For at typical grade and drain projects permit sketches and applicable information shall be submitted approximately 146 weeks into the project. For typical bridge and approach projects the permit sketches and applicable information shall be submitted approximately 39 weeks into the project. If there is a lag in the schedule due to unforeseen delays the permit sketches and applicable information shall be submitted 12 months or 52 weeks prior to the projected letting date. The permits sketches and applicable information shall be submitted to the Environmental Division for permit approval.

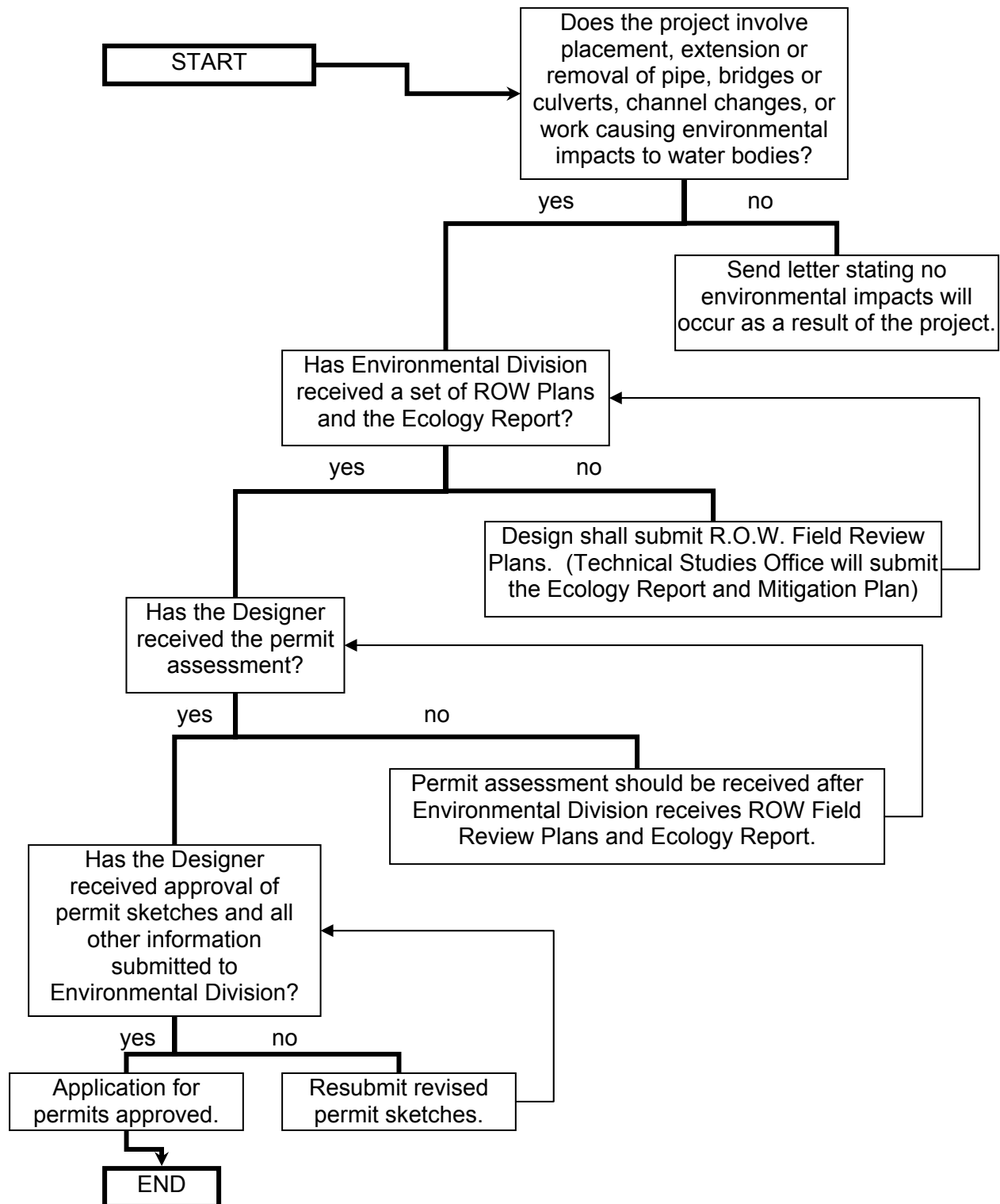


Figure 3-6
Permitting Process Flow Chart

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
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 10+250 ± (Rt. & Lt.) and 10+850 ± (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

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Mr. Jim Bivens
January 24, 2005
Page 2

- 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 removed 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 is a link 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 small wetland impacts. Typically, Individual permits are required for channel changes and wetland impacts greater than 0.1 hectares (0.25 acres) of isolated wetlands or 0.04 hectares (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 large stream and wetland impacts.

National Pollutant Discharge Elimination System Permit (NPDES)

This permit controls water pollution by regulating point sources (i.e. ditches, pipes) 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 0.40 hectares (1 acre) or more.

Class V Injection Well Permit

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 permit website:

<http://www.state.tn.us/twra/index.html>

Reelfoot Watershed Management Permit

The Reelfoot Watershed Management permit is required for all projects that affect 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/inet/functions/cw/cecwo/reg/index.htm>

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 Water 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 Water 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 0.2 hectares (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. 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/g-o/g-opt/g-opt.htm>

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 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 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 a 215 mm × 280 mm (8 ½ × 11-inch) sheet. If the Quadrangle portion showing the project is larger than that which will fit on the 215 mm × 280 mm (8½ x 11-inch) sheet, it shall be divided into 215 mm × 280 mm (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.

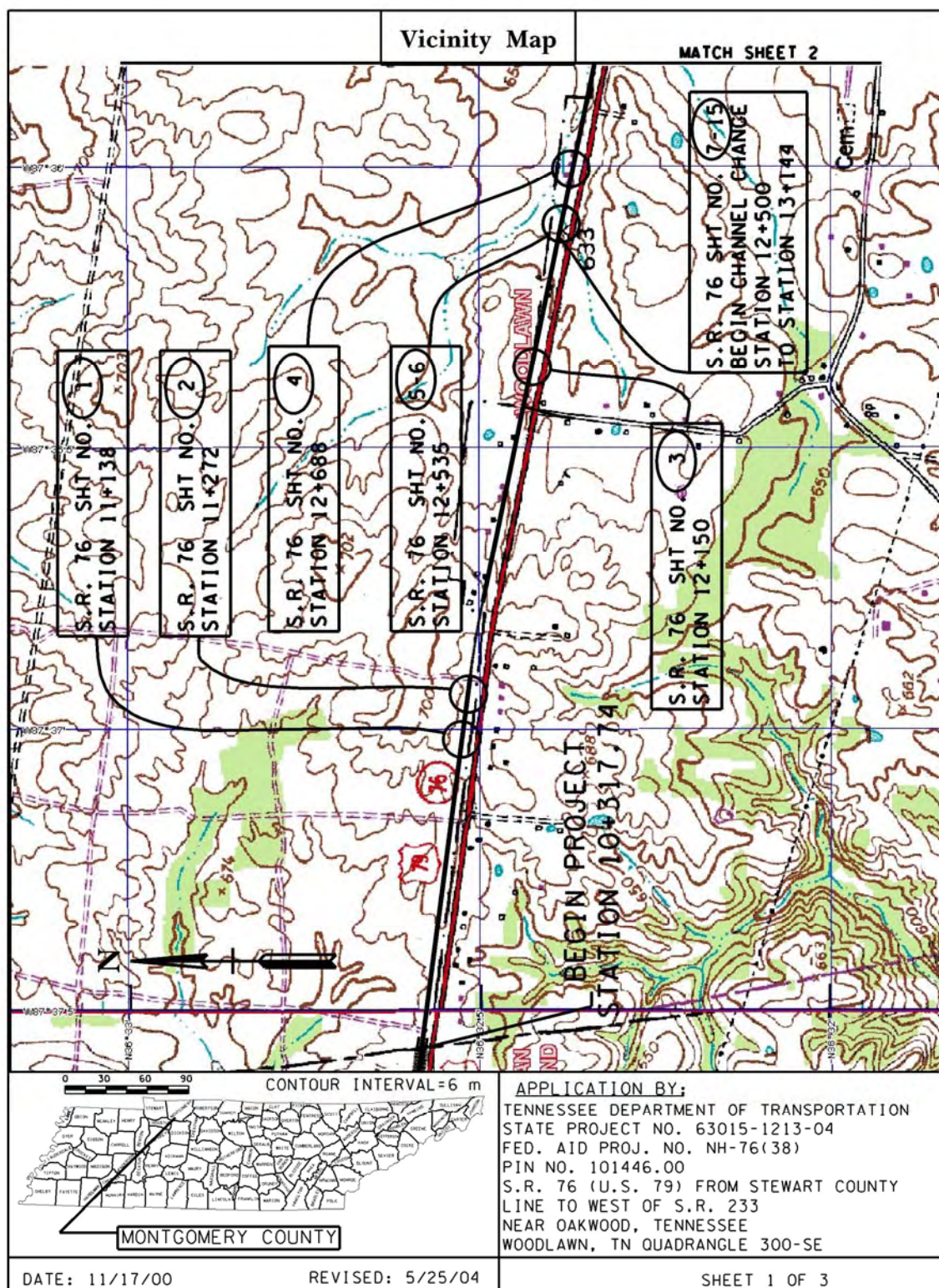


Figure 3-8
Example Vicinity Map

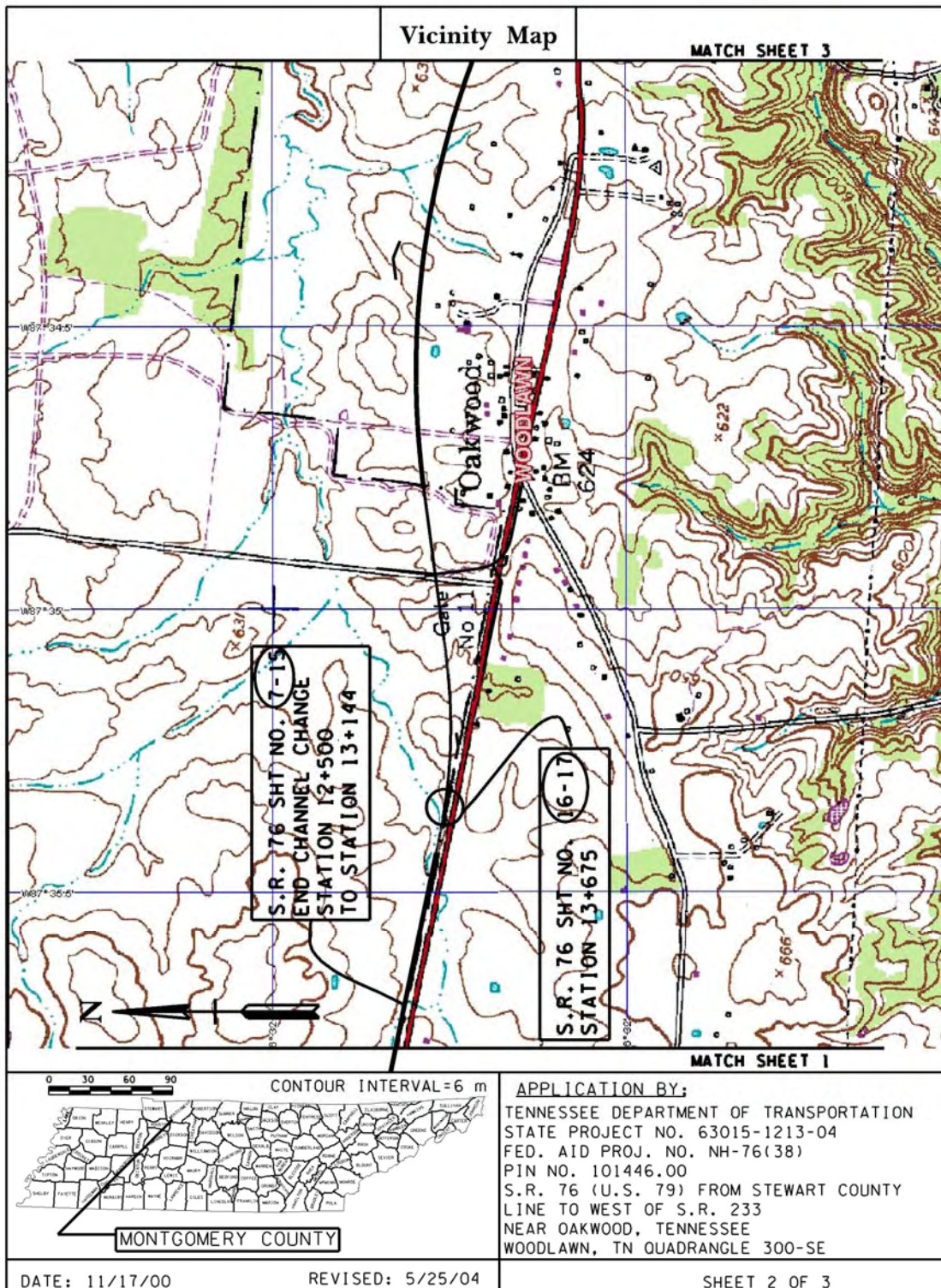


Figure 3-8 (continued)
Example Vicinity Map

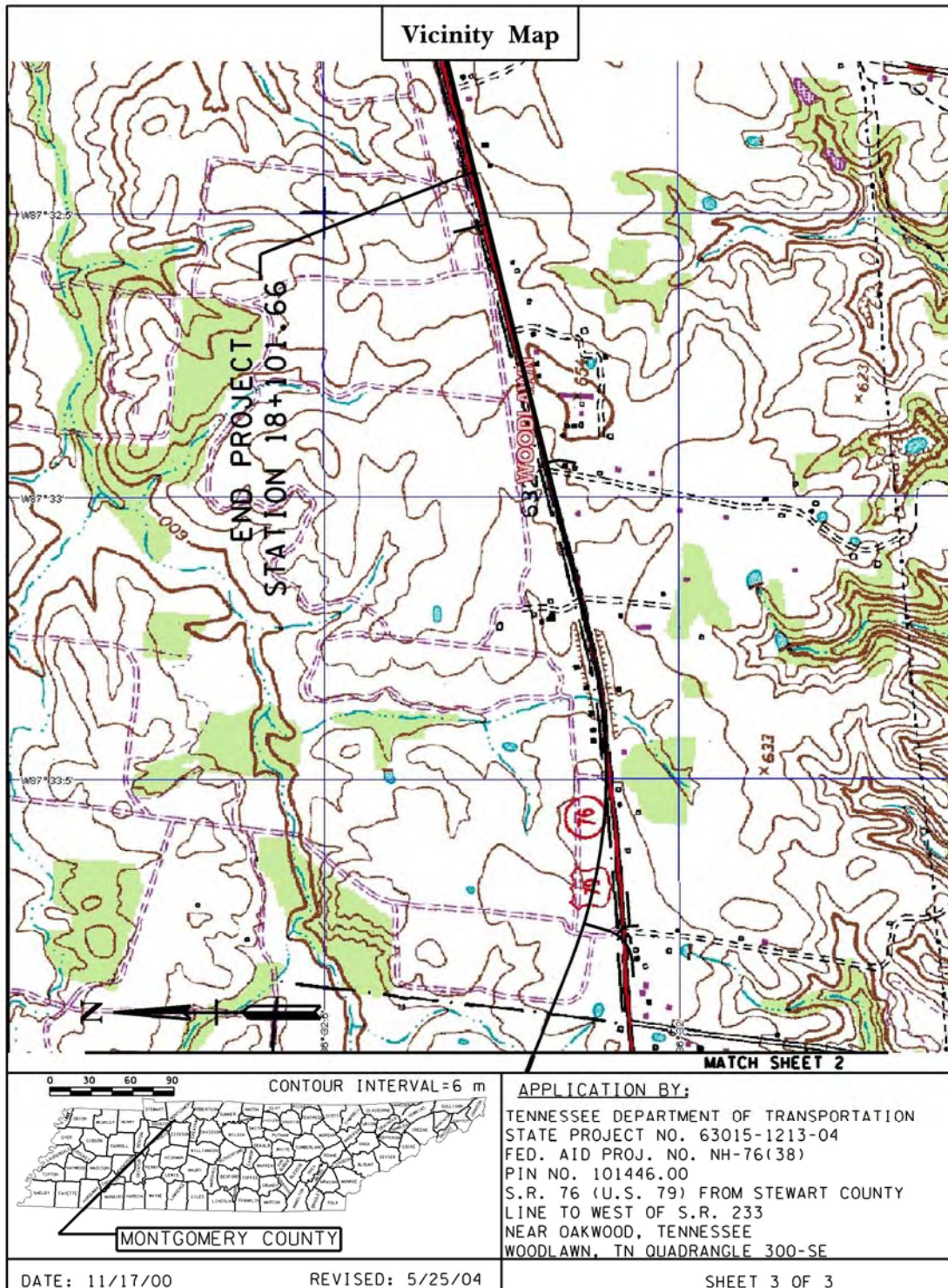


Figure 3-8 (continued)
Example Vicinity Map

3) Provide a table of environmental impacts listing the following:

- ☐ Station or range of stations of impact (i.e. STA. 6+520.00 or STA. 8+200 to 10+316)
- ☐ 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 Hectares	Feature Impacted
11+138	Wetland Fill	0.018	Isolated Wetland
11+272	Wetland Fill	0.026	Isolated Wetland
12+150	Wetland Fill	0.215	Isolated Wetland
12+688	Wetland Fill	0.003	Isolated Wetland

Station No.	Impact	Length in m	Feature Impacted
12+535	Culvert	91	Fletchers Fork Creek
12+500 to 13+144	Channel Changes	645	Fletchers Fork Creek
13+675	Culvert	67	Fletchers Fork Creek

	Property Owner	Address
11+138	Jane Smith	556 Quali Hollow Road, Clarksville, Tn 55555
11+272	Jane Smith	556 Quali Hollow Road, Clarksville, Tn 55555
12+150	Jane Smith	556 Quali Hollow Road, Clarksville, Tn 55555
12+688	John Doe	555 Quali Hollow Road, Clarksville, Tn 55555
12+535	John Doe	555 Quali Hollow Road, Clarksville, Tn 55555
12+500 to 13+144	John Doe	555 Quali Hollow Road, Clarksville, Tn 55555
13+675	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.

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

Figure 3-10 is an example of a Location Map.

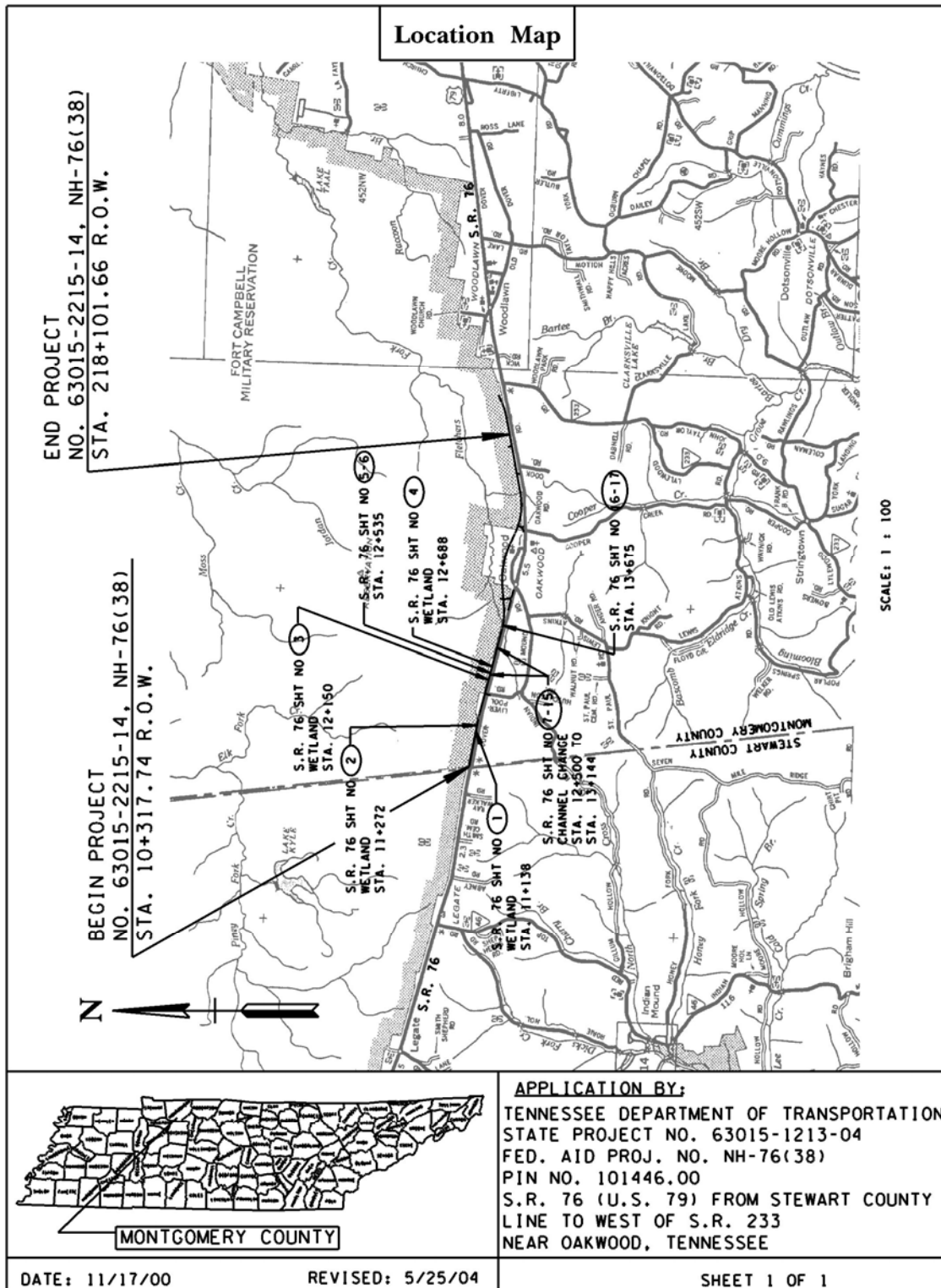


Figure 3-10
Example Location Map

General Permit Drawings

All permit drawings shall have the following general information (See "Permit Border Cell"):

- ☐ All maps and drawings shall be on 215 mm × 280 mm (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.
- ☐ 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 25 mm (1-inch) margin shall be left at the top edge and left side for binding purposes
- ☐ A 13 mm (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.)
- ☐ North arrow
- ☐ All drawings shall be to scale, and the scale shall be indicated graphically
- ☐ Proposed Right-of-Way boundaries and all easements shown and labeled
- ☐ Proposed cut and fill slope lines shown and labeled
- ☐ Delete unnecessary information to avoid clutter
- ☐ An information block containing the following information:
 - Tennessee Department of Transportation shall be identified as the applicant
 - Quadrangle sheet name and number
 - Preliminary Engineering Number
 - Project Identification Number (PIN)
 - Route number and name
 - Official project description
 - County
 - Nearest town or city
 - Sheet ___ of ___

Additional Permit Specific Sketch Requirements:

In addition to the above general information, the following information will be required on the site specific permit drawings:

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)

Channel Changes

The following information is required on permits for channel changes, alterations, or longitudinal encroachments (transitions of up to 15 m on either end of a culvert is not included in this category):

- ☐ Station or range of stations of the impact
- ☐ Plan view of the channel change 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, please contact the Technical Studies Office for an appropriate channel design. This shall also be shown on the proposed layout sheet in the plans.
- ☐ Length and size of existing open channel impacted
- ☐ Length and size of existing structures along the impact
- ☐ Length of relocated channel
- ☐ Length and size of structures located along the channel change
- ☐ Length of rip-rap and/or relevant features with the channel change. Rip-rap 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 regarding in-kind replacement of trees or channel (no substitutions, etc...)
- ☐ 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 14.15 m³/s, at the downstream section of the proposed change.

