

## CHAPTER 3: DETAILS

### Safety Edge

Technical Memorandum NO. 11-01-T-01 dated January 19, 2011 states that ALL Mn/DOT projects let on or after July 1, 2011 will have to include a safety edge if it meets the requirements as outlined in the Technical Memorandum (under guidelines).

Construction of a Safety Edge at the edge of the paved surface significantly reduces the potential of “tire scrubbing” and minimizing the consequences of drifting off the pavement surface.

The safety edge construction is done by shaping the edge of the pavement material with a 30-degree slope during the paving process (measured from the pavement/shoulder cross slope plane).

1. Safety Edge is required along bituminous pavement edges on projects where all of the following are true:

- New bituminous pavement/shoulder or bituminous overlay is being constructed with at least 2 (two) inches of paving depth.
- Paved shoulders are 6 (six) feet or less in width. (Safety Edge is optional on wider shoulders.)
- Pavement/shoulders do not have curbing.
- Safety edge will be optional for concrete shoulders.
- Safety Edge is required on Maintenance/Repair projects where it has previously been incorporated into the pavement/shoulders.
- Safety Edge requirements will not apply to preventive maintenance type projects; chip seals, crack sealing, slurry sealing, etc., with less than 2 inches of thickness.

For divided highways, the safety edge must be added to both median and outside bituminous shoulders when the paved shoulder width is 6 feet or narrower and the travel lanes are also bituminous. On concrete divided highways with bituminous shoulders, the median shoulder safety edge will be optional.

The safety edge must be constructed as an integral operation of the roadway pavement placement process.

The installation of the safety edge in limited clear zone areas or in front of guardrails is optional if the designer concludes that it interferes with operational aspects or is too onerous to construct. The decision must be documented in the permanent project file.

During construction, a 2-4 inch depth of non-bituminous shoulder material adjacent to the pavement edge may be removed prior to installing the safety edge to allow for a thicker edge section.

Bituminous pavement safety edges are easily constructed with the use of a manufactured shoe device, which attaches to the screed of the paving machine. The device uses a spring-loaded shoe

that constrains the asphalt head, thus increasing the density of the extruded edge profile. The shoe is capable of applying variable pressure to ensure some compaction of the edge during paving operation. **Make sure that the plan/special provisions includes language requiring this method of installation.**

A single-plate strike-off method is **not allowed** for bituminous paving, as the single-plate strike-off method has been found to produce a non-durable edge.

**District Materials input must be solicited on each project where safety edges are to be installed. In certain cases, additional subgrade support may be needed to support the installation of the safety edge.**

For information on the technical content of this Technical Memorandum, please contact the **State Traffic Safety Engineer.**

Payment for the Safety Edge will be included in the Roadway Bituminous quantities.

The following details (as taken from Technical Memorandum NO. 11-01-T-01 dated January 19, 2011) should be included in either the detail sheets or as a detail on the typical sheets....

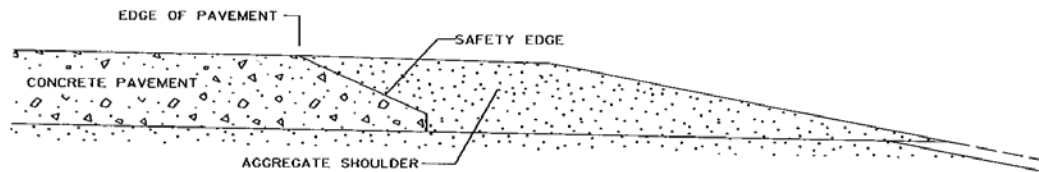


FIGURE A  
CONCRETE PAVEMENT

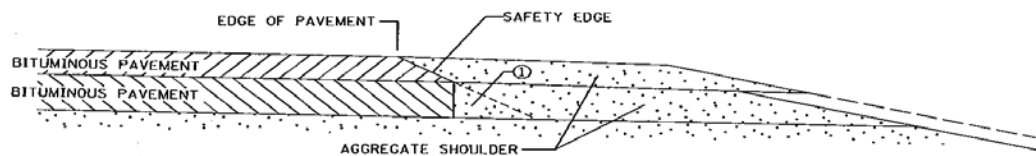


FIGURE B  
BITUMINOUS PAVEMENT

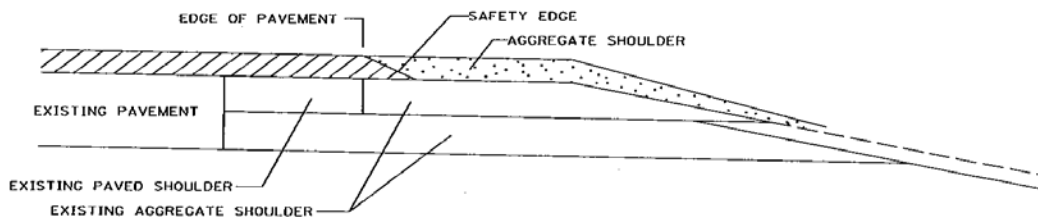


FIGURE C  
BITUMINOUS OVERLAY

① OPTIONAL DESIGN EXTENDS SAFETY EDGE DEEPER THAN 6" AND WIDER THAN 10.5". SEE PLAN DESIGN DETAILS.