Figure 3-11 is an example of Permit Sketches required for a channel change.

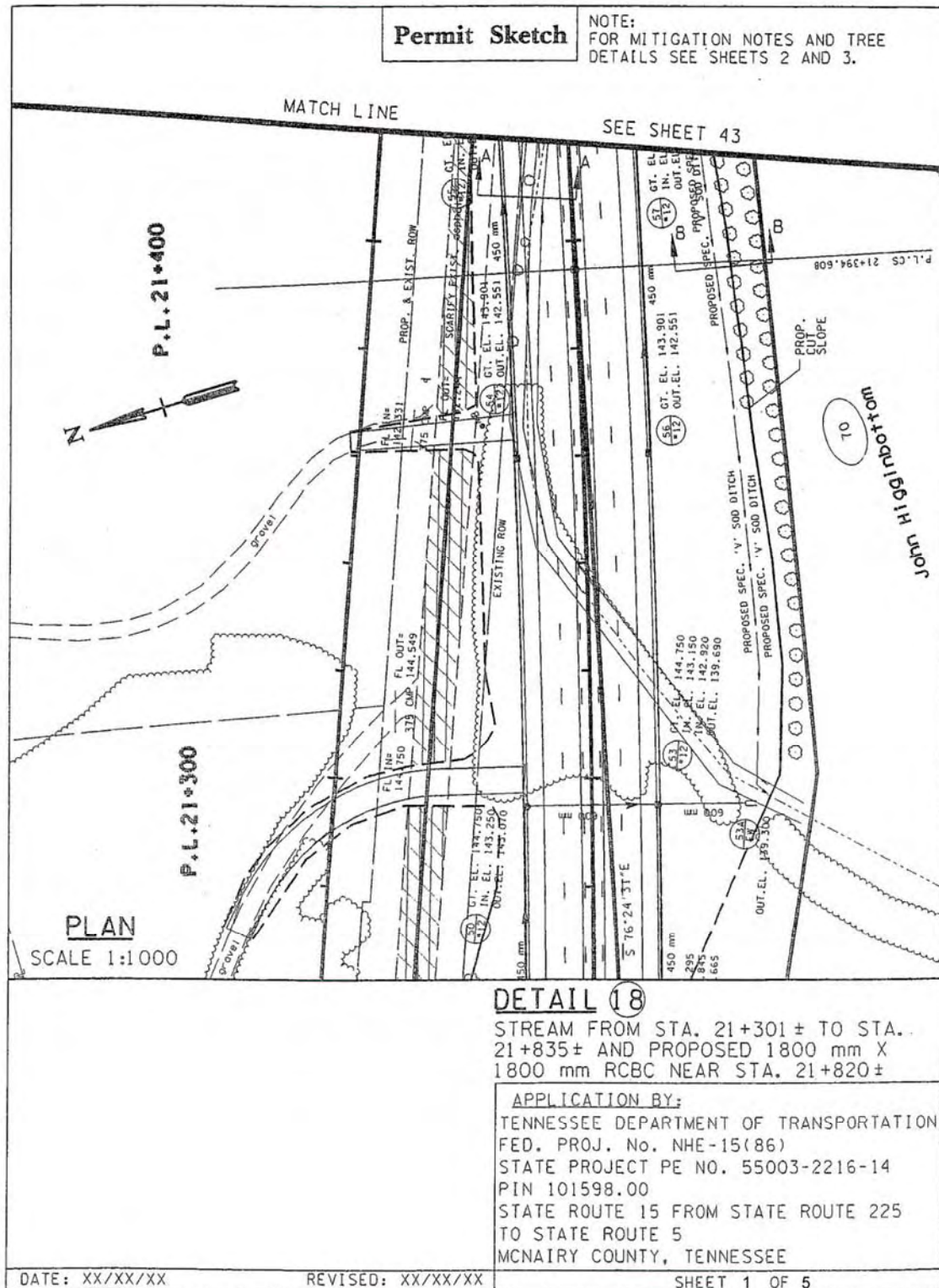


Figure 3-11
Example Channel Change Permit Sketches

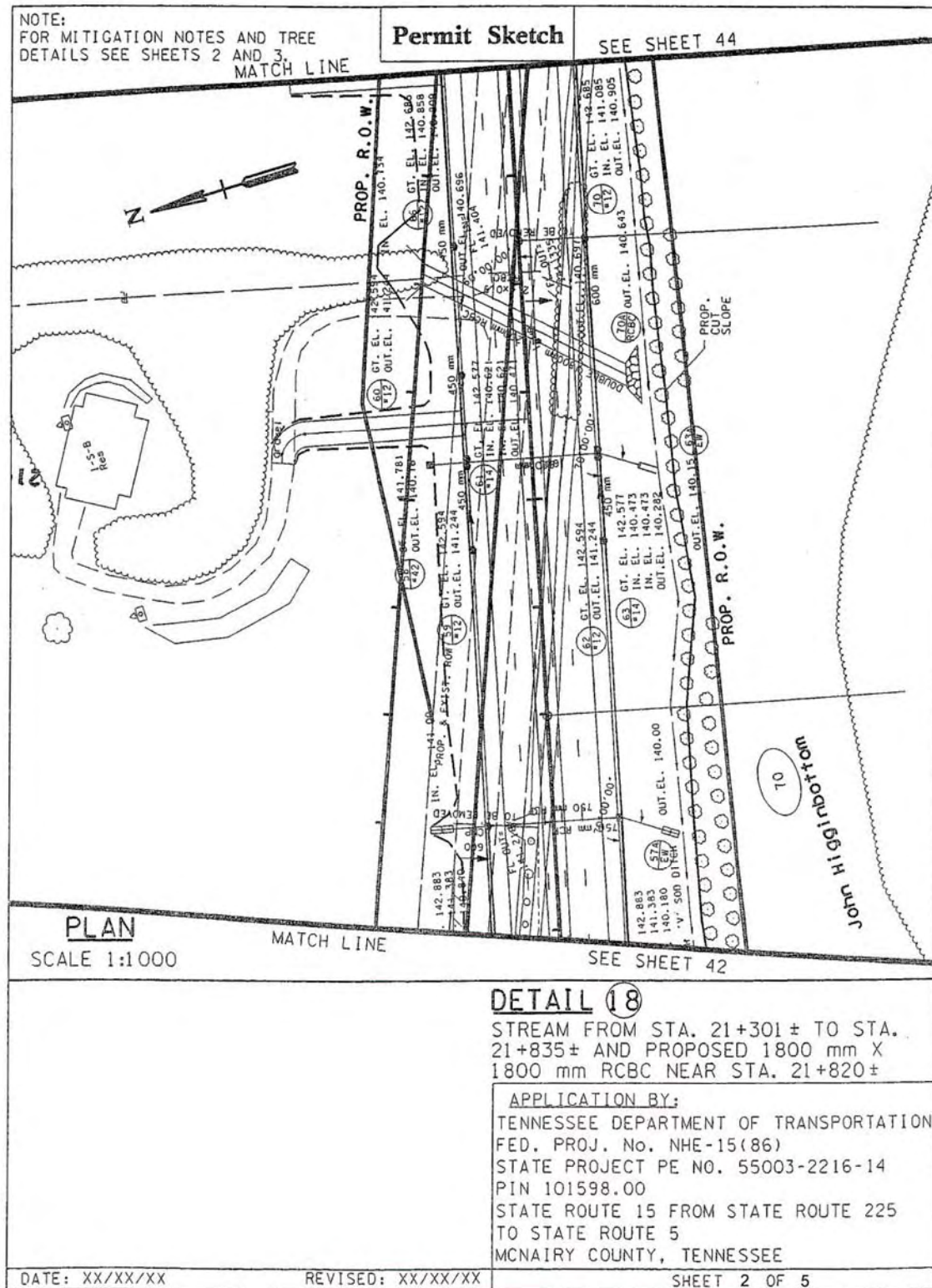


Figure 3-11 (continued)
Example Channel Change Permit Sketches

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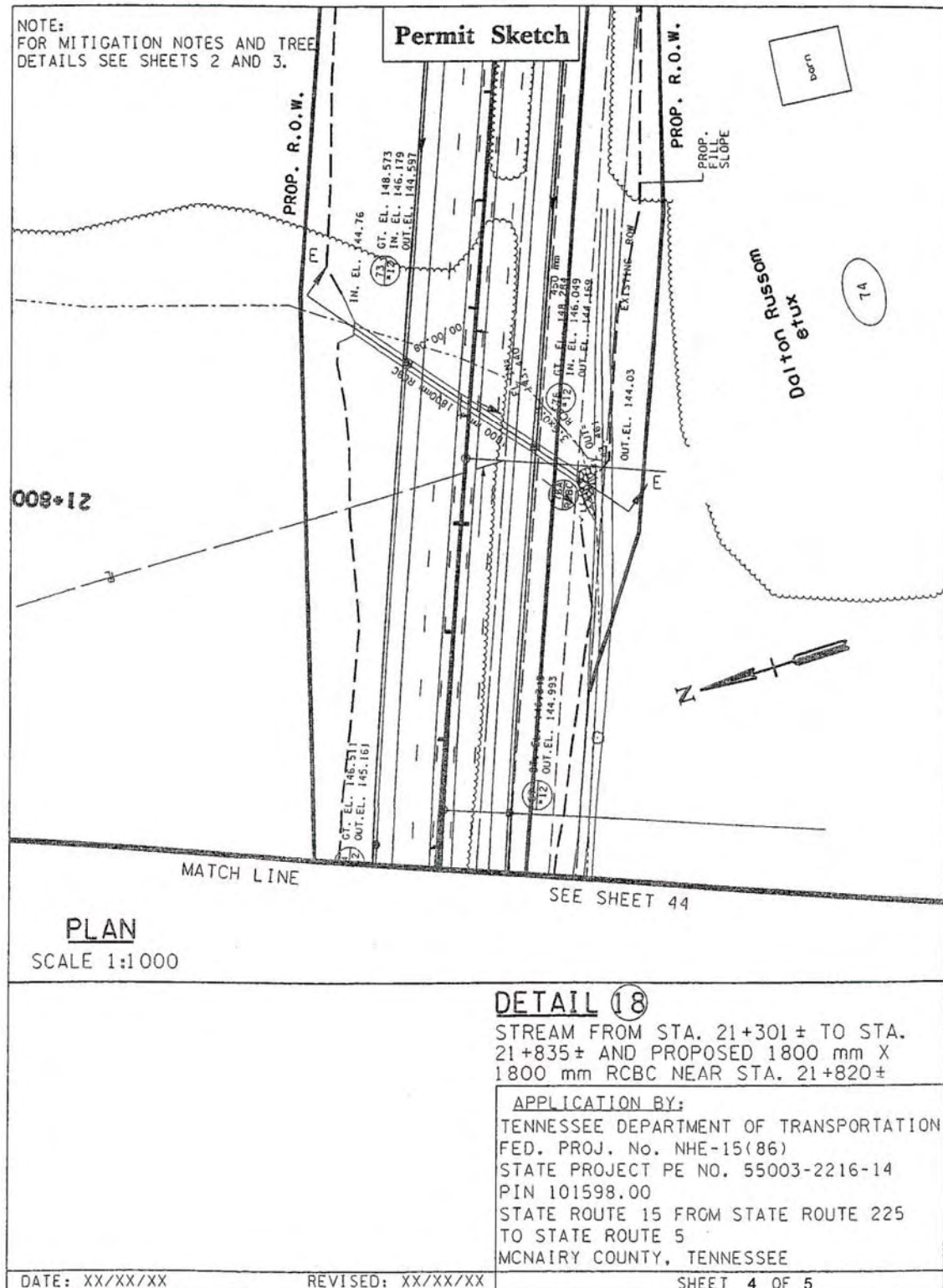


Figure 3-11 (continued)
Example Channel Change Permit Sketches

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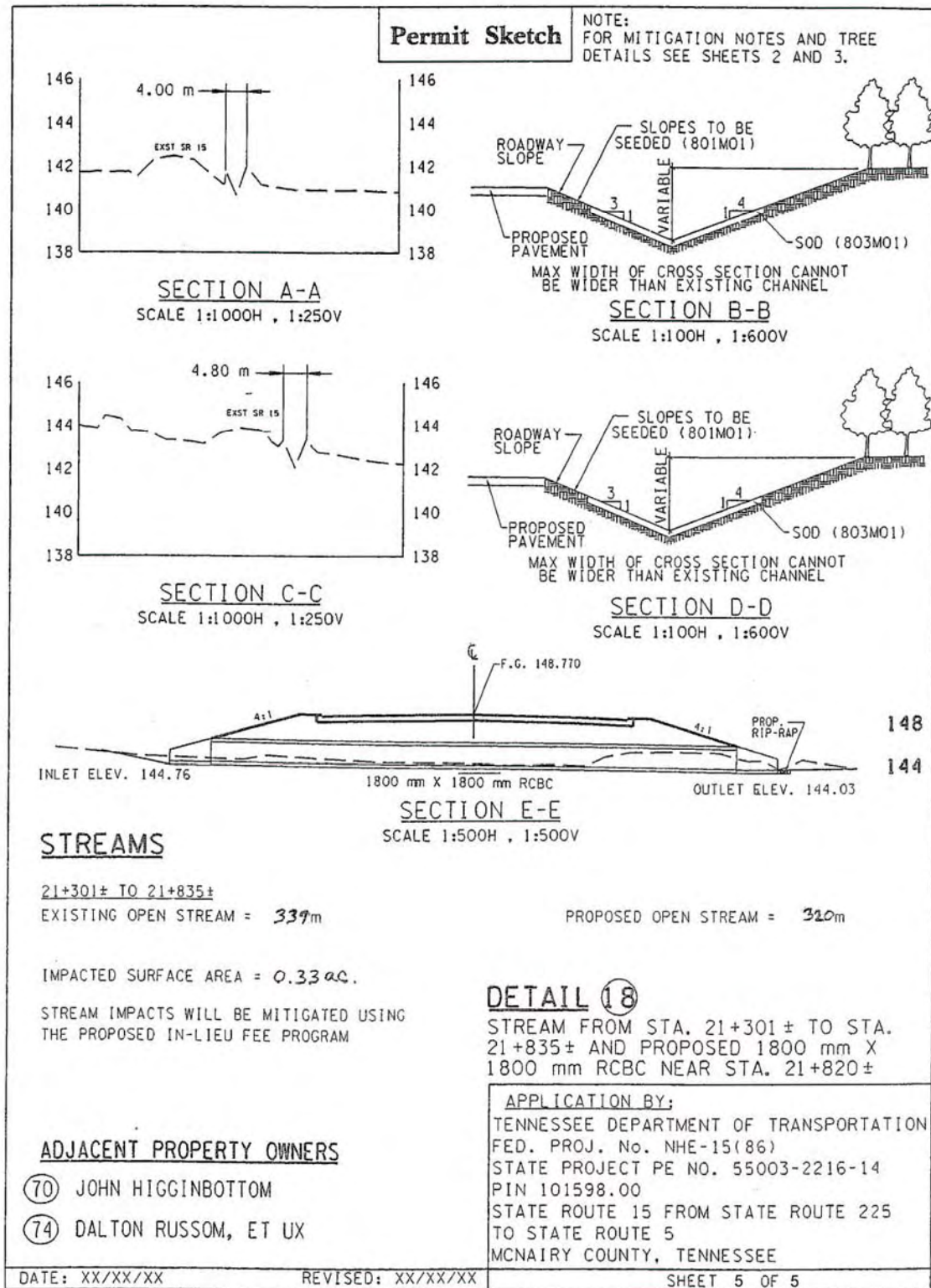


Figure 3-11 (continued)
Example Channel Change Permit Sketches

Culverts longer than 60 meters

The following information is required on permit sketches for new culverts longer than 60 meters and for culvert extensions which will result in the culvert being greater than 60 meters (including the concrete aprons):

- ☐ Station or range of stations of the impact
- ☐ Plan view showing:
 - Location of and labeling of the existing and proposed culvert and extensions
 - Proposed rip-rap (to scale)
 - Proposed trees for in-kind replacement
- ☐ Notes regarding in-kind replacement of trees (no substitutions, etc.)
- ☐ Typical cross-section of the culvert (to scale)
- ☐ Other relevant features (to scale)
- ☐ Table indicating:
 - Length of existing open channel impacted
 - Length and size of existing structures along the impact
 - Length and size of proposed structures, concrete aprons, endwalls or wingwalls along the impact
 - Length of proposed rip-rap
 - Length of tree plantings for in-kind replacement

Figure 3-12 is an example of the typical sketches required for a culvert longer than 30 meters.

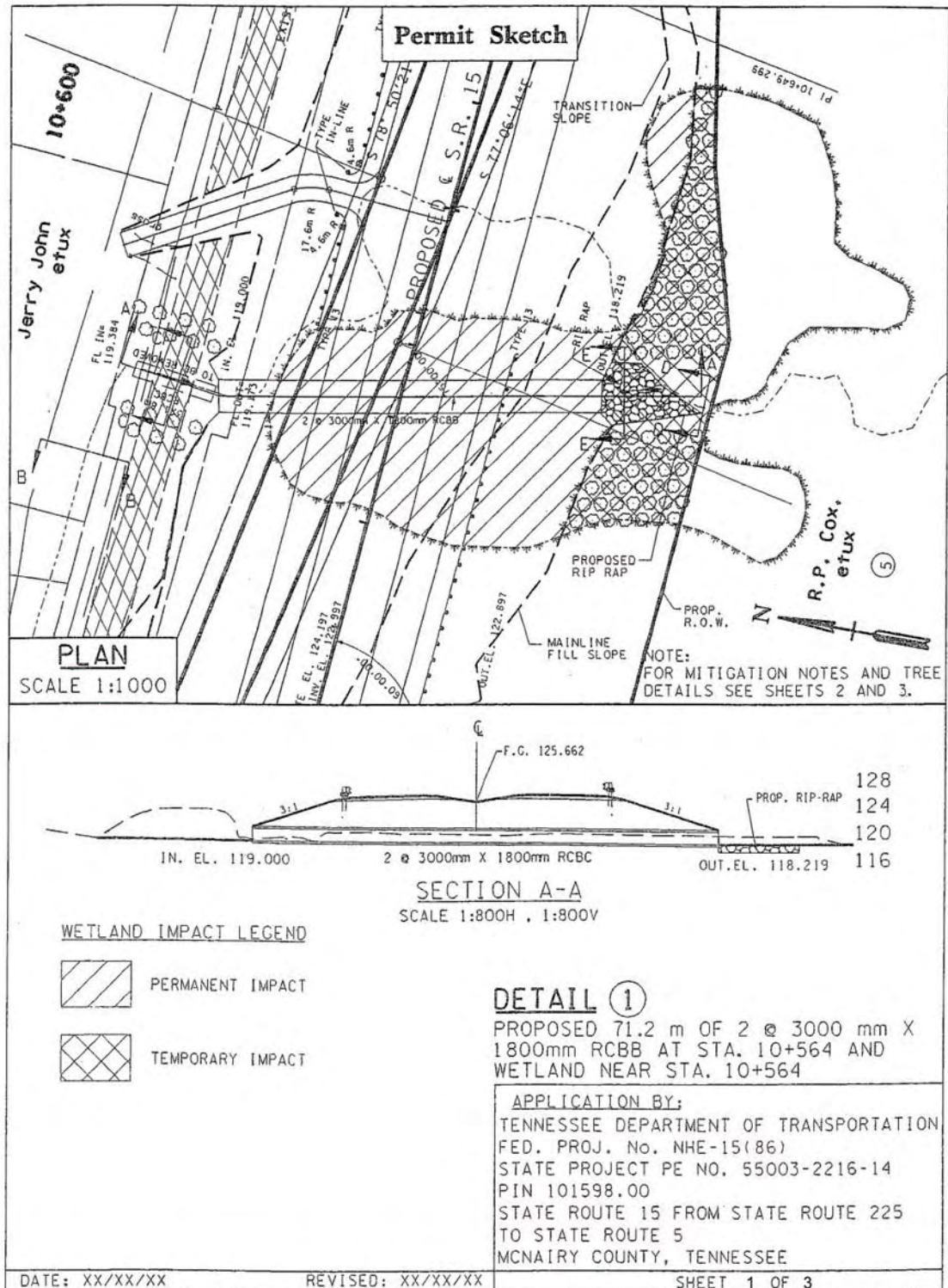


Figure 3-12
Example Permit Sketches for Culverts Longer than 60 Meters

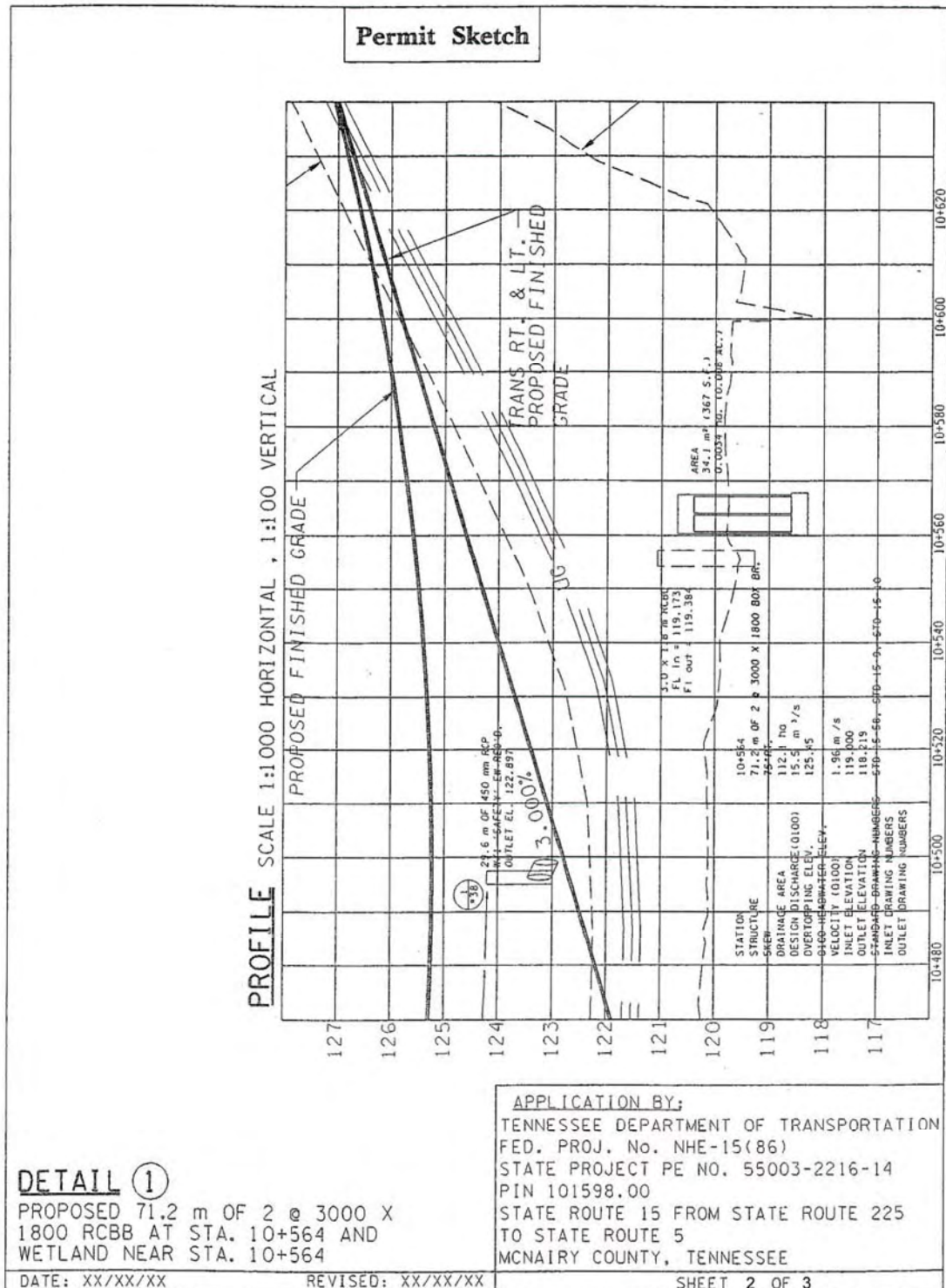


Figure 3-12 (continued)
 Example Permit Sketches for Culverts Longer than 60 Meters

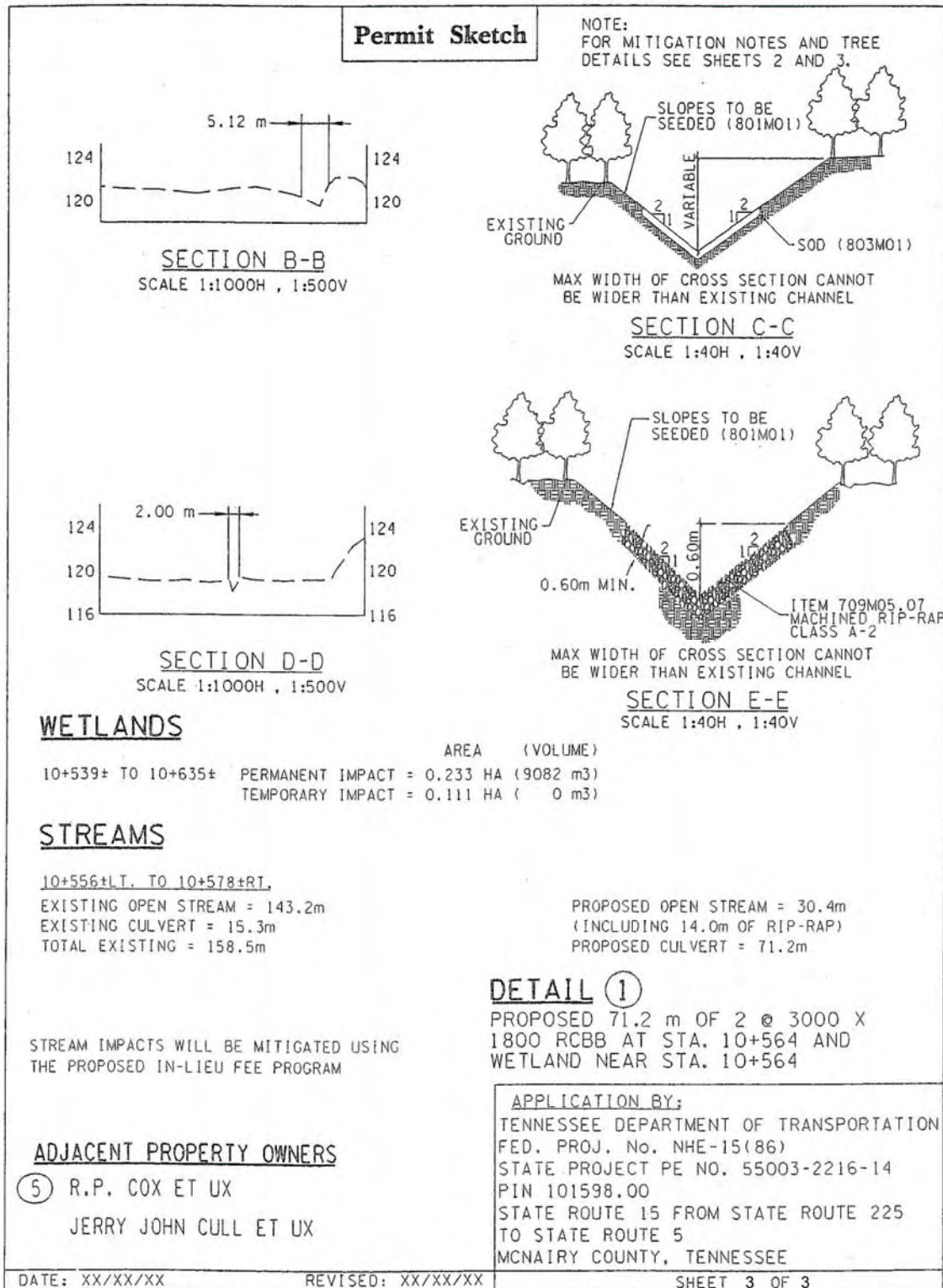


Figure 3-12 (continued)
Example Permit Sketches for Culverts Longer than 60 Meters

Endangered Species

The following information is required on permit sketches for projects involving areas of concern such as 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
- ☐ 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 decontaminate the location
- ☐ Notes regarding mitigation of impact
- ☐ Other relevant features (to scale)

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)
 - Cross-hatch the permanent wetland impacts and hatch the temporary wetland impacts
 - Construction haul/access roads
 - Note indicating if a portion of the wetland is outside of TDOT Right-of-Way, easements, and/or not to be disturbed during construction
- ☐ Profile view of impact area showing existing and proposed conditions (to scale)
- ☐ Boundaries of the existing wetland shall be indicated even if the wetland extends past the Right-of-Way or easement lines
- ☐ Notes regarding mitigation (tree, species, etc...) of temporary wetland replacement as indicated in the ecology report (also, shown on proposed layout sheet in plans)
- ☐ Table indicating:
 - Legend of hatching for the permanent and temporary wetland impacts
 - Area of the permanent and temporary wetland impacts in hectares
 - Volume of the permanent and temporary wetland impacts in cubic meters

Figure 3-13 is an example of the typical sketches required for wetland impacts.

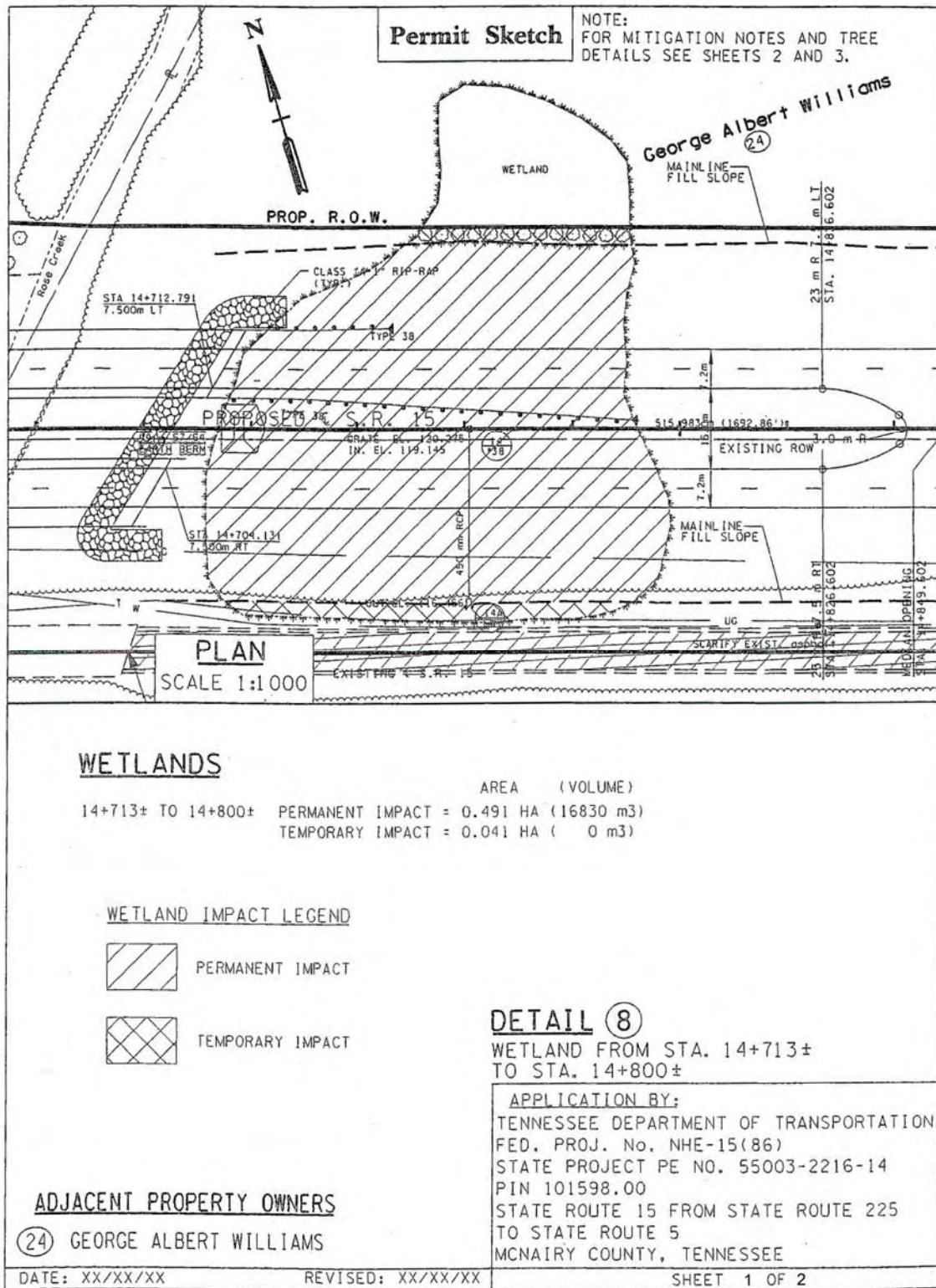
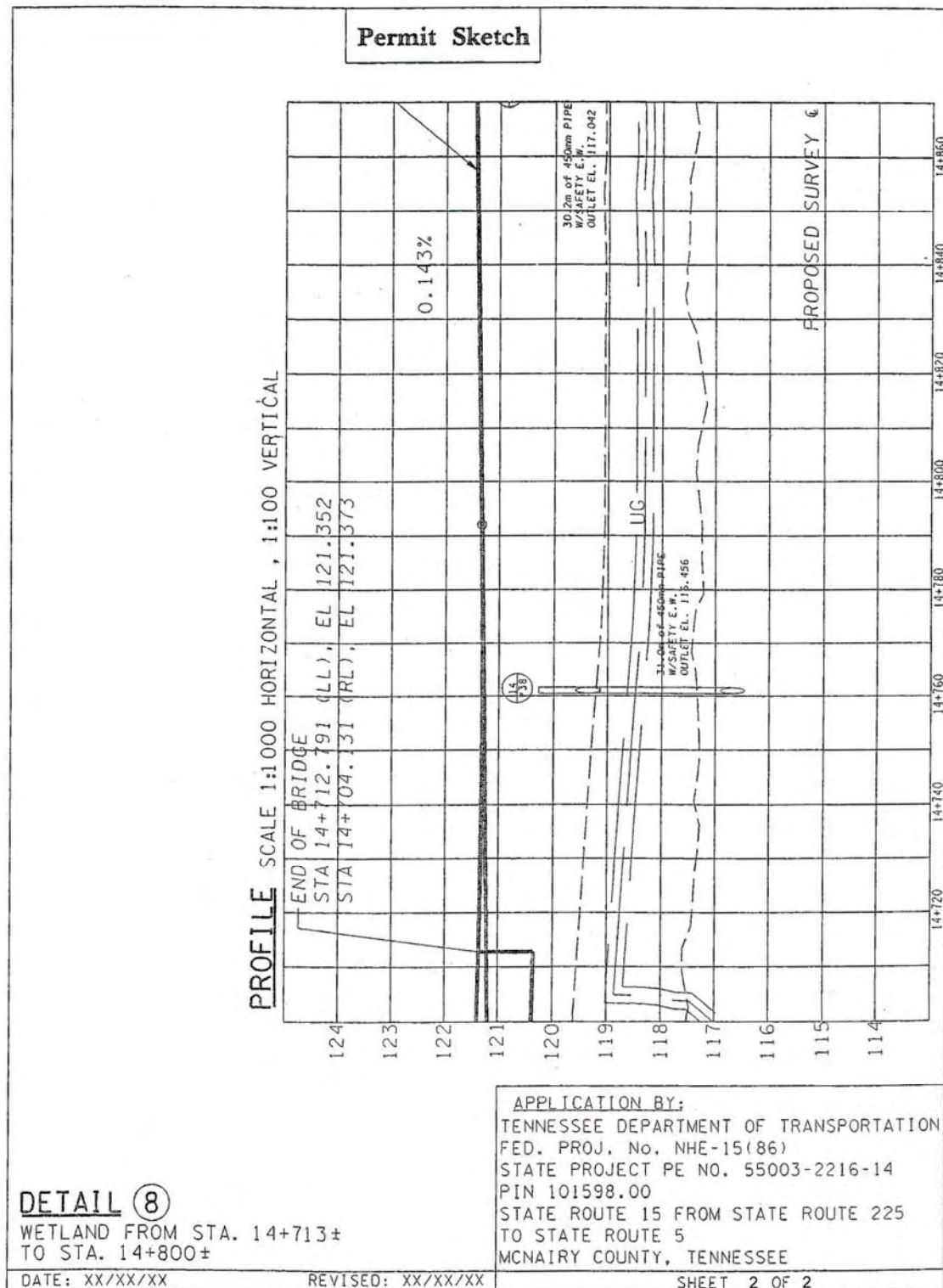


Figure 3-13
Example Permit Sketches for Wetland Impacts



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 e-mail 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 3-14 is an example e-mail 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 3-14
Example Approved Application for Permits Notification E-Mail

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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 vary 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 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.

* indicates project milestones

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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.

* indicates project milestones

TDOT - ROADWAY DESIGN GUIDELINES

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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) <i>(** 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)</i>	
147		Environmental Division to begin review 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.

* indicates project milestones

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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. (<i>**If there is a lag in the schedule to other issues this should take place 9 months or 39 weeks prior to Letting Date</i>)
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 (mylars) 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.

* indicates project milestones

TDOT - ROADWAY DESIGN GUIDELINES

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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.

* indicates project milestones

TDOT - ROADWAY DESIGN GUIDELINES

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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.

* indicates project milestones

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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 (mylars) 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.

* indicates 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 (**METRIC.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)

Design Division personnel can access these cells through the TDOT Tools tutorial system on the "**Permits and Forms**" tutorial. This tutorial can be brought up through the TDOT drop down menu on the Microstation® title bar, in the TDOT Design Division Toolbox.

Consultants can access the latest versions of the standard cell libraries, which include these cells on TDOT Design Division's web page at:

www.state.tn.us/transport/plan&dev/design/design.htm

These files may be obtained on disk by contacting the Design Division at (615) 741-4484.

3-410.02 PLACEMENT OF TREES FOR PERMIT REQUIREMENTS

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.

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SECTION IV - CONSTRUCTION

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 CHECKLIST (See 1-110.00)

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

4-115.00 IDENTIFICATION OF SUPERVISORS, DESIGNERS, AND CHECKERS ON TITLE SHEET

On the lower left-hand corner of the project title sheet shall be listed the name of the TDOT Civil Engineering Manager 1, TDOT Transportation 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 TRANSPORTATION 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

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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 CONSULTANT'S SEAL AND SIGNATURE ON TITLE SHEET

When a consultant submits final Construction Plans, the consultant's seal and signature shall be placed on the right side of the title sheet above the Chief Engineer's signature. The consultant's seal and signature must also be placed on every subsequent sheet of the Construction Plans (except the cross-sections), usually in the lower right-hand corner.

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 kilometers". 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 traffic 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. This applies to both full-size 914.4 mm x 558.8 mm (36" x 23") and 279 mm x 432 mm (11" x 17") title sheets.

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.

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SHEET NAME	SHEET NO.
Title Sheet	1
Roadway Index and Standard Drawings Index	1A
Estimated Bridge Quantities and Bridge Index	2
Estimated Roadway Quantities	2A – 2A1
Utilities	2B – 2B1
Typical Sections and Paving Quantities	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	16 - 17
Private Drive and Field Ramp Profiles	18 - 21
Interchange Grading Plans	22 - 24
Drainage Maps	25 - 27
Culvert Sections	28 - 30
Erosion and Sediment Control Plans	31 - 33
Wetland Mitigation Plans	34 - 35
Traffic Control Plans with Construction Phasing Notes	36, 36A - 36Z
Signing and Pavement Marking Plans	37, 37A - 37Z
Sign Schedule Sheets	38, 38A - 38Z
Miscellaneous Signing Details (* see below)	39, 39A - 39Z
Signal Layouts	40, 40A - 40Z
Lighting Layouts	41, 41A - 41Z
Soils Sheets	42, 42A - 42Z
Roadway Cross-Sections	43 - 191
Side Road Cross-Sections	192 - 200
Utility Index, Utility Owners, and Utility Sheets	U1-1 – U7-xx

Figure 4-2
Typical Index of Sheets

* Unless otherwise contacted by the Design Traffic Engineering Section, Signing Office.

4-135.00 GENERAL NOTES ON CONTRACT PLANS

A list of general notes frequently used on project plans is included in the Instructional Bulletins. Some of these notes were extracted from other sections of this document and are so noted, while others have been developed through general usage.

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 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 wording.

The designer shall use headings of "General" or "Special" for all notes placed on the second sheet series on the plans. The determination of which heading is applicable is as follows:

"General Notes" - Computerized list of general notes shown in the Instructional Bulletins.

"Special Notes" - Notes written specifically for the project or notes that vary in any way from the computerized list of general notes.

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 the Utility Sheets, Utility Relocation Plans, and a Utilities Index Sheet directly to the Program Operations Office 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)

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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 Estimates Section 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. (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 4-3. For format of Utility Owners see Figure 4-4. (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 4-5. (Responsible Office: Utilities)
8. All sheets shall be 914mm X 559mm and plotted on 4 mil mylar. (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 forwarded to the Design Manager to insure the "Estimated Utility Quantities" are updated and included in the revision distribution. (Responsible Office: Design and Utilities)
11. Utility quantities and item numbers will be consistent with the units of measurement used for the roadway plans. (Responsible Office: Utilities)

SHEET NAME

Utilities Index, Utility Owners, and Utility Sheets
Electrical Relocation Sheets
Water Relocation Sheets
Sewer Relocation Sheets
Gas Relocation Sheets
Cable TV Relocation Sheets
TVA Relocation Sheets

SHEET NUMBER

U1-1 – U1-xx
U2-1 – U2-xx
U3-1 – U3-xx
U4-1 – U4-xx
U5-1 – U5-xx
U6-1 – U6-xx
U7-1 – U7-xx

Figure 4-3
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)
E-mail: (if available)

Electrical:

Nashville Electric
1000 Church Street
Nashville, TN 37216
Contact: Mike Jones
Telephone: 615-555-1234
Fax: (if available)
E-mail: (if available)

Sewer:

Metro Water and Sewer
P.O. Box 123
Nashville, TN 37243
Contact: Bill Williams
Telephone: 615-555-1213
Fax: (if available)
E-mail: (if available)

Figure 4-4
Typical Format for Utility Owner Information

TYPE	YEAR	PROJECT NO.	SHEET NO.
CONST.	2003	NH-I-40-7(157)359	U1-1

Figure 4-5
Upper Right Hand Corner Box

1. Use "**CONST.**" for the type of 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.
3. Insert federal construction project number. If not a federal project, use the state construction project number.

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4-140.00 CONSTRUCTION PROJECT QUANTITY ESTIMATES AND PLANS SUBMITTAL (See 3-400.15)

The following shall be provided to the Program Operations Office, Estimates Section when submitting final Construction Plans:

1. The Right-of-Way title sheet that will be forwarded to the Plans Sales Office by the Estimates Section. The designer shall pencil both the federal and state construction project numbers along the left margin of the Right-of-Way title sheet prior to turning it in with the Final Construction Plans.
2. If the project includes grading quantities, six copies of the grading quantity calculation sheets will be furnished with the plans.
3. A complete construction quantity estimate (with item numbers) shall be submitted to the Estimates Section with the plans. (See Sections 3-400.15 and 4-140.05.)
4. 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 with the plans. All other unit prices will be set by the Estimates Section.
5. If the project includes non-participating items, any information concerning price will be furnished to the Estimates Section.

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.)

To insure the proper and rapid processing of Construction Plans, the following transmittal letter, shown in Figure 4-6, shall accompany the Construction Plans submittal to the Estimates and Bid Analysis Office.

If further information is required, please contact the Estimates and bid Analysis Office.



STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
NASHVILLE, TENNESSEE 37243-0350

MEMORANDUM

TO: Estimating and Bid Analysis Office
Attn: Estimates Section
Suite 1000, J.K. Polk Bldg.
Nashville, TN. 37243-0350

FROM: James Iway, Roadway Specialist Supervisor
Design Office, Region 2

DATE: February 8, 2006

SUBJECT: Project No.: BR-STP-33 (10), 44004-3211-94
Pin No. 100300.00
Description: S.R. 50, Bridge and Approaches over Will Bee Creek (L.M. 0.23)
Jackson County

The following completed Construction Plan items for the referenced project are being transmitted for the June 2006 Letting Process.

<u> X </u>	Original Construction Drawings (38 Sheets)
<u> X </u>	Original Roadway Cross-Sections (52 Sheets)
<u> X </u>	Original R.O.W. Title Sheet
<u> X </u>	Copy Haul Distance Sheet
<u> X </u>	Copy Grading Quantity Sheets
<u> N/A </u>	Copy R.O.W. Office building removal letter
<u> N/A </u>	3 1/2" computer disk or CD w/ estimate
<u> X </u>	<u>Estimate e-mailed</u>
<u> </u>	11" X 17" Resurfacing Plans (<u> </u> Sheets)

Comments:

For further information, please contact William B. Dunn Phone: (615) 520-4556

cc: David Davis
James Johnston
File

Figure 4-6
Example Construction Plans Transmittal Letter

4-140.01 279 mm x 432 mm (11" x 17") PLANS SUBMITTAL

State resurfacing plans will be submitted on a 279 mm by 432 mm (11"x17") format and will be limited to a maximum of twelve (12) sheets in this format. All plans requiring more than 12 sheets will be submitted on standard full size mylar plans sheets.

When submitting plans on 279 mm x 432 mm (11" x 17") paper, a minimum margin shall be provided on all sheets. The minimum margin shall be 25 mm (1") for the left margin and 5 mm (0.2") for the top, bottom and right margin.

The original copy shall be submitted to the Estimating and Bid Analysis Office.

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, if the plans have not been printed by the Printing Services Office.

All letting revisions generated in the Regional Design Offices will be submitted through the TDOT C.E. Manager 2 responsible for the project. The TDOT C.E. Manager 2 will be responsible for having the revision forwarded to the Estimating and Bid Analysis Office in an accurate and timely manner.

All letting revisions generated in the Headquarters Design Offices will be submitted through the TDOT C.E. Manager 1 or Transportation Manager 1 responsible for the project. They will be responsible for having the revision forwarded to the Estimating and Bid Analysis Office in an accurate and timely manner.

It will be the responsibility of the C.E. Manager 2 to retrieve any original reproducible mylars from "A" Level which are to be revised on projects generated in the regions. It will be the responsibility of the C.E. Manager 1 or Transportation Manager 1 responsible for the project to retrieve any original reproducible mylars from "A" Level which are to be revised on their own projects. The revised reproducible mylars will then be returned to "A" Level after the revision has been completed.

An "Estimate Revision Request" form, shown in Figure 4-7, must be filled out for each revision and it must be initialed by one of the members of the Estimates Section. After the "Estimate Revision Request" form has been initialed, one (1) copy of that form will remain with the Estimates Section and one (1) initialed copy of the form with the plans change will be taken to the Construction Office. This information is necessary in order to maintain a current and accurate state estimate.

4-140.05 CONSTRUCTION QUANTITIES ESTIMATE DATA FILE

The construction quantities estimate is an Excel file, as shown in Figure 4-8, in the format as designated by the TDOT Excel templates.

For TDOT employees, the templates are available in the self-extracting archive, 2ndSheets.exe at

<http://home.tdot.state.tn.us/asstchiefengrdesign/Design/DesignFiles/default.htm#MSOffice>

For consultants, the templates are available in the self-extracting archive, 2ndSheets.exe at

http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/design.htm#MSOffice

Instructions for use of these templates are in **Cadd.doc**, also at the same site.

There are Excel templates for projects with one, two or three state project numbers. For jobs with more than three state project numbers, see Cadd.doc for instructions.

Only prices for Right-of-way removal items shall be entered in the estimate. The Estimates Section will set all other prices. Prices and 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 Cadd.doc 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.

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SUBMITTAL OF CONSTRUCTION QUANTITIES ESTIMATES

For in-house and consultant design projects, the designer shall forward the completed construction estimate Excel file via e-mail at the time final plans are submitted to the following Groupwise e-mail address:

Name: **Estimates, TDOT Construction** (User Id: JJCONST).

For consultant design projects, the completed Excel file is to be forwarded with the final construction plans to the Civil Engineering Manager 1 or Transportation Manager 1 for submittal. Submittal may be either on CD or via e-mail. The manager will forward the file via e-mail to:

Name: **Estimates, TDOT Construction** (User Id: JJCONST).

SUBMITTAL OF PRELIMINARY CONSTRUCTION QUANTITIES ESTIMATES (See 3-400.15)

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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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5	Project Description				
6	Letting Date				
7					
8	Project Type of Work				
9	Unit (English or Metric):				
10	County				
11	Route				
12	Road Name				
13	Type of Road				
14	Project Length				
15	Beginning Station				
16	Ending Station				
17	Beginning Log Mile				
18	Ending Log Mile				
19	North Coordinate				
20	East Coordinate				
21	Longitude				
22	Latitude				
23	Roadway Designer				
24	Roadway CE Manager				
25	Date Turned In				
26	Bridge Required				
27	Bridge Designer				
28	Bridge CE Manager				

Proj Data Col #1-Est. Rdwy. Quantities Col #2-Est. Rdwy. Quantities Box Bridge Quantities

EstRdwyexample.xls:1

	A	B	C	D	E	F	G
2	ESTIMATED ROADWAY QUANTITIES						
3	ITEM NO.	DESCRIPTION	UNIT	QUANTITY			
4	307-02.02	ASPHALT CONCRETE MIX (PG70-22) (BPPB-HM) GRADING B-M2	TON	3182			
5	411-02.01	ASPHALT CEMENT (PG70-22) (ACS) GRADING D	TON	112			
6		Alternate AA1					
7	303-01	MINERAL AGGREGATE, TYPE A BASE, GRADING D	TON	35000			
8	307-02.01	ASPHALT CONCRETE MIX (PG70-22) (BPPB-HM) GRADING A	TON	6477			
9	307-02.02	ASPHALT CEMENT (PG70-22) (BPPB-HM) GRADING A-5	TON	165			
10		Alternate AA2					
11	303-01	MINERAL AGGREGATE, TYPE A BASE, GRADING D	TON	25000			
12	307-02.01	ASPHALT CONCRETE MIX (PG70-22) (BPPB-HM) GRADING A	TON	5667			
13	307-02.02	ASPHALT CEMENT (PG70-22) (BPPB-HM) GRADING A-5	TON	124			
14	309-01.01	MINERAL AGGREGATE (A-CBC)	TON	10653			
15	309-01.02	PORTLAND CEMENT (A-CBC)	TON	411			
16	309-02	BITUMINOUS MATERIAL (A-CBC)	TON	28			
17		Alternate AA3					
18	303-01	MINERAL AGGREGATE, TYPE A BASE, GRADING D	TON	25000			
19	307-02.01	ASPHALT CONCRETE MIX (PG70-22) (BPPB-HM) GRADING A	TON	5667			
20	307-02.02	ASPHALT CEMENT (PG70-22) (BPPB-HM) GRADING A-5	TON	124			
21	312-01	MINERAL AGGREGATE (ALFSB)	TON	7711			
22	312-02	LIME	TON	293			
23	312-03	FLY ASH	TON	921			
24	312-04	BITUMINOUS MATERIAL (ALFSB)	TON	28			
25							
26							
27							
28							
29							
30							
31							
32							
33							

Proj Data Col #1-Est. Rdwy. Quantities Col #2-Est. Rdwy. Quantities Box Bridge Quantities

Figure 4-8
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, 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 the 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

When a project has been awarded to construction, and a change becomes necessary anywhere on the project, a Construction Plans revision is required. All construction revisions will be submitted through the TDOT C.E. Manager 1 or Transportation Manager 1 responsible for the project in an accurate and timely manner.

In the Regional Design Offices, the TDOT C.E. Manager 1 or Transportation Manager 1 responsible for the project will distribute the construction revision prints to the appropriate Regional personnel. They will submit construction revisions prints for the appropriate Headquarters personnel through the Plans Sales Office.

In the Headquarters Design Offices, the TDOT C.E. Manager 1 or Transportation Manager 1 responsible for the project will distribute the construction revision prints through the Plans Sales Office.

CHAPTER 2 - EARTHWORK

4-202.00 REMOVAL OF STRUCTURE

When the proposed structure is a girder bridge, the removal item for the existing structure(s) shall be placed on the Estimated Structure Quantities sheet and numbered in sequence beginning with Item No. 202M04.01 and continuing through Item No. 202M04.49, 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. 202M04.50 and continuing through Item No. 202M04.99, 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. 202M01, Removal of Structures and Obstructions, Lump Sum, or Item No. 202M01.50, 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 that 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. 202M06.01 through 202M06.99 shall be listed as such and shall not be included in Item No. 202M01 or 202M01.50.

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 under the bid price for Item No. 202M06.01, Removal of Buildings (Tract No. ____) through Item No. 202M06.99, 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 4-9.

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Metric

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REMOVAL OF BUILDINGS AND OBSTRUCTIONS DESCRIPTION BLOCK		
PAY ITEM	TRACT NO.	DESCRIPTION

NO ADDITIONAL COMPENSATION WILL BE MADE FOR THESE REMOVALS.

Figure 4-9
Removal of Buildings and Obstructions Description Block

4-202.13 ABANDONMENT OF WATER WELLS (See 4-625.00)

Item No. 202M13, 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. 604M15.01, Portland Cement Grout per cubic meter, shall be used to seal wells, and, for estimating purposes, shall be computed as shown below:

1. Wells with a diameter of 300 mm or less

The grout fill material shall extend from the bottom of the well to within 1.5 meters of the final surface where the well is in a roadway cut or to within 1.5 meters 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 300 mm

The bottom 1.5 meters 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 (See 2-145.00)

The Special Provision for Section 203 allows the use of Item No. 203M05, Undercutting, per Cubic Meter, as a pay item if the amount of undercutting needed, as specified in the soil report, is approximately 10% or more of Item No. 203M01, Road and Drainage Excavation (Uncl.).

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.

4-203.05 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 Tonne instead of per cubic meter. This item shall be paid for as follows:

Item No. 203M02.01 - Borrow Excavation (Graded Solid Rock) - Tonne.

Use a factor of 2.0926 Tonnes per cubic meter 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. 203M30.01, 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. 203M30.01 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. 203M30.01 be considered anytime that the total excavation is approximately 1150 cubic meters, 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. 203M30.01.

Figure 4-10, 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.

ALL COSTS OF THESE ESTIMATED QUANTITIES TO BE INCLUDED IN PRICE BID FOR ROADWAY APPROACHES ITEM NO. 203M30.01							
Road & Drain Exc. (Uncl.)	Borrow Excavation (Uncl.)	Water	Placing & Spreading Topsoil	Channel Exc.	Seeding w/Mulch	Water Seeding & Sodding m ³	Sodding (New Sod)
m ³	m ³	m ³	m ³	m ³	Unit		m ²
1153	129	15	216	336	19	8	32

NO CHANGE IN COMPENSATION WILL BE MADE FOR NORMAL VARIATIONS IN ESTIMATED QUANTITIES.

Figure 4-10
Example of Estimated Quantities for Roadway Approaches Block

For projects with more than one structure, each site shall be estimated and an item per site used. Use the Roadway Approach, Item No. 203M30.01 followed by 203M30.02, etc.

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Metric

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4-203.30 TOPSOIL COMPUTATION (See 3-315.05)

4-203.35 CHANNEL EXCAVATION FOR BOX AND SLAB TYPE CULVERTS AND BRIDGES

The **channel excavation** must be computed by the roadway designers. The channel excavation will be included in the Estimated Roadway Quantities Block. DO NOT include the cost of this item in the unit cost of concrete. This item must be bid separately under the price bid for Item No. 203M08, Channel Excavation (Unclassified), per cubic meter. See Section 4-204.05 for limits of this item.

See Section 4-204.05 concerning **culvert excavation** for box and slab type culverts and bridges.

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Metric

Revised: 03/15/06

4-203.40 COMPUTATIONS FOR ITEM NO. 203M06 WATER

Embankment:

$$\text{Earth embankment (m}^3\text{) x 0.012502} = \text{m}^3$$

Base material and granular backfill:

$$\text{Compacted volume (m}^3\text{) x 0.075010} = \text{m}^3$$

Foundation preparation (Item Nos. 204M10.01 through 204M10.16):

$$\text{Width of subgrade (m) x 0.15 m x Length of project(m) x 0.019805} = \text{m}^3$$

Subgrade treatment (lime) (Item No. 302M01.01):

$$\text{Subgrade treatment volume (m}^3\text{) x 0.200026} = \text{m}^3$$

Soil-cement base (Item No. 304M01.02):

$$\text{Volume of base (m}^3\text{) x 0.075010} = \text{m}^3$$

Aggregate-cement base (Item No. 309M01.01):

$$\text{Volume of base (m}^3\text{) x 0.075010} = \text{m}^3$$

Lime fly-ash base (Item Nos. 312M01, 312M02, and 312M03):

$$\text{Volume of base (m}^3\text{) x 0.15235} = \text{m}^3$$

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. 203M01, Road and Drainage Excavation (Unclassified), it is to be referred to as unclassified excavation. When the designer has received the Soils and Geology Report stating approximately what portion is common and what portion is solid rock, he or she is to use a block as shown in Figure 4-11a. If the designer does not know the composition of the material being excavated, he or she is to use a block as shown in Figure 4-11b.

Figure 4-11a
Estimated Grading Quantities Block (Materials Composition Known)

Figure 4-11b
Estimated Grading Quantities Block (Materials Composition Unknown)

4-204.00 PIPE CULVERT EXCAVATION

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 meter of pipe.

See Standard Drawing No. DM-PB-1 for additional details and general notes.

4-204.05 EXCAVATION FOR CONCRETE BOX AND SLAB TYPE CULVERTS AND BRIDGES (See 4-203.35)

Compute quantities of **culvert excavation** (Figure 4-12) 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."

See Section 4-203.35, concerning **channel excavation** for box and slab type culverts and bridges.

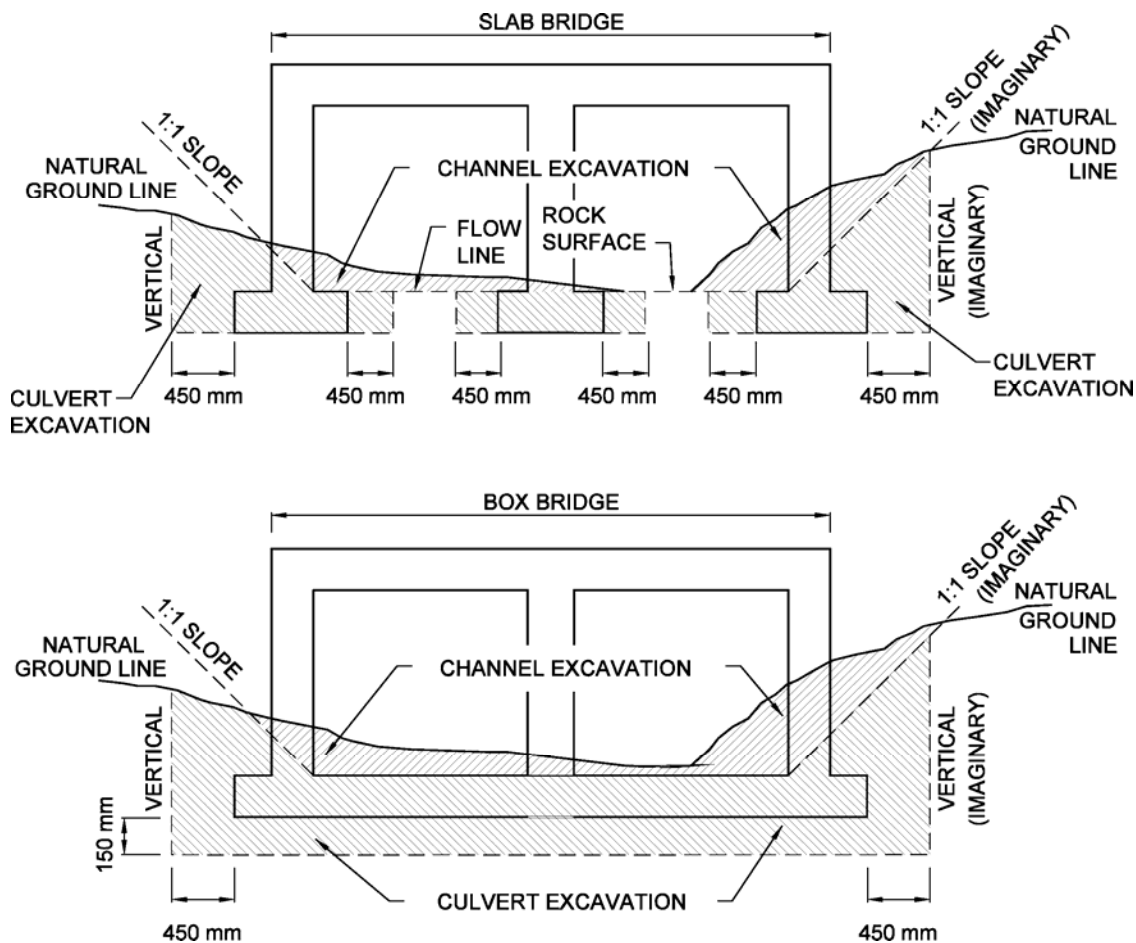


Figure 4-12
Quantities for Channel Excavation for Slab Type and Box Culverts and Bridges

4-209.00 TEMPORARY EROSION AND SEDIMENT CONTROL NOTE

The designer shall **footnote** all applicable erosion and sediment control pay items as follows:

"See Subsection 209.07 of the Standard Specifications for Maintenance Replacement."

4-209.01 COMPUTATIONS OF TEMPORARY EROSION AND SEDIMENT CONTROL QUANTITIES

The designer's development of the erosion and sediment control plan shall be done in such a manner as to comply with the anticipated construction sequencing for the particular project. All linear measurements for the erosion and sediment control quantities can be scaled from the erosion and sediment control plan as it is developed.

The designer shall be aware that the quantities for many of the erosion and sediment control pay items are based on an expected life span of this item as well as the construction sequencing. In order to make the calculations for quantities on a particular pay item, the designer should:

1. Place the necessary erosion and sediment control pay items, as needed, on the erosion control plan used on the construction project, taking into account the sequencing of the construction activities.
2. Divide the estimated duration of the construction activities by the estimated life of each erosion and sediment control pay item to obtain an adjustment factor for each pay item.
3. Multiply the adjustment factor derived above by the computed quantity as taken from the erosion and sediment control plan to obtain the necessary quantity for each pay item. This quantity shall be placed in the appropriate column on the estimated quantity sheet.

To assist the designer in estimating the duration of the construction activities, some ranges of construction times are listed in Table 4-1. Another good source of information, for construction time on similar projects (in previous lettings), is the Notice to Contractors. For the total construction time estimate (in weeks) as shown in the Notice to Contractors, divide the total number of working days by 3.85.

Two and Three Lane Highways	
Less than 1.5 km	16 to 32 weeks**
1.5 km to 3 km	20 to 38 weeks**
3 km to 4.5 km	28 to 44 weeks**
Over 4.5 km	6 to 8 weeks per kilometer
Four and Five Lane Highways	
Less than 1.5 km	24 to 36 weeks**
1.5 km to 3 km	32 to 42 weeks**
3 km to 4.5 km	38 to 54 weeks**
Over 4.5 km	8 to 12 weeks per kilometer

** Do not accumulate times

Add 65% to the above time for an urban (curb and gutter) section.
Reduce the above time by 20% for SIA Projects.

Table 4-1
Estimated Duration of Time for Construction Activities

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Item No. 203M01 Temporary Berm

Temporary berms shall be paid for under Item No. 203M.01, Road and Drainage Excavation (Unclassified). They shall be measured by the cubic meter as designed and as completed in place. Also, they shall be maintained by the contractor at his expense for the duration of the project.

Item Nos. 209M02.03 through 209M02.07 Temporary Slope Drain Pipe

Temporary slope drain pipes will be sized according to the table shown on Drawing No. ECM-STR-27. They will be measured by the linear meter, as designed and as completed in place.

Item No. 209M03 Check Dams

Length across top of dam (m) x vertical height (m) = Surface area (m²)

Check dams will be measured by the square meter as designed and as completed in place. They are to be measured longitudinally across the top of the dam and on a vertical plane down to the contour of the bottom of the ditch. Reconstruction and measurement may be required by the sequence of construction.

Item No. 209M04 Brush Barriers (to be used only in rural areas) (to be used only if brush is available)

Brush barriers will be measured by the linear meter, as constructed. Reconstruction and remeasurement may be required by the sequence of construction.

Item No. 209M05 Sediment Removal

Total area inside ROW (ha) x 64 m³/ha = Sediment removal (m³)

0.5 V_w x 1.25 = Sediment removal (m³)

V_w = Total Volume of Wet Storage in All Sediment Traps and Basins on Project.

Material is removed from a variety of sediment traps, check dams, natural areas, holding basins, etc.

For Widening Projects use the following formula:

Total area inside ROW (ha) x 32 m³/ha = Sediment removal (m³)

Item No. 209M06 Baled Hay or Straw Erosion Checks

Baled hay or straw erosion checks will be measured by the bale. The expected life span is three to nine months; therefore, complete replacement and remeasurement is required an average of every six months, unless revised by the sequence of construction. Average bale length is 900 mm.

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$$\frac{\text{Total project calendar days adjusted to the sequence of construction}}{(6 \text{ mo.}) \times (30 \text{ days / mo.})} = * \text{ Adjustment factor}$$

* Round factor to nearest whole number

Adjustment factor x computed number of bales installed = Total bales

Example No. 1

There is a 4 kilometer widening job using the existing vertical and horizontal alignment. The highway is to be widened from a two-lane to a four-lane facility by being widened equally on each side.

First look at Table 4-1 under section 4-209.01. Under four-lane highway for 3 kilometers to 4.5 kilometers the table reads 38 to 54 weeks. For this example, 38 weeks was arbitrarily selected. Any number of weeks up to 50 would have provided an adjustment factor less than 1, and therefore, given the same results. Divide 38 by 2, and one will get 19 weeks for each side of the highway. Measured number of bales as taken from the Erosion and Sediment Control Plan equals 5000 (2500 per side).

$$\frac{\text{Total project calendar days adjusted to the sequence of construction}}{(6 \text{ mo.}) \times (30 \text{ days / mo.})} = * \text{ Adjustment factor}$$

* Based upon combination of the percent of total time and the percent of total length to complete the project.

Adjustment factor x computed number of bales installed = Total bales

Phase 1 - Widening of Right Side of Highway

$$\frac{19 \text{ weeks} \times 7 \text{ days / week}}{(6 \text{ mo.}) \times (30 \text{ days / mo.})} = \frac{133}{180} = ** 0.74 \text{ (use 1)}$$

** Adjustment factor for side of highway must equal or exceed 1

Phase 2 - Widening of Left Side of Highway

$$\frac{19 \text{ weeks} \times 7 \text{ days / week}}{(6 \text{ mo.}) \times (30 \text{ days / mo.})} = \frac{133}{180} = ** 0.74 \text{ (use 1)}$$

** Adjustment factor for side of highway must equal or exceed 1

Conclusion - Any time adjustment factor is less than one, use 1. Use 2500 bales per construction phase. Total number of bales used is 5000 (2500 per side).

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Example No. 2

There is a 6 kilometer four-lane highway on new alignment to be graded. Assume it will be constructed in five equal segments of both length and time. Each segment will be twenty percent of the total project length and require twenty percent of the total time to complete.

First look at Table 4-1. Under four-lane highway for over 4.5 kilometers the table reads 8 to 12. Use 10 weeks per kilometer. Multiply 10 times 6 (length of project in kilometers) and the answer is 60 weeks to complete the project. Measured number of bales as taken from the Erosion and Sediment Control Plan, equal 10000 equally spaced throughout the project limits.

Number of Bales Required Without Phasing

$$\frac{60 \text{ weeks} \times 7 \text{ days / week}}{(6 \text{ mo.}) \times (30 \text{ days / mo.})} = \frac{420}{180} = ** 2.33$$

** Adjustment factor for entire project without phasing

Adjustment factor x computed number of bales installed = Total bales

2.33 x 10000 = 23300 total bales required without phasing

Number of Bales Required With Phasing

The following example assumes that the project is to be constructed in five equal segments, each requiring twenty percent of the work time.

$$\frac{\text{Total project calendar days adjusted to the sequence of construction}}{(6 \text{ mo.}) \times (30 \text{ days / mo.})} = * \text{ Adjustment factor}$$

* Based upon combination of the percent of total time and the percent of total length to complete the project.

Phase 1 - Use 100% for time and 20% for length

$$\frac{1.00 \times 0.20 \times 60 \text{ weeks} \times 7 \text{ days / week}}{(6 \text{ mos.}) \times (30 \text{ days / mo.})} = \frac{84}{180} = * 0.47$$

Phase 2 - Use 80% for time and 20% for length

$$\frac{0.80 \times 0.20 \times 60 \text{ weeks} \times 7 \text{ days / week}}{(6 \text{ mo.}) \times (30 \text{ days / mo.})} = \frac{67}{180} = * 0.37$$

Phase 3 - Use 60% for time and 20% for length

$$\frac{0.60 \times 0.20 \times 60 \text{ weeks} \times 7 \text{ days / week}}{(6 \text{ mo.}) \times (30 \text{ days / mo.})} = \frac{50}{180} = * 0.28$$

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Phase 4 - Use 40% for time and 20% for length

$$\frac{0.40 \times 0.20 \times 60 \text{ weeks} \times 7 \text{ days / week}}{(6 \text{ mo.}) \times (30 \text{ days / mo.})} = \frac{34}{180} = * 0.19$$

Phase 5 - Use 20% for time and 20% for length

$$\frac{0.20 \times 0.20 \times 60 \text{ weeks} \times 7 \text{ days / week}}{(6 \text{ mo.}) \times (30 \text{ days / mo.})} = \frac{17}{180}$$

$$\text{Total adjustment factor for all phases of construction} = * 1.40$$

* Based upon increments of 20 percent of the total time and 20 percent of the total length to complete the project done during each phase of construction.

$$\text{Adjustment factor} \times \text{computed number of bales installed} = \text{Total bales}$$

$$1.40 \times 10000 = 14000 \text{ Total bales required with phasing}$$

Conclusion - By phasing of construction, the requirements for bales of hay on this particular project was reduced from 23300 to 14000, which is a reduction of 9300 bales or 40 percent.

Example No. 3

There is a 6 kilometer four-lane highway on new alignment to be graded. Assume it will be constructed in five segments varying both in length and in time. The duration of time and length will vary for each segment.

First, look at Table 4-1. Under four-lane highway for length over 4.5 kilometers, the table reads 8 to 12 weeks per kilometer. Use 10 weeks per kilometer. Multiply 10 times 6 (length of project in kilometers) and the answer is 60 weeks to complete the project. Measured number of bales as taken from the Erosion and Sediment Control Plan, equals 10000, equally spaced throughout the project limits.

Number of Bales Required Without Phasing

$$\frac{60 \text{ weeks} \times 7 \text{ days / week}}{(6 \text{ mo.}) \times (30 \text{ days / mo.})} = \frac{420}{180} = ** 2.33$$

** Adjustment factor for entire project without phasing

$$\text{Adjustment Factor} \times \text{Computed No. of Bales Installed} = \text{Total Bales}$$

$$2.33 \times 10000 = 23300 \text{ Total Bales Required without Phasing}$$

Number of Bales Required With Phasing

The following example assumes that the project is to be constructed in five equal segments, each requiring twenty percent of the work time.

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$$\frac{\text{Total project calendar days adjusted to the sequence of construction}}{(6 \text{ mo.}) \times (30 \text{ days / mo.})} = * \text{ Adjustment factor}$$

* Based upon combination of the percent of total time available at the beginning of each phase of construction and the percent of total length to complete during each phase of construction of the project. Note that in the following computations the time required to construct each phase, as well as the percent of the total length of the project to be completed during each phase, will vary from phase to phase.

Phase 1 - Use 100% for time and 15% for length to be constructed

$$\frac{1.00 \times 0.15 \times 60 \text{ weeks} \times 7 \text{ days / week}}{(6 \text{ mo.}) \times (30 \text{ days / mo.})} = \frac{63}{180} = * 0.35$$

Phase 2 - Use 85% for time available and 30% for length to be constructed

$$\frac{0.85 \times 0.30 \times 60 \text{ weeks} \times 7 \text{ days / week}}{(6 \text{ mo.}) \times (30 \text{ days / mo.})} = \frac{107}{180} = * 0.60$$

Phase 3 - Use 60% for time available and 30% for length to be constructed

$$\frac{0.60 \times 0.30 \times 60 \text{ weeks} \times 7 \text{ days / week}}{(6 \text{ mo.}) \times (30 \text{ days / mo.})} = \frac{76}{180} = * 0.42$$

Phase 4 - Use 35% for time available and 15% for length to be constructed

$$\frac{0.35 \times 0.15 \times 60 \text{ weeks} \times 7 \text{ days / week}}{(6 \text{ mo.}) \times (30 \text{ days / mo.})} = \frac{22}{180} = * 0.12$$

Phase 5 - Use 10% for time available and 10% for length to be constructed

$$\frac{0.10 \times 0.10 \times 60 \text{ weeks} \times 7 \text{ days / week}}{(6 \text{ mo.}) \times (30 \text{ days / mo.})} = \frac{4}{180} = * 0.02$$

$$\text{Total adjustment factor for all phases of construction} = * 1.51$$

* Based on combination of the percent of total time available at the beginning of each phase of construction and the percent of total length to complete during each phase of construction of the project. Note that in the following computations the time required to construct each phase, as well as the percent of the total length of the project to be completed during each phase, will vary from phase to phase.

$$\text{Adjustment factor} \times \text{computed number of bales installed} = \text{Total bales}$$

$$1.51 \times 10000 = 15100 \text{ total bales required with phasing}$$

Conclusion - By phasing of construction, the requirements for bales of hay on this particular project was reduced from 23300 to 15100, which is a reduction of 8200 bales or 35 percent.

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Metric

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Item No. 209M08.01 Temporary Filter Barrier

Temporary filter barrier will be measured by the linear meter as designed and completed in place. The expected life span is six to twelve months, therefore a complete replacement and remeasurement is required an average of every nine months, unless revised by the sequence of construction.

$$\frac{\text{Total project calendar days adjusted to the sequence of construction}}{(9 \text{ mo.}) \times (30 \text{ days / mo.})} = * \text{ Adjustment factor}$$

* Round factor to nearest whole number

Adjustment factor x computed linear meter of filter barrier = Total (Lin. m)

Item No. 209M08.03 Temporary Silt Fences (Without Backing)

Temporary silt fences will be measured by the meter as designed and completed in place. The expected life span is six to twelve months; therefore, a complete replacement and remeasurement is required an average of every nine months, unless revised by the sequence of construction.

$$\frac{\text{Total project calendar days adjusted to the sequence of construction}}{(9 \text{ mo.}) \times (30 \text{ days / mo.})} = * \text{ Adjustment factor}$$

* Round factor to nearest whole number

Adjustment factor x computed linear meter of silt fence = Total (Lin. m)

Item Nos. 209M10.20 Temporary Sediment Trap

Temporary sediment trap will be measured by the cubic meter as designed and completed in place. The expected life span is twenty-four months; therefore, a complete replacement and remeasurement is required every twenty-four months, unless revised by the sequence of construction.

$$\frac{\text{Total project calendar days adjusted to the sequence of construction}}{(24 \text{ mo.}) \times (30 \text{ days / mo.})} = * \text{ Adjustment factor}$$

* Round factor to nearest whole number

$$\text{Surface area (m}^2\text{) x depth (m) x adjustment factor} = \text{Total (m}^3\text{)}$$

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Example: Summary Table for Temporary Sediment Trap

<u>No.</u>	<u>Station</u>	<u>Location</u>	<u>Description</u>	<u>Material (m³)</u>
1	5+700	Mainline	9m x 4.5m x 1.2m	81.8
2	1+800	Side Road A	12m x 6m x 1.5m	175.5
3	6+570	Mainline	18m x 9m x 1.2m	265.1
Total				522.4

Item No. 209M11 Sediment Basin Riser

Temporary basin riser will be paid by each, per individual installation, as designed and completed in place, unless revised by the sequence of construction, which may require reconstruction and remeasurement.

Item No. 303M10.01 Mineral Aggregate (size 57)

Mineral aggregate (size 57) will be measured by the Tonne (1.77 Tonnes/m³), as designed and completed in place, (unless revised by the sequence of construction, which may require reconstruction and remeasurement).

Item No. 709M05.06 Machined Rip-Rap (Class A-1)

Item No. 709M05.07 Machined Rip-Rap (Class A-2)

Item No. 709M05.05 Machined Rip-Rap (Class A-3)

Machined rip-rap (Class A-1, A-2, A-3, B, and C) will be measured by the Tonne (2.08 Tonnes/m³) as designed and completed in place (unless revised by the sequence of construction, which may require reconstruction and remeasurement).

Computed Quantity (m³) x 2.08 Tonnes/m³ = Total (Tonnes)

Item No. 740M06.01, 740M10.01: 740M10.05 (See 4-740.00)

Item No. 801M01.07 Temporary Seeding (With Mulch) (See 4-801.07)

Item No. 801M02 Seeding (Without Mulch) (See 4-801.07)

Item No. 801M03 Water (See 4-801.10)

Item No. 805M12.01:Item No. 805M12.04 (See 4-805.00.)

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 where the pavement design was 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. 301M01 Aggregate for Subgrade Treatment

$$\text{Compacted volume (m}^3\text{)} \times 2.41 \text{ Tonnes/m}^3 = \text{Tonnes}$$

4-302.00 COMPUTATION OF SUBGRADE TREATMENT (LIME)

Item No. 302M01.01 Hydrated Lime

$$\frac{\text{Subgrade treatment volume (m}^3\text{)} \times \text{*Weight (kg/m}^3\text{)} \times \text{* \%}}{1000 \text{ kg/ Tonne}} = \text{Tonnes}$$

* Weight to be supplied by the Pavement Design Section in kg/m³.

* % 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.

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Item No. 302M02 Bituminous Material (S. T. Lime)

$$\frac{\text{Surface Area (m}^2\text{)} \times 0.91 \text{ L/m}^2}{964 \text{ L/ Tonne}} = \text{Tonnes}$$

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. 303M01, *303M01.08, *303M01.09 and 303M02

$$\text{Loose weight of material} = 1720 \text{ kg/m}^3$$

$$\frac{1720 \text{ kg/m}^3 \times 1.4}{1000 \text{ kg/ Tonne}} = 2.41 \text{ Tonnes/m}^3$$

$$\text{Compacted volume (m}^3\text{)} \times 2.41 \text{ Tonnes/m}^3 = \text{Tonnes}$$

* To be used normally when the blending of two or more materials (for example, gravel and chert, etc.) is specified.

Item No. 303M01.01 Granular Backfill (Roadway)

$$\text{Compacted volume (m}^3\text{)} \times 2.08 \text{ Tonnes/m}^3 = \text{Tonnes}$$

Item No. 303M01.03 Granular Backfill for Retaining Walls

$$\text{Compacted volume (m}^3\text{)} \times 2.08 \text{ Tonnes/m}^3 = \text{Tonnes}$$

Item No. 502M05 Calcium Chloride Type 1

$$\text{Total aggregate (Tonnes)} \times 0.066 \text{ Bag/ Tonne} = \text{Bags}$$

Item No. 303M10.01 Mineral Aggregate (size 57)

$$\text{Loose weight of material} = 1554 \text{ kg/m}^3$$

$$\frac{1554 \text{ kg/m}^3 \times 1.02}{1000 \text{ kg/ Tonne}} = 1.59 \text{ Tonnes/m}^3$$

$$\text{Uncompacted volume (m}^3\text{)} \times 1.59 \text{ Tonnes/m}^3 = * \text{Tonnes}$$

* To be used for fill material between concrete median barriers at areas requiring bridge pier protection in the median (See Standard Drawing Nos. SM-MB-2 and SM-MB-4).

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Revised: 03/15/06

$$\frac{1554 \text{ kg/m}^3 \times 1.14}{1000 \text{ kg/ Tonne}} = 1.77 \text{ Tonnes/m}^3$$

$$\text{Compacted volume (m}^3\text{)} \times 1.77 \text{ Tonnes/m}^3 = \text{**Tonnes}$$

** To be used when called for with erosion and sediment control structures.

Item No. 303M10.03 through 303M10.06 Mineral Aggregate (specify size)

$$\text{Compacted volume (m}^3\text{)} \times 2.08 \text{ Tonnes/m}^3 = \text{Tonnes}$$

4-303.05 GRANULAR BACKFILL FOR STRUCTURES

It will no longer be necessary to obtain backfill quantities from the Structures Division. Item Nos. 303M01.01, Granular Backfill (Roadway) and 303M01.03, 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. 303M01.02, Granular Backfill (Bridges) will be used, and it will be listed on the Estimated Structures Quantity sheet. It cannot be used in the roadway quantities.

4-304.00 COMPUTATIONS FOR SOIL-CEMENT BASE

Item No. 304M01.02 Cement (Soil-Cement Base)

$$\text{Volume of New Material} \times 1.300 \text{ (Shrinkage Factor)} = \text{Volume of Select Material (C.M.)}$$

$$\frac{1506 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = 1.506 \text{ Tonnes/m}^3$$

$$\text{Total Volume m}^3 \times 1.506 \text{ Tonnes/m}^3 \times \begin{matrix} 9\% \text{ (Volume of Select Material)} \\ 12\% \text{ (In-place Soil)} \end{matrix} = \text{Tonnes}$$

Item No. 304M02 Bituminous Material (Soil-Cement Base)

$$\frac{\text{Surface area (m}^2\text{)} \times 0.91 \text{ L / m}^2}{964 \text{ L / Tonne}} = \text{Tonnes}$$

4-307.00 COMPUTATIONS FOR BITUMINOUS PLANT MIX BASE (HOT MIX)

PG64-22 Base Mixes (Grading "A")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2456 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M01.01}$$

NOTE: 25 mm per square meter weighs 61 ± kg

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PG64-22 Base Mixes (Grading "A-S")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 1922 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \begin{array}{l} \times 0.0325 = \text{Tonnes} \text{ Item 307M01.02} \\ \times 0.9675 = \text{Tonnes} \text{ Item 307M01.03} \end{array}$$

NOTE: 25 mm per square meter $48 \pm$ kg

PG64-22 Base Mixes (Grading "A-CRL")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 1922 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \begin{array}{l} \times 0.0325 = \text{Tonnes} \text{ Item 307M01.04} \\ \times 0.9675 = \text{Tonnes} \text{ Item 307M01.05} \end{array}$$

NOTE: 25 mm per square meter $48 \pm$ kg

PG64-22 Base Mixes (Grading "B")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2413 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307-01.06}$$

NOTE: 25 mm per square meter $60 \pm$ kg

PG64-22 Base Mixes (Grading "B-M")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2413 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307-01.07}$$

NOTE: 25 mm per square meter weighs $60 \pm$ kg

PG64-22 Base Mixes (Grading "B-M2")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2413 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M01.08}$$

NOTE: 25 mm per square meter weighs $60 \pm$ kg

PG64-22 Base Mixes (Grading "C")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2349 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M01.09}$$

NOTE: 25 mm per square meter weighs $59 \pm$ kg

PG64-22 Base Mixes (Grading "C-W")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2349 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M01.10}$$

NOTE: 25 mm per square meter weighs $59 \pm$ kg

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PG64-22 Base Mixes (Grading "CS")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2456 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M01.15}$$

NOTE: Application rate of 21.7 kg (depth of 8.9mm) per square meter shall be used unless otherwise specified.

NOTE: 25 mm per square meter weighs 61 ± kg

PG64-22 Base Mixes (For 18.75 mm (0.75") Superpave Mix)

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2264 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M01.13}$$

NOTE: 25 mm per square meter weighs 48 ± kg

PG64-22 Base Mixes (For 25 mm (1") Superpave Mix)

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2413 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M01.14}$$

NOTE: 25 mm per square meter weighs 60 ± kg

PG70-22 Base Mixes (Grading "A")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2456 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M02.01}$$

NOTE: 25 mm per square meter weighs 61 ± kg

PG70-22 Base Mixes (Grading "A-S")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 1922 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tons} \quad \begin{array}{l} \times 0.0325 = \text{Tonnes} \quad \text{Item 307M02.02} \\ \times 0.9675 = \text{Tonnes} \quad \text{Item 307M02.03} \end{array}$$

NOTE: 25 mm per square meter 48 ± kg

PG70-22 Base Mixes (Grading "A-CRL")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 1922 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tons} \quad \begin{array}{l} \times 0.0325 = \text{Tonnes} \quad \text{Item 307M02.04} \\ \times 0.9675 = \text{Tonnes} \quad \text{Item 307M02.05} \end{array}$$

NOTE: 25 mm per square meter 48 ± kg

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PG70-22 Base Mixes (Grading "B")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2413 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307-02.06}$$

NOTE: 25 mm per square meter $60 \pm$ kg

PG70-22 Base Mixes (Grading "B-M")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2413 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307-02.07}$$

NOTE: 25 mm per square meter weighs $60 \pm$ kg

PG70-22 Base Mixes (Grading "B-M2")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2413 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M02.08}$$

NOTE: 25 mm per square meter weighs $60 \pm$ kg

PG70-22 Base Mixes (For 18.75 mm (0.75") Superpave Mix)

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2264 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M02.13}$$

NOTE: 25 mm per square meter weighs $48 \pm$ kg

PG70-22 Base Mixes (For 25 mm (1") Superpave Mix)

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2413 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M02.14}$$

NOTE: 25 mm per square meter weighs $60 \pm$ kg

PG76-22 Base Mixes (Grading "A")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2456 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M03.01}$$

NOTE: 25 mm per square meter weighs $61 \pm$ kg

PG76-22 Base Mixes (Grading "A-S")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 1922 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \begin{array}{l} \times 0.0325 = \text{Tonnes} \quad \text{Item 307M03.02} \\ \times 0.9675 = \text{Tonnes} \quad \text{Item 307M03.03} \end{array}$$

NOTE: 25 mm per square meter $48 \pm$ kg

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PG76-22 Base Mixes (Grading "A-CRL")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 1922 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \begin{array}{l} \times 0.0325 = \text{Tonnes} \text{ Item 307M03.04} \\ \times 0.9675 = \text{Tonnes} \text{ Item 307M03.05} \end{array}$$

NOTE: 25 mm per square meter $48 \pm$ kg

PG76-22 Base Mixes (Grading "B")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2413 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M03.06}$$

NOTE: 25 mm per square meter $60 \pm$ kg

PG76-22 Base Mixes (Grading "B-M")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2413 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M03.07}$$

NOTE: 25 mm per square meter weighs $60 \pm$ kg

PG76-22 Base Mixes (Grading "B-M2")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2413 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M03.08}$$

NOTE: 25 mm per square meter weighs $60 \pm$ kg

PG76-22 Base Mixes (Grading "C")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2349 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M03.09}$$

NOTE: 25 mm per square meter weighs $59 \pm$ kg

PG76-22 Base Mixes (For 18.75 mm (0.75") Superpave Mix)

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2264 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M03.13}$$

NOTE: 25 mm per square meter weighs $48 \pm$ kg

PG76-22 Base Mixes (For 25 mm (1") Superpave Mix)

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2413 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M03.14}$$

NOTE: 25 mm per square meter weighs $60 \pm$ kg

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PG82-22 Base Mixes (Grading "B-M2")

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2413 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M04.08}$$

NOTE: 25 mm per square meter weighs 60 ± kg

Crumb Rubber Mod. Base Mixes (GAP Grading Mix)

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2456 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 307M20.01}$$

NOTE: 25 mm per square meter weighs 61 ± kg

4-308.00 COMPUTATIONS FOR BITUMINOUS COATED AGGREGATE BASE (PLANT MIX)

Item Nos. 308M01 (Mix No. 1) and 308M02 (Mix No. 2) Cold Mixes

$\frac{\text{Compacted Volume (m}^3\text{)} \times 1922 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes}$	$\times 0.965 = \text{Tonnes}$	Item 308M01.01 Item 308M02.01
	$\times 0.035 = \text{Tonnes}$	Item 308M01.02 Item 308M02.02

NOTE: 25 mm per square meter weighs 48 ± kg

Place a footnote under the quantity block referring to Item No. 308M01.01 reading as follows:

"Includes approximately 22 kg/m² of choker stone for each 90 mm layer."

Place a footnote under the quantity block referring to Item No. 308M02.01 reading as follows:

"Includes approximately 16 kg/m² of choker stone for each 65 mm layer."

Mix No. 1 shall be specified for layers 75 mm thick or more and Mix No. 2 for layers less than 75 mm.

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4-309.00 COMPUTATIONS FOR AGGREGATE-CEMENT BASE COURSE - LIMESTONE

Item No. 309M01.01 Mineral Aggregate (A-CBC)

Compacted volume (m³) x 2.3086 Tonnes/m³ = Tonnes

Item No. 309M01.02 Portland Cement (A-CBC)

Compacted volume (m³) x 0.0891 Tonnes/m³ = Tonnes

Item No. 309M02 Bituminous Material (A-CBC)

$$\frac{\text{Surface Area (m}^2\text{)} \times 0.91 \text{ L/m}^2}{964 \text{ L/ Tonne}} = \text{Tonnes}$$

4-309.01 COMPUTATIONS FOR AGGREGATE-CEMENT BASE COURSE - GRAVEL

Item No. 309M01.01 Mineral Aggregate (A-CBC)

Compacted volume (m³) x 2.1530 Tonnes/m³ = Tonnes

Item No. 309M01.02 Portland Cement (A-CBC)

Compacted volume (m³) x 0.1049 Tonnes/m³ = Tonnes

Item No. 309M02 Bituminous Material (A-CBC)

$$\frac{\text{Surface area (m}^2\text{)} \times 0.91 \text{ L/m}^2}{964 \text{ L/ Tonne}} = \text{Tonnes}$$

4-312.00 COMPUTATIONS FOR AGGREGATE-LIME-FLY ASH STABILIZED BASE COURSE

Item No. 312M01 Mineral Aggregate (ALFSB)

Compacted volume (m³) x 2.005 Tonnes/m³ = Tonnes

Item No. 312M02 Lime

Compacted volume (m³) x 0.0763 Tonnes/m³ = Tonnes

Item No. 312M03 Fly-Ash

Compacted volume (m³) x 0.2396 Tonnes/m³ = Tonnes

Item No. 312M04 Bituminous Material (ALFSB)

$$\frac{\text{Surface area (m}^2\text{)} \times 0.91 \text{ L/m}^2}{964 \text{ L/ Tonne}} = \text{Tonnes}$$

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 curb 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 300 mm of width per 25 mm 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 transitions 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 300 mm will be used to feather the pavement edge.

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 1 L per 80 L 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. 402M01 Bituminous Material for Prime Coat (PC)

$$\frac{\text{Surface area (m}^2\text{)} \times \text{rate (L/m}^2\text{)}}{964 \text{ L/ Tonne}} = \text{Tonnes}$$

* Rate 1.36 - 1.58 L/m²

** When Tar only is specified use 889 L/ Tonne

Item No. 402M02 Aggregate for Cover Material (PC)

$$\frac{\text{Surface area (m}^2\text{)} \times \text{rate (kg/m}^2\text{)}}{1000 \text{ kg/ Tonne}} = \text{Tonnes}$$

* Rate 4.3 - 6.5 kg/m²

4-403.00 COMPUTATIONS FOR TACK COAT

Item No. 403M01 Bituminous Material for Tack Coat (TC)

$$\frac{\text{Surface area (m}^2\text{)} \times 0.09 \text{ (L/m}^2\text{)}}{964 \text{ L/ Tonne}} = \text{Tonnes}$$

Item No. 403M02 Asphalt Cement for Tack Coat (TC)

$$\frac{\text{Surface area (m}^2\text{)} \times 0.23 \text{ (L/m}^2\text{)}}{964 \text{ L/ Tonne}} = \text{Tonnes}$$

4-404.00 COMPUTATIONS FOR DOUBLE BITUMINOUS SURFACE TREATMENT

Item No. 404M01.01 Bituminous Material for Double Bituminous Surface Treatment

$$\frac{\text{Surface area (m}^2\text{)} \times \text{rate (L/m}^2\text{)}}{964 \text{ L/ Tonne}} = \text{Tonnes}$$

* Rate 3.08 - 3.80 L/m²

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Item No. 404M01.02 Mineral Aggregate for Double Bituminous Surface Treatment

$$\frac{\text{Surface area (m}^2\text{)} \times \text{*rate (kg/m}^2\text{)}}{1000 \text{ kg/ Tonne}} = \text{Tonnes}$$

* Rate 22 - 31 kg/m²

4-405.00 COMPUTATIONS FOR BITUMINOUS SEAL COAT (CHIP SEAL)

Item No. 405M01.01 Bituminous Material for Bituminous Seal Coat (BSC)

$$\frac{\text{Surface area (m}^2\text{)} \times \text{*rate (L/m}^2\text{)}}{964 \text{ L/ Tonne}} = \text{Tonnes}$$

* Rate 1.18 - 1.63 L/m² (GENERAL USE)

* Rate 0.45 - 1.13 L/m² (MILLING - COLD PLANING)

Item No. 405M01.02 Mineral Aggregate for Bituminous Seal Coat (BSC)

$$\frac{\text{Surface area (m}^2\text{)} \times \text{*rate (kg/m}^2\text{)}}{1000 \text{ kg/ Tonne}} = \text{Tonnes}$$

* Rate 9 - 14 kg/m² (GENERAL USE)

* Rate 0 - 7 kg/m² (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 Pavement Design Section. After the bituminous seal coat is placed, a tack coat (see Section 4-403.00 - Item No. 403M01) 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 maximum application rate for general use shown in Section 4-405.00. This will allow 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. 405M01.01, Bituminous Material for Bituminous Seal Coat (BSC) per Tonne, and 405M01.02, Mineral Aggregate for Bituminous Seal Coat (BSC) per Tonne. 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."

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4-406.00 COMPUTATIONS FOR BITUMINOUS SEAL COAT (SPLIT APPLICATION)

Item No. 406M01.01 Bituminous Material for Bituminous Seal Coat, Split Application (BSC-SA)

$$\frac{\text{Surface area (m}^2\text{)} \times \text{rate (L/m}^2\text{)}}{964 \text{ L / Tonne}} = \text{Tonnes}$$

* Rate 2.08 - 2.44 L/m²

Item No. 406M01.02 Aggregate for Bituminous Seal Coat, Split Application (BSC-SA)

$$\frac{\text{Surface area (m}^2\text{)} \times \text{rate (kg/m}^2\text{)}}{1000 \text{ kg/ Tonne}} = \text{Tonnes}$$

* Rate 20 - 24 kg/m²

4-411.00 COMPUTATIONS FOR ASPHALTIC CONCRETE SURFACE (HOT MIX)

Item No. 411M01 Grading "D" Surface (Performance Grade PG64-22)

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2264 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad = \text{Tonnes} \quad \text{Item 411M01.10}$$

NOTE: 25 mm per square meter weighs 57 ± kg

Item No. 411M01 Superpave Surface (Performance Grade PG64-22)

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2264 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \begin{array}{l} \times 0.06 = \text{Tonnes} \\ \times 0.94 = \text{Tonnes} \end{array} \quad \begin{array}{l} \text{Item 411M01.03} \\ \text{Item 411M01.04} \end{array}$$

NOTE: 25 mm per square meter weighs 57 ± kg

Item No. 411M01 Grading "E" Surface (Performance Grade PG64-22)

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2296 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad = \text{Tonnes} \quad \text{Item 411M01.11}$$

NOTE: 25 mm per square meter weighs 57.5 ± kg

Item No. 411M01 Grading "E" Shoulders (Performance Grade PG64-22)

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2200 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \text{Item 411M01.07}$$

NOTE: 25 mm per square meter weighs 55 ± kg

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Item No. 411M02 Grading "D" Surface (Performance Grade PG64-22)

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2264 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad = \text{Tonnes} \quad \text{Item 411M02.10}$$

NOTE: 25 mm per square meter weighs 57 ± kg

Item No. 411M02 Superpave Surface (Performance Grade PG70-22)

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2264 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \begin{array}{l} \times 0.06 = \text{Tonnes} \\ \times 0.94 = \text{Tonnes} \end{array} \quad \begin{array}{l} \text{Item 411M02.03} \\ \text{Item 411M02.04} \end{array}$$

NOTE: 25 mm per square meter weighs 57 ± kg

Item No. 411M02 Grading "E" Surface (Performance Grade PG70-22)

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2296 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad = \text{Tonnes} \quad \text{Item 411M02.11}$$

NOTE: 25 mm per square meter weighs 57.5 ± kg

Item No. 411M03 Grading "D" Surface (Performance Grade PG76-22)

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2264 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad = \text{Tonnes} \quad \text{Item 411M03.10}$$

NOTE: 25 mm per square meter weighs 57 ± kg

Item No. 411M03 Superpave Surface (Performance Grade PG76-22)

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2264 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad \begin{array}{l} \times 0.06 = \text{Tonnes} \\ \times 0.94 = \text{Tonnes} \end{array} \quad \begin{array}{l} \text{Item 411M03.03} \\ \text{Item 411M03.04} \end{array}$$

NOTE: 25 mm per square meter weighs 57 ± kg

Item No. 411M04 Grading "D" Surface (Performance Grade PG82-22)

$$\frac{\text{Compacted volume (m}^3\text{)} \times 2264 \text{ kg/m}^3}{1000 \text{ kg/ Tonne}} = \text{Tonnes} \quad = \text{Tonnes} \quad \text{Item 411M04.10}$$

NOTE: 25 mm per square meter weighs 57 ± kg

4-411.03 RAISED BITUMINOUS RUMBLE STRIPS AND SCORED OR INDENTED RUMBLE STRIPS

Rumble strips are a traffic warning device, and when required, shall be constructed as specified in Special Provision 411D, or as shown on the plans. Raised bituminous rumble strips and scored or indented rumble strips are the two types of rumble strips to be used in Tennessee.

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.

A scored shoulder shall be specified on all new construction and resurfacing projects on the Interstate System and freeways. Scored shoulders will be used on both outside and inside shoulders. 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. The scored or indented rumble strip shall be constructed as specified in Special Provision 411D.

Scored shoulders will be constructed on asphalt or concrete shoulders. Asphalt shoulders must have a minimum depth of pavement of 40 mm. Scored shoulders shall also be omitted adjacent to ramps, acceleration and deceleration lanes including tapers and along the radius of side road approaches, entrances and median crossovers.

On all new construction and resurfacing projects where scored shoulders are used, they are to be paid for under Item No. 411M10.01, Scoring Pavement, per linear kilometer. Scoring of shoulders shall be called for on the plans. Both the inside and the outside shoulders shall be scored.

Item No. 411M10.01 shall be footnoted as follows:

"See Special Provision No. 411D."

On all new construction and resurfacing projects where raised rumble strips are used, they are to be paid for at the cost bid for the various items of construction.

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.

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4-414.05 COMPUTATIONS FOR MICRO-SURFACING

Item No. 414M03.01 Emulsified Asphalt for Micro-Surfacing

0.12 x Below Aggregate Quantity = Tonnes

NOTE: Application rate based on 12 percent of the dry weight of the aggregate.

Item No. 414M03.02 Aggregate for Micro-Surfacing

$$\frac{\text{Surface area (m}^2\text{)} \times \text{XX kg/m}^2}{1000 \text{ kg/ Tonne}} = \text{Tonnes}$$

NOTE: Application rate of 16.3 kg (approximate depth 9.5 mm) per square meter shall be used if plans require a leveling mixture (7.6 kg per square meter) and a surface mixture (8.7 kg per square meter) to be placed, or 12 kg (approximate depth 7.0 mm) per square meter if only a surface mixture is to be placed, unless otherwise specified.

Item No. 403M01 Bituminous Material for Tack Coat (TC) to be used with MicroSurfacing

$$\frac{\text{Surface area (m}^2\text{)} \times \text{*rate (L/m}^2\text{)}}{964 \text{ L/ Tonne}} = \text{Tonnes}$$

* Rate 0.23 - 0.45 (L/m²)

4-415.00 COLD PLANING OF BITUMINOUS PAVEMENT

On projects having 2000 Tonnes or more of cold planed material, it shall be paid for by the Tonne. This shall be calculated using 2.24 kg/m²/mm of estimated depth to be cold planed, converted to Tonnes.

This shall be measured and paid for under Item No. 415M01.01, Cold Planing of Bituminous Pavement per Tonne.

On projects where the required depth of cold planing is known and the quantity is less than 2000 Tonnes, it may be paid for by the square meter. 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. 415M01.02, Cold Planing of Bituminous Pavement per Square Meter.

On projects having less than 2000 Tonnes 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 meter.

This shall be measured and paid for under Item No. 415M01.03, Cold Planing of Bituminous Pavement per Cubic Meter.

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. 502M02 Holes

$$\frac{\text{Length of project (m) x number of lanes x 4 holes/slab}}{\text{length of slabs}} = \text{Each}$$

Item No. 502M10 Cement-Fly Ash Grout

- (a) Cubic meters/hole x number of holes = Cubic Meters
- (b) Use one of the following values as directed on the Construction Field Review:
 - 1. Concrete pavement in worse than average condition.
0.011 - 0.014 cubic meters/hole
 - 2. Concrete pavement in average condition.
0.011 cubic meters/hole
 - 3. Concrete pavement in better than average condition.
0.008 - 0.011 cubic meters/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.

The Standard Drawing Index Sheet for all projects having either concrete box and/or slab culverts or bridges shall include the following:

Standard Drawing numbers STD-M-15-1 through STD-M-15-6, STD-M-15-8, STD-M-15-9, STD-M-15-12 through STD-M-15-15, STD-M-15-19, STD-M-15-20, and STD-M-15-25 through STD-M-15-29 will be used on all structures.

Standard Drawing STD-M-15-10 will be used when the structure is on 90 or 75 degree skew.

Standard Drawing STD-M-15-11 will be used when the structure is on 60 or 45 degree skew.

Standard Drawing STD-M-15-24 will be used for all skews other than 90 degrees.

In addition to these drawings, the designer will use the appropriate STD-M-15 series of drawings showing the particular structures that apply to the project.

4-604.05 PRECAST, PRESTRESSED BRIDGE DECK PANELS

Precast, prestressed 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

Use Standard Drawing STD-M-15-16 on all concrete box culverts and bridges in Region IV. This drawing may be used in selected locations in Regions I, II, and III, if requested by the Structures or Design Division during the Construction Field Review.

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, which is included for the paved aprons. The steel bar reinforcement may be computed using a weight of 2.8 kg per square meter of apron, plus the weight of the A1300 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 4-13), 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 4-14:
 - 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 750 mm 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 4-15.
 - 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 300 mm 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 4-2. (See associated Figure 4-16.) The Structures Division will assist the designer in these calculations, if he or she requires assistance.

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- D. If the top slab is to be used as the riding surface, and the Design Speed is less than 60 km/h, 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*.”

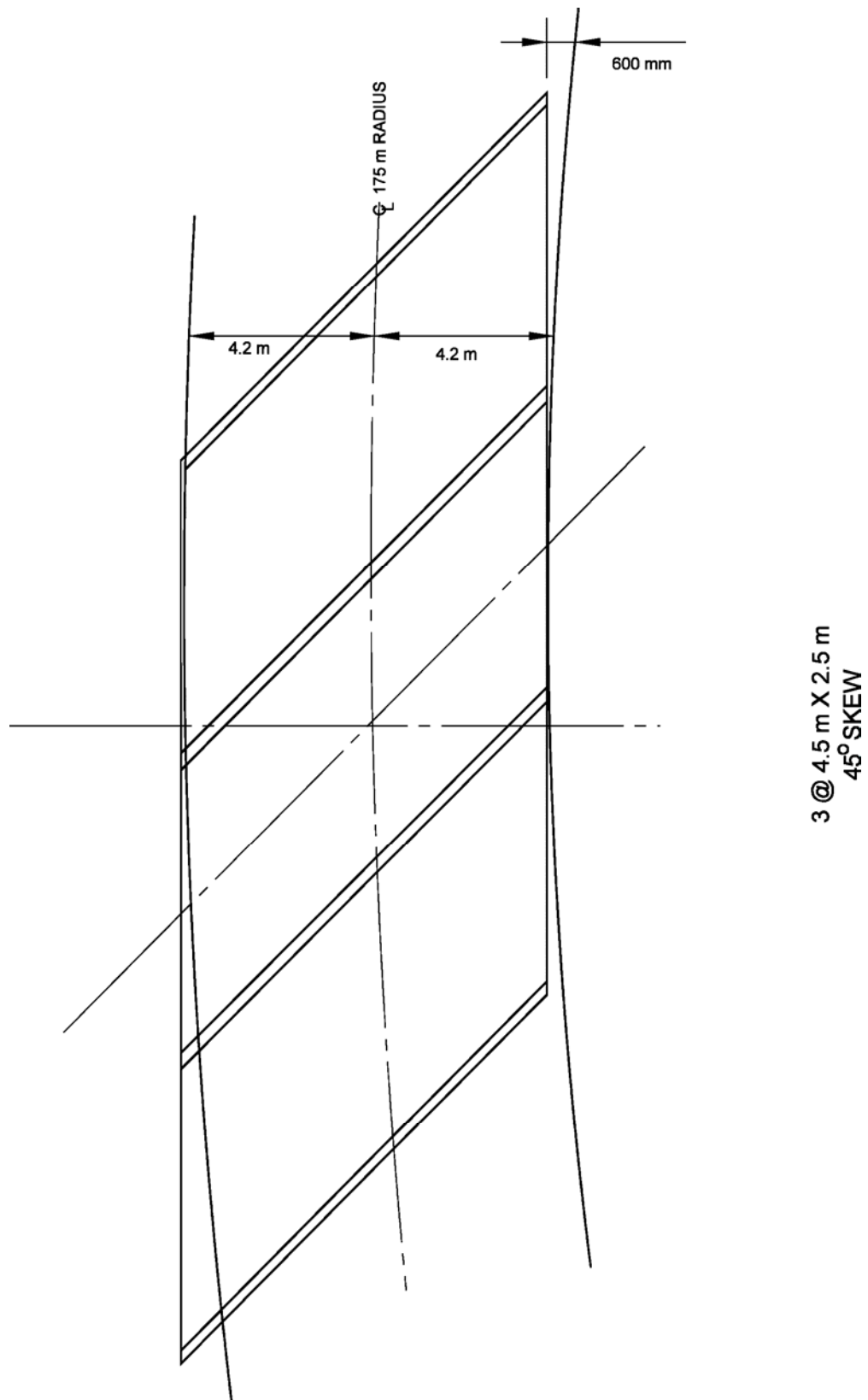


Figure 4-13
Potential Guardrail Encroachment

The drawing shows a building facade with a central rectangular section and two side sections. The central section has a flat roof and is divided into three vertical panels. The side sections have gabled roofs. Section A-A is a vertical section through the central part, showing the internal structure and the roof. Section B-B is a horizontal section through the side part, showing the internal structure and the roof. The perspective view shows the building from a low angle, with the central section and the side sections. The labels A, B, C, and D are used to identify specific features in the sections and the perspective view.

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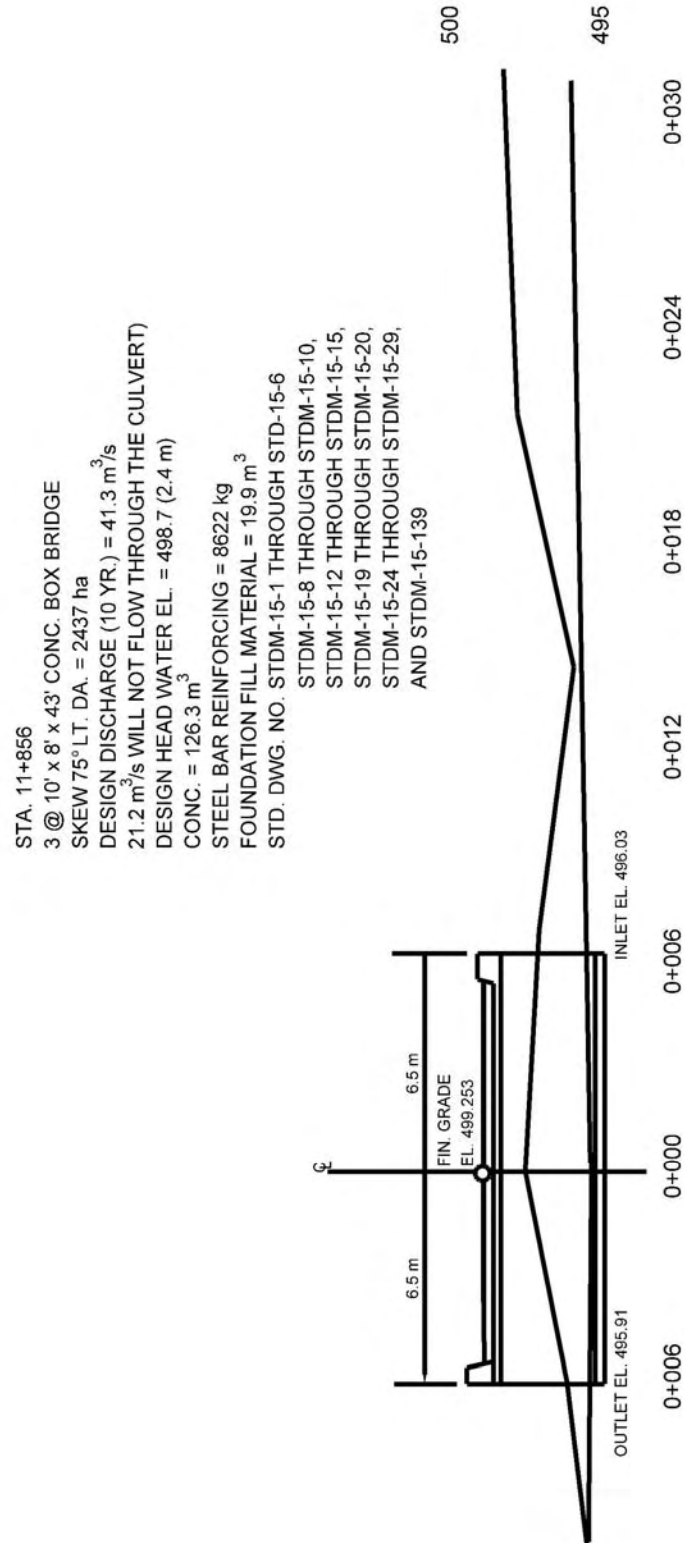


Figure 4-15
 Typical Cross-Section Information for Box and Slab Type Culverts and Bridges

ADJUSTMENT FACTOR FOR ESTIMATING ADDITIONAL REINFORCING STEEL QUANTITIES IN THE VERTICAL WALLS OF CONCRETE BOX OR SLAB TYPE CULVERTS OR BRIDGES		
SPAN WIDTH IN METERS	*EXTERIOR WALL IN kg/L.m/V.m	*INTERIOR WALL IN kg/L.m/V.m
2.4	11.08	6.49
3.0	11.96	7.32
3.6	14.35	8.35
4.5	19.24	10.59
5.5	19.24	10.59

* ADDITIONAL KILOGRAMS OF REINFORCING STEEL IN VERTICAL WALLS BASED ON KILOGRAMS PER LINEAR METER ONE METER IN HEIGHT FOR ANY NUMBER OF BARRELS ON ANY SKEW. THIS TABLE IS GOOD FOR AN INCREASE IN WALL HEIGHT NOT EXCEEDING 0.6 METERS AND FILL HEIGHTS NOT EXCEEDING 0.6 METERS.

Table 4-2
Adjustment Factor for Estimating Additional Reinforcing Steel Quantities in the Vertical Walls of Concrete Box or Slab Type Culverts or Bridges

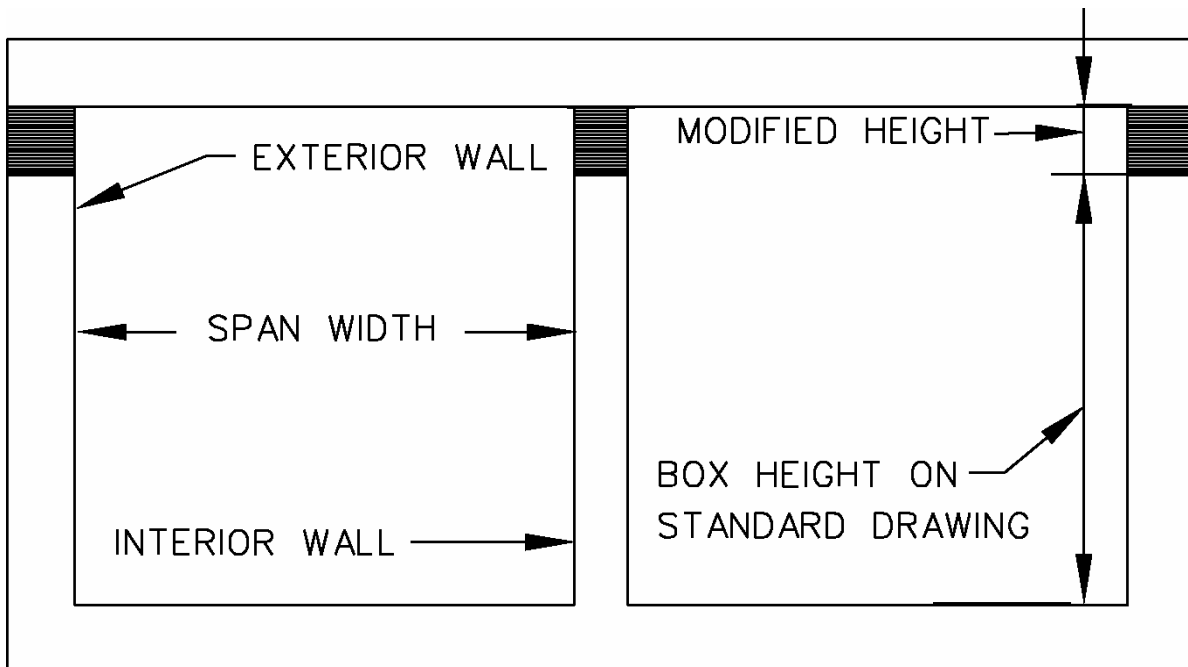


Figure 4-16
Typical Concrete Box or Slab Type Culvert or Bridge Modification

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-M-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 300 mm 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. 604M02.02, 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 4-204.05 and 4-203.35)**

**4-604.35 CHANNEL EXCAVATION FOR BOX OR SLAB TYPE CULVERTS
OR BRIDGES (See 4-203.35)**

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 is used on the standard drawings. This check must be completed prior to submitting the Construction Plans to the Program Operations Office, Estimates Section. 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 a bridge end drain for structures which have concrete approach slabs and Standard Drawings STD-1-10 through STD-1-13 show a 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. 610M07.03, 450 mm Pipe Drain (Bridge Drain) per linear meter. The cost of the bridge drain outlet pipe endwall, shall be paid for as Item No. 709M01.01, Rubble-Stone Rip-Rap per cubic meter. 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 7.5 meters past the end of the parapet, and rip-rap shall be hand placed around the guardrail for an equal distance.

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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. 617M01 Bridge Deck Sealant per square meter

4-621.00 TEMPORARY STRUCTURES

On all construction projects having detours requiring temporary drainage structures, the designer shall use Item Nos. 621M01.01 through 621M01.10, 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. 621M01.01 through 621M01.10 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 his 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 for these items."

This footnote is for Item Nos. 621M01.01 through 621M01.10 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 in erosion control.

4-625.00 ABANDONMENT OF WATER WELLS (See 4-202.13)

Item No. 625M01.01, Well Abandonment per Lump Sum, will no longer be used.

CHAPTER 7 - INCIDENTAL CONSTRUCTION

4-705.00 GUARDRAIL ACROSS BOX AND SLAB TYPE CULVERTS AND BRIDGES AND CONCRETE DECK BRIDGES

The designers of the roadway plans will calculate and show estimated quantities of all metal guardrail across the subject structures. Some coordination may be required with the Structures Division to find out if the bridge rail is concrete parapet or metal guardrail.

Concrete Box and Slab Type Culverts and Bridges

If the embankment depth at the point where the guardrail post is driven is greater than or equal to 1.12 m, use Item No. 705M02.02, Single Guardrail (Type 2).

If the concrete slab is used as the riding surface, use Item No. 705M01.04, Metal Beam Guard Fence, with the post bolted to the slab.

If the embankment depth at the point where the guardrail would normally be driven is less than 1.12 m, use Item No. 705M01.04, with the post bolted to the top of the slab.

Note that Item No. 705M01.04 shall be used in multiples of 1.905 m, and that the pay length will be the sum of the number of posts bolted plus one multiplied by 1.905 meters.

See Standard Drawing SM-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, it shall be connected to the metal approach guardrail with Item No. 705M01.01, Guardrail at Bridge Ends, shown on Standard Drawing SM-GR-23.

If the designer has a project that has an existing concrete slope face end post, as detailed on Standard Drawing SBRM-2-131 and SBRM-2-132, the metal rail shall be attached with Item No. 705M10.30, Guardrail Attachment to Slope Face Endpost, meter, or an existing concrete vertical face endpost, as detailed on SBRM-2-133 and SBRM-2-134. The metal rail shall be attached with Item No. 705M10.31, Guardrail Attachment to Vertical Face Endpost, meter.

If a concrete deck bridge has metal guardrail, it shall be Item No. 705M01.04 Metal Beam Guard Fence as shown on Standard Drawing SM-GR-22.

4-705.05 GUARDRAIL END TERMINALS

The most desirable approach end terminal continues to be Item No. 705M04.02, Guardrail Terminal (Type 12). When it is not feasible to use this end terminal, a gating type approach end terminal shall be used.

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. Item 705M04.07, Tangent Energy Absorbing Terminal (NCHRP 350, TL3) shall be used. End terminals that are specified under this pay item meeting these criteria include: the Extruder Terminal – ET-2000, the

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Sequential Kinking Terminal – SKT, the Beam Eating Steel Terminal – BEST, or approved equal. These terminals shall be specified on the construction plans as type 38 terminals. They shall have a length of 15.24 meters.

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 60 kilometers 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 60 kilometers 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 705M04.04 Guardrail Terminal (Type 21).

4-709.05 RIP-RAP

For estimating purposes, multiply cubic meters by 2.076 to convert to Tonnes.

Machined rip-rap (Class A-1, A-2, A-3, B, and C) will be measured by the Tonne (2.08 Tonnes/m³) as designed and completed in place (unless revised by the sequence of construction, which may require reconstruction and remeasurement).

Computed Quantity (m³) x 2.08 Tonnes/m³ = Total (Tonnes)

Classifications of machined rip-rap and their pay item nos. are as follows:

709M05.05	Machined Rip-Rap (Class A-3)
709M05.06	Machined Rip-Rap (Class A-1)
709M05.07	Machined Rip-Rap (Class A-2)
709M05.08	Machined Rip-Rap (Class B)
709M05.09	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. 709M05.10 through 709M05.13, Machined Rip-Rap (Description), and use the rip-rap notes in the General Notes Instructional Bulletin.

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 RDM-UD-3 and RDM-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 RDM-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.

CONSTRUCTION SIGNING

The use of advisory speed plates shall be limited to locations where the traffic control design warrants a 16 kilometers 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. Road Work Next XX sign shall be used on road work more than 1600 meters (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).

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.
2. Where portable concrete barrier rails are used, vertical panels or delineators should be used 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 being used 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 (200 mm) 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 TM-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. 712M06.01, Vertical Panels per Square Meter, 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 meters 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 60 meter maximum.

PORTABLE BARRIER RAIL

Taper rates shall be 10:1 or flatter for designs where posted speeds are less than or equal to 60 km/h and 15:1 or flatter for designs where posted speeds are greater than 60 km/h. 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

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Item No. 705M08.51, 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. 705M04.50) shall be used on portable barrier rail in accordance with the TM-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 102 mm x 76 mm (4" x 3") dimensions. Delineators with dimensions other than 102 mm x 76 mm (4" x 3") may be used if the product is on the approved products list. The variations in delineator dimension should not exceed $\pm 10\%$.
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.

4-712.10 DIFFERENCES IN ELEVATION BETWEEN ADJACENT ROADWAY ELEMENTS

In order 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. Difference in elevation between adjacent roadway elements greater than 20 mm and not exceeding 50 mm:
 - 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 600 meters with a minimum of 2 signs per exposed area. Where uneven pavement is encountered, signs shall be placed on each side of the roadway.

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- 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 50 mm and not exceeding 150 mm, 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 80 km/h or greater, spacing of the protective devices shall not exceed 30 meters.
 - (2) Where posted speeds are less than 80 km/h, the maximum spacing of the protective devices in meters shall not exceed $\frac{3}{8}$ the posted speed in kilometers per hour or 15 meters, whichever spacing is greater.
 - b. If the difference in elevation is eliminated or decreased to 50 mm 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 600 meters 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 90 mm, 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 600 meters 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 3 kilometers 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 150 mm but not exceeding 450 mm, 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 80 km/h or greater, spacing of the protective devices shall not exceed 30 meters.
 - (2) Where posted speeds are less than 80 km/h, the maximum spacing of the protective devices in meters shall not exceed $\frac{3}{8}$ the posted speed in kilometers per hour or 15 meters, whichever spacing is greater.

In order to use this method, the contractor must reduce the difference in elevation to 150 mm 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 150 mm 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 600 meters with a minimum of 2 signs per exposed area. In these situations the Contractor shall limit his operations to one work zone not exceeding 1.5 kilometers 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.

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4. For differences in elevation between adjacent roadway elements greater than 450 mm:

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 1.5 kilometers 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 9 meters 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 2.4 meters of the nearest traffic lane with difference in elevation greater than 20 mm and not exceeding 50 mm:

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 600 meters 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 2.4 meters of the nearest traffic lane with difference in elevation greater than 50 mm and not exceeding 150 mm:

- a. Separation shall be accomplished by drums, barricades or other approved devices in accordance with the following:

- (1) Where posted speeds are 80 km/h or greater, spacing of the protective devices shall not exceed 30 meters.

- (2) Where posted speeds are less than 80 km/h the maximum spacing of the protective devices in meters shall not exceed $\frac{3}{8}$ the posted speed in kilometers per hour or 15 meters, whichever spacing is greater.

3. If the difference in elevation is within 2.4 meters of the nearest traffic lane with difference in elevation greater than 150 mm:

- a. Separation shall be accomplished by drums, barricades or other approved devices in accordance with the following:

- (1) Where posted speeds are 80 km/h or greater, spacing of the protective devices shall not exceed 30 meters.

- (2) Where posted speeds are less than 80 km/h the maximum spacing of the protective devices in meters shall not exceed

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3/8 the posted speed in kilometers per hour or 15 meters, 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 2.4 meters 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 2.4 meters from the nearest traffic lane but not more than 9 meters 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 80 km/h or greater, spacing of the protective devices shall not exceed 30 meters.
- 2. Where posted speeds are less than 80 km/h, the maximum spacing of the protective devices in meters shall not exceed 3/8 the posted speed in kilometers per hour or 15 meters, 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 requested and established by the contractor. This sign is to be placed 300 meters (1000 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. 712M06.16, 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.”

4-712.20 MERGE LEFT

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.

Any interstate or controlled access facility with lane closures not utilizing Merge Left shall be brought to the attention of the appropriate Civil Engineering Manager 2 prior to finalizing the traffic control.

4-713.00 FLEXIBLE DELINEATIONS

On resurfacing projects (4R, etc.), the Design Office will be responsible for computing the quantity of flexible delineators and shall refer to Standard Drawing TM-S-11 for the proper procedure in figuring these quantities.

If the resurfacing is tapered out before reaching the ramp terminal, the designer shall look at the need for delineators along the ramp as well as along the main line. On projects that already have flexible delineators, this would mean replacing any broken or missing delineators. On projects that have the button delineator on metal posts, this would mean complete replacement with flexible delineators.

The designer does not need to show the location of the proposed delineators; but, must make sure Standard Drawing TM-S-11 is included in the contract plans so proper location can be determined by the engineer and contractor.

On projects, which the Design Traffic Engineering Section, Signing Office will be developing the marking and signing plans, the flexible delineators will also be included in these plans.

**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 notify the Design Traffic Engineering Section, Signing Office a minimum of four weeks prior to printing plans for the Construction Field Review.

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 Design Traffic Engineering Section, Signing Office will no longer be responsible for applying the proposed signing to these sheets.

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A marked-up set of prints will be sent to the TDOT C.E. Manager 1 or TDOT Transportation Manager 1 in charge of the project for their review of the proposed signing. The designer of the project will then be responsible for putting the proposed signing on their sheets. An updated "Signing Cell Library" will be furnished if needed.

The Design Traffic Engineering Section, Signing Office will still furnish the sign schedule sheets, quantities, recommended standard drawings and general notes for the proposed signing plan.

This will alleviate some of the problems with coordinating the proposed signing with the increased revising and changing of the designer's layouts.

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 TM-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. 713M16.20 through 713M16.29. 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 TM-S-20, or if there are any questions, contact the Design Traffic Engineering Section, Signing Office.

See Traffic Design Manual, Chapter 6, Signing and Pavement Marking.

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 TM-M-7, the following pay items and methods of measurement shall be used:

- A. 716M02.04, Plastic Pavement Marking (Channelization Striping) - m²
716M05.04, Painted Pavement Marking (Channelization Striping) - m²
The unit of payment is per square meter of striping material applied including the boundary lines of the channelized area. This is applicable for 200 mm wide border lines only. All other border lines (edgelines and double yellow centerline) are paid for under their respective pay items and measured by the linear meter. This is used on medians, pavement transitions, obstruction approaches and traffic islands with areas greater than 40 m².
- B. 716M04.04, Plastic Pavement Marking (Transverse Shoulder) - Lin. m.
The unit of payment is per linear meter of diagonal marking. The 100 mm edge line is paid for under a "Pavement Marking (Line)" item.
- C. 716M02.07, Plastic Pavement Marking (600 mm Barrier Line) - Lin. m.

716M05.07, Painted Pavement Marking (600 mm Barrier Line) - Lin. m.
The unit of payment is per linear meter of boundary line (with no diagonal marking used).

Note that the unit of payment for Item No. 716M08.04, Removal of Pavement Marking (Channelization Striping), has been changed from per linear meter to per square meter 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.

The traffic volumes needed in this section of the design may be found in the latest *Traffic Flow Maps* book available from the Traffic Studies Office of the Planning Division.

Generally, centerlines and edgelines shall be placed on all pavements with a minimum total width of 4.8 meters.

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 following sections for guides for temporary and permanent marking materials and for general notes.

See Traffic Design Manual, Chapter 6, Signing and Pavement Marking.

4-716.10 POLICY FOR 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 (716m10.01 or 716m10.15) or reflectorized paint (716m05.01) 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 MARKINGS 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 200 mm painted white skip lines and white raised pavement markers on 12 m spacing.
- b. **Left edge lines** (yellow) – Use 200 mm painted solid yellow lines and yellow raised pavement markers on 6 m spacing.
- c. **Right edge lines** (white) – **Allow as equals:**
 - (1) Use 200 mm solid white wet-reflective temporary tape (according to manufacturer's specifications).
 - (2) Use 200 mm painted solid white lines with an approved white barrier rail delineator on top of barrier rail on 6 m spacing,

Or

Use 200 mm painted solid white lines only or with white flexible delineators at outside edge of shoulder on 6m spacing when no barrier rail is present.

B. On Transition Sections:

- a. **Lane lines** – Use 200 mm painted solid white lines and white raised pavement markers on 6m spacing.
- b. **Left edge lines** (yellow) – Use 200 m painted solid yellow lines and yellow raised pavement markers on 6m spacing.
- c. **Right edge lines** (white) – **Allow as equals:**
 - (1) Use 200 mm solid white wet-reflective temporary tape (according to manufacturer's specifications)
 - (2) Use 200 mm painted solid white lines with an approved white barrier rail delineator on top of barrier rail on 6m spacing on top of barrier rail on 6 m spacing,

Or

Use 200 mm painted solid white lines only or with white flexible delineators at outside edge of shoulder on 6 m 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, 50 mm wider than prescribed permanent lines, and raised pavement markers on 24 m spacing.
- B. Edge and center lines** – Use solid lines (yellow or white, as appropriate) 50 mm 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 used for left edge line spacing shall be 6 m.

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 100 mm 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)

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4-716.15 POLICY FOR PERMANENT PAVEMENT MARKINGS

<u>TYPE ROADWAY</u>	<u>ADT</u>	<u>MATERIAL</u>
Asphalt Interstate or Other Similar Freeways and Expressways (See Note No. 1)	75000 or Over	Preformed Plastic Centerlines, Lane Lines and Edgelines (716M10.15 - 150 mm)
Asphalt Interstate or Other Similar Freeways and Expressways	Under 75000	Thermoplastic Centerlines, Lane Lines and Edgelines (716M02.10 - 150 mm)
Asphalt Multi-lane Conventional Highways	All ADT's	Thermoplastic Centerlines, Lane Lines and Edgelines (716M02.01)
Asphalt Two-lane	2000 or Over	Thermoplastic Centerlines, Lane Lines and Edgelines (716M02.01)
Asphalt Two-lane	Under 2000	Paint Centerlines and Edgelines (716M05.01)
Concrete All Roadways (See Note No. 2)	All ADT's	Preformed Plastic Centerline, Lane Lines and Edgelines (716M10.01 or 716M10.15)
Concrete Grinding	All ADT's	Preformed Plastic Centerline, Lane Lines and Edgelines (716M10.01 or 716M10.15)
Bridge Replacement Project (Non-Freeway)	Over 1000	Preformed Plastic Centerlines, Lane Lines and Edgelines (716M10.01)
Bridge Replacement Project (Non-Freeway)	Under 1000	Paint Centerlines and Edgelines (716M05-01)
Intersection Improvement/ Signal Project	Over 1 mile of Pavement Marking Line Length	Asphalt Pavement – Thermoplastic (716M02.01) Concrete Pavement – Preformed Plastic (716M10.10)
Intersection Improvement/ Signal Project	Under 1 mile of Pavement Marking Line Length	Preformed Plastic Centerline, Lane Lines and Edgelines (716M10.01)

1. On Microsurface pavements, thermoplastic shall be used for lane lines and edgelines.
2. Includes all concrete ramps and concrete bridge decks.

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NOTE: Centerlines, edgelines and broken white lines on all interstate and non-interstate access control roadways, will now be 150 mm wide. These 150 mm wide lines will be used on all new construction, reconstruction and resurfacing projects. See web site regarding pay items for these 150 mm lines.

http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/RoadItemLists/roaditem_index.htm

NOTE: Intersections within roadway projects shall have all lines marked with the same marking material as that determined in the previous table for the entire project.

NOTE: All specialty markings (legends, arrows, RR crossings, crosswalks, stop lines, crosshatched islands, word messages, etc.) shall be plastic. They shall be paid for under the 716M02.___, 716M03.___, and 716M04.___ series pay items.

NOTE: 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 TM-M-6 and TM-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."

4-716.20 GENERAL PAVEMENT MARKING NOTES FOR ROADWAY PLANS

Temporary Pavement Marking on Intermediate Layers

"Temporary pavement line markings on intermediate layers of pavement shall be reflective tape or reflectorized paint installed to permanent standards before dark hours. Short, unmarked sections shall not be allowed. These markings will be measured and paid for under Item No. 716M05.01, Painted Pavement Marking (100 mm Line)."

"Wide (200 mm) temporary pavement marking line will be measured and paid for under Item No. 716M05.02, Painted Pavement Marking (200 mm Barrier Line)."

Final Pavement Marking

- A. If reflectorized paint is used:

"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. 716M05.01, Painted Pavement Marking (100 mm line) per linear kilometer."

- B. If thermoplastic is used:

"If thermoplastic is used on the final surface, 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. Short, unmarked sections shall not be allowed. 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. These markings will be measured and paid for under Item No. 716M02.01, Plastic Pavement Marking (100 mm Line)."

- C. If preformed plastic is used on new concrete:

"Permanent pavement line markings shall be preformed plastic installed to permanent standards prior to opening to traffic. Short, unmarked sections shall not be allowed. These markings will be measured and paid for under Item No. 716M10.01, Preformed Plastic Pavement Marking (100 mm Line)."

- D. If preformed plastic is used on concrete grinding:

"Permanent pavement line markings shall be preformed plastic 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. 716M10.01, Preformed Plastic Pavement Marking (100 mm Line)."

4-716.25 SPECIALTY PAVEMENT MARKINGS

On projects where plastic specialty pavement items are being used the following changes will be made:

1. Cross-walk with longitudinal lines as shown on Standard Drawing TM-M-4 will use the following pay item:

716M02.09, Plastic Pavement Marking (Longitudinal Cross-walk) per linear meter.

The measurement for this marking is identical to that for standard cross-walk, for example, one measurement along the centerline of the crosswalk (perpendicular to curbs).

2. Dotted white line for vehicle double turn path delineation requires a 200 mm stripe. Pay item will be as follows:

716M02.08, Plastic Pavement Marking (200 mm Dotted Line) per linear meter.

4-716.30 USE OF REMOVABLE PAVEMENT MARKING LINE

Item No. 712M09.01, Removable Pavement Marking (100mm Line) per linear meter, 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. 716M05.01, Painted Pavement Marking (Line) per linear kilometer, 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 REFLECTIVE PAVEMENT MARKERS

Snowplowable reflective pavement markers shall be included on all future Interstate and full-access controlled projects.

On interstate and full-access control resurfacing projects, the designer shall be responsible for verifying the existence of snowplowable pavement markers and for computing the quantity of these markers for removal. The designer shall also compute the quantity for new snowplowable pavement markers to be installed for these projects.

On projects which the Design Division, Signals, Signing and Lighting Section will be developing the marking and signing plans, the snowplowable reflective markers will also be included in these plans.

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. 730M14.02, Saw Slot, and 730M14.03, 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.

Also add the following notes:

"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 in 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."

"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 locations for detector loop replacement."

"Loops shall be installed in the leveling course if a leveling course is provided."

"Loop replacement shall be in accordance with Section 730 of the Standard Specifications."

Standard Drawings TM-SG-2 and TM-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.

4-730.20 TEMPORARY TRAFFIC SIGNAL SYSTEMS USED AT TWO-LANE BRIDGE RECONSTRUCTION SITES

When using Item No. 730M40, Temporary Traffic Signal System per each, to provide traffic control for one-lane alternating flow at two-lane bridge reconstruction sites, alternate this item with Item No. 730M50, Temporary Traffic Signal System (Radio Controlled) per each. See Standard Drawing Nos. TM-WZ-32, TM-WZ-33, TM-WZ-34, and TM-WZ-35 details and general notes. Footnote Item No. 730M50 as follows:

"International Traffic Systems, Inc., Lakeland, Florida,
QPB 1000 RF Series (Span Wire Mounted)"

4-740.00 GEOTEXTILE FABRIC AND MEMBRANE

- Item No. 740M06.01 Geomembrane
- Item No. 740M10.01 Geotextile (Type I) (Subsurface Drainage)
- Item No. 740M10.02 Geotextile (Type II) (Sediment Control)
- Item No. 740M10.03 Geotextile (Type III) (Erosion Control)
- Item No. 740M10.04 Geotextile (Type IV) (Stabilization)
- Item No. 740M10.05 Geotextile (Type V) (Description)

Geotextile fabric and geomembrane will be measured by the square meter as designed and completed in place, unless revised by the sequence of construction, which may require reconstruction and remeasurement.

CHAPTER 8 - ROADSIDE DEVELOPMENT

4-801.00 SEEDING (WITH MULCH) (See 4-801.05)

The use of Seeding (With Mulch) is strongly recommended on projects, except where Seeding (Without Mulch) and Erosion Control Blanket or Sod is specified. The following is the method for computation of seeding on right-of-way.

$$\frac{\text{Area to be seeded (m}^2\text{)}}{100 \text{ m}^2/\text{unit}} \times 1.25 = \text{_____ units}$$

Item No. 801M01
and/or
Item No. 801M01.02

Method for computation of seeding on waste areas and borrow pits outside right-of-way.

$$\frac{\text{Excess material to be wasted (m}^3\text{)}}{500 \text{ m}^3/\text{Unit}} = \text{_____ units}$$

Item No. 801M01
and/or
Item No. 801M01.02

$$\frac{\text{Borrow material (m}^3\text{)}}{500 \text{ m}^3/\text{unit}} = \text{_____ units}$$

Item No. 801M01
and/or
Item No. 801M01.02

4-801.05 CROWN VETCH MIXTURE (WITH MULCH)

See Section 4-801.00 for computations.

Item 801M01.02, 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 blank being filled in with the proper item.

"Item No. 801M01.02, Crown Vetch Mixture (with Mulch) shall be used on slopes 3:1 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. 801M01.07 Temporary Seeding (With Mulch)

Item No. 801M02 Seeding (Without Mulch)

Temporary seeding (with mulch) and seeding (without mulch) will be measured by the unit (100 m²) as designed and completed in place, unless revised by the sequence of construction, in which case complete replacement and remeasurement may be required.

$$\frac{\text{Total area of seeding (m}^2\text{) x number of effective phases of the sequence of construction}}{100 \text{ (m}^2\text{) / unit}} = \text{Total seeding (units)}$$

Exceptional locations where the slopes are flatter than 3:1, 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 below.

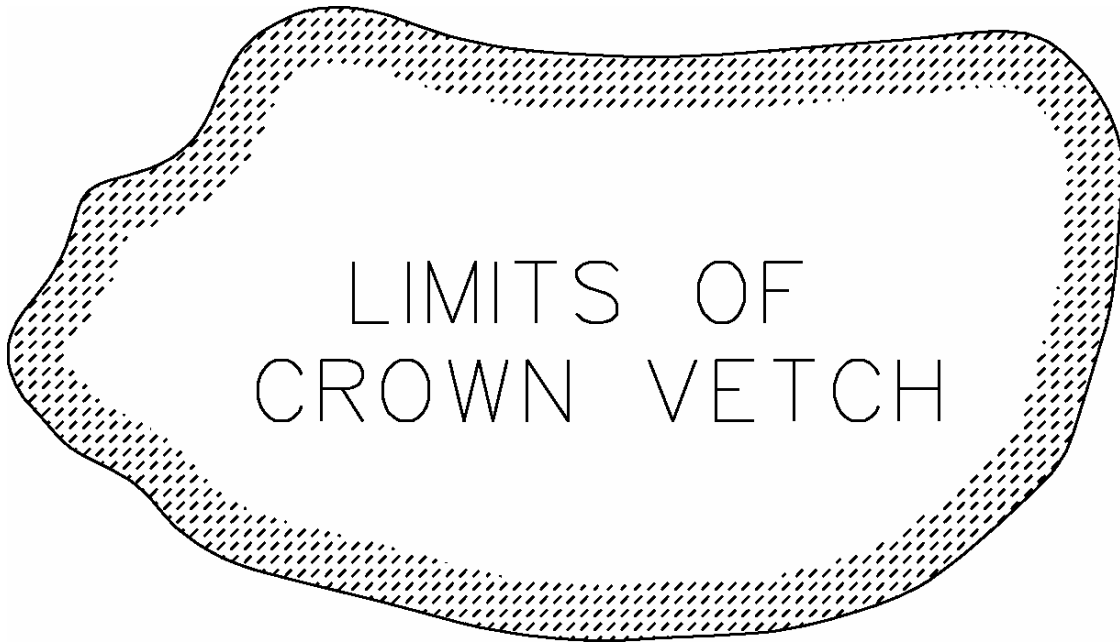


Figure 4-17
Typical Limits of Crown Vetch

4-801.10 WATER (SEEDING AND SODDING)

Item No. 801M03 Water (Seeding and Sodding)

Water for seeding, sodding, crown vetch mixture or sprigging (crown vetch):

Water will be measured by the cubic meter as designed and completed in place, unless revised by the sequence of construction, in which case complete replacement and remeasurement may be required.

$$\text{Seeding- (all areas)} \quad \frac{\text{Surface area (m}^2\text{) x 0.4 m}^3\text{/unit}}{100 \text{ m}^2\text{/unit}} = \text{_____ m}^3 \text{ Item No. 801M03}$$

$$\text{Total seeding (units) x 0.453 m}^3\text{ / unit} = \text{Total Water (m}^3\text{)}$$

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The designer shall **footnote** pay item as follows:

"Includes _____ m³ for erosion and sediment control."

Sodding-
(Crown Vetch) $\frac{\text{Surface area (m}^2\text{)} \times 45 \text{ L/m}^2}{1000 \text{ L/m}^3}$ = _____ m³ Item No. 801M03

4-801.15 SEEDING (SUPPLEMENTAL APPLICATION)

5 kg Minimum Quantity

Units of 801M01 x 0.75 kg/Unit x 15% = _____ kg Item No. 801M07

Units of 801M01.02 x 0.75 kg/Unit x 15% = _____ kg Item No. 801M07.01

4-801.20 FERTILIZER (SUPPLEMENTAL APPLICATION)

1 Tonne Minimum Quantity

Units of 801M01 x $\frac{11 \text{ kg/Unit} \times 15\%}{1000 \text{ kg/ Tonne}}$ and/or 801M01.02 = _____ Tonnes Item 801M08

4-805.00 EROSION CONTROL BLANKET

When erosion control blankets are used, it will not be necessary to include mulch with the seeding. The designer in this case shall use Item No. 801M02, Seeding (Without Mulch) per unit, for their seeding item.

When erosion control blankets are used in a ditch that is adjacent to the seeded and mulched slopes, continue to compute a quantity for Item No. 801M01, Seeding (With Mulch) per unit for the ditch area.

When erosion control blankets are used, it will not be necessary to include mulch when seeding with crown vetch mixture. The designer in this case shall use Item No. 801M02.01, Crown Vetch Mixture (Without Mulch) per unit, for their seeding item.

The designer shall use the erosion control blankets detailed on erosion and sediment drawing number ECM-STR-34 in the following manner:

Use of erosion control blankets **are strongly recommended** for the following conditions:

- A. In flat or rolling terrain, on 2:1 or 3:1 fill slopes and/or 2:1 or 3:1 cut slopes (in soils) that are 6 meters or greater in height
- B. In mountainous or hilly terrain, on 2:1 or 3:1 fill slopes and/or 2:1 or 3:1 cut slopes (in soils) that are 9 meters or greater in height
- C. On slopes built of highly erodible soils such as sandy soils in West Tennessee that have heights less than A or B

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- D. On slopes when roadway is passing through a small urban or residential area and sod is not being specified. Slopes on urban projects are still to be sodded
- E. On slopes running adjacent to a stream or adjacent to a large ditch or channel that empties directly into an environmentally-sensitive stream, near the roadway construction
- F. On bridge and approach projects when crossing an environmentally-sensitive stream
- G. As a temporary slope protection on the front and side slopes of bridge abutments when sod is not required
- H. On slopes where the installation of silt fencing and/or sediment traps would be considered unduly difficult
- I. At points of storm water runoff concentration from pavement to slope, such as the low side of a superelevated section, the low areas of sag vertical curves, etc.
- J. At points of storm water runoff concentration where off-site runoff threatens stability of cut slopes
- K. At all locations specified by the Soils and Geology Section of the Materials and Tests Division
- L. As specified by Regional Construction personnel during phases of plans field reviews

The criteria for selection of the type erosion and sediment blanket used shall be as follows:

The type II blanket shall be used on continuous slopes that are 3:1 or flatter and on slopes of 2:1 that are up to 6 meters in height. Type II blanket shall be paid for under Item No. 805M12.02, Erosion Control Blanket (Type II) per square meter.

The type III blanket shall be used on continuous slopes that are 2:1 and over 24 meters height and paid for under Item No. 805M12.03, Erosion Control Blanket (Type III) per square meter.

The type IV blanket shall be used on slopes, only when specified by the Soils and Geology Section of the Materials and Tests Division, and paid for under Item No. 805M12.04, Erosion Control Blanket (Type IV) per square meter.

4-806.00 PROJECT MOWING CYCLE

Projects on State Routes with high traffic volumes and high visibility shall include Item No. 806M02.03, 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:***

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- Expected project duration is one year or greater
- Project is in a urban area (for purposes of this bulletin 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. 806M02.03, 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. 806M02.03, 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*.

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