## **APPROACH PANEL STANDARDS - IMPLEMENTATION GUIDELINES**

The approach panel standard sheets have been revised and updated. The old standard sheets will be archived and replaced by new standard sheets. Many details have been rearranged and expanded so that the information needed for construction is more complete. There are eight new standard sheets, with each sheet containing a particular set of details. A typical bridge will require six standard approach panel sheets, the first two sheets will vary depending on the approach barrier configuration (see below), the other four sheets will be typical for all approach panel configurations. A description of each of the standard approach panel sheets follows:

### Geometry & Reinforcing Details

Depending on the approach barrier configuration, use one of the following 2 alternates to select the first two sheets of approach panel standards for a particular bridge (check with the bridge designer if necessary);

ALTERNATE A - Use the following 2 sheets for bridges where the concrete barrier off the end of the bridge is mounted on a wingwall (typical of past bridge designs);

- 1) 5-297.222 Geometry - - This sheet contains the approach panel layout information. This is project/bridge specific information showing the skew, stationing and elevation of key panel points. The type of joint at the end of the panel is indicated on this sheet. This sheet along with sheet 5-297.223 should be used when the concrete barrier is mounted on a wingwall.
- 2) 5-297.223 Reinforcing Details - - This sheets shows the details for the steel reinforcing bars, including plan views and cross section views indicating the size and spacing of the reinforcement in the panel. The new standards now include a bar mark (i.e. AP1302E) for each reinforcing bar. A blank *Bill of Reinforcement* is provided for the contractor/fabricator to complete, to be submitted along shop drawings for each panel.

ALTERNATE B - Use the following 2 sheets for bridges where the concrete barrier off the end of the bridge is mounted on the approach panel (This is a new construction detail and is expected to be used very often in the future).

- 1) 5-297.224 Geometry - - This sheet contains the approach panel layout information. This is project/bridge specific information showing the skew, stationing and elevation of key panel points. The type of joint at the end of the panel is also indicated on this sheet. This sheet along with sheet 5-297.225 should be used on bridges where the concrete barrier is mounted on the approach panel. To accommodate guardrail connection and crash test requirements the concrete barrier must extend 5'-0" minimum onto the approach panel. For wingwalls that are parallel to the roadway centerline the barrier must extend 5'-0" minimum onto the approach panel or to the end of the wingwall, whichever is longer. Barrier reinforcement and payment will be included in the bridge plan.

- 2) 5-297.225 Reinforcing Details - - This sheet shows the details for the steel reinforcing bars, including plan views and cross section views indicating the size and spacing of the reinforcement in the panel. The new standards now include a bar mark (i.e. AP1302E) for each reinforcing bar. A blank *Bill of Reinforcement* is provided for the contractor/fabricator to complete, to be submitted along with shop drawings for each panel.

#### Other Approach Panel Standard Sheets

- 1) 5-297.227 Miscellaneous Details - - This sheet includes the details and reinforcement for the sill at the end of the approach panel and the curb transition details. Blank *Bill of Reinforcement* tables are provided for the contractor/fabricator to complete, to be submitted along with shop drawings for each panel.
- 2) 5-297.228 Joint Layout - - This sheet indicates the joint locations and types for all of the longitudinal and transverse joints on the approach panel and is intended to be customized by the grading/roadway designer to include the unique features (skew, length, etc.) of each approach panel. The Concrete Engineering Unit at the Maplewood Lab can be contacted for assistance with joint layouts.
- 3) 5-297.229 Joint Details - - This sheet provides the sawing, sealing, and other requirements for the joints indicated on sheet 5-297.228 and details regarding sidewalk (if present) cover plates.
- 4) 5-297.231 Drainage Details - - The location of pipe drains and catch basins are included on this sheet. In the future a sheet with details for a drainage flume (in lieu of a catch basin) will be added.

#### **Road Designer Responsibilities:**

- 1) Select the first two standard sheets (Either Alternate A or Alternate B). The choice depends on the location of the concrete barrier and whether it is attached to the approach panel or to the bridge abutment wingwall. The Bridge Preliminary Plan will indicate which detail should be used. The Bridge Office will provide assistance on the selection if needed.

Include either 5-297.222 & 5-297.223 (Alternate A) or 5-297.224 & 5-297.225 (Alternate Option B)

- a) Choose the correct panel plan view based on the skew of approach panel. Cross out the unneeded view. The approach panel plan view should be modified/mirrored to show the actual skew orientation, wingwall and curb transition configuration, and traffic direction arrows. Fill in the proposed skew angle (where needed).
- b) Fill in all data for proposed stations and elevations. Contact the Bridge Office for stations and elevations at the end of the bridge.
- c) Fill in the proposed expansion joint type (E8H, or None). Contact the Bridge Office for the appropriate type, which will generally be E8H for trunk highway

bridges and "None" for low volume local roads. Details of the E8H expansion joint are shown on sheet 5-297.227 and 5-297.229.

- d) Note that the Contractor is directed to provide shop drawings for the reinforcing layout and a completed *Bill of Reinforcement* table. The Contractor is to send this information to the Project Engineer at least 3 weeks prior to rebar fabrication. The Bridge Office Construction Unit will provide help on reviewing the shop drawings if necessary.
- 2) Work with the Concrete Engineering Unit to determine the location and type of all joints on the approach panel and complete standard sheet 5-297.228. Sheet 5-297.229 should also be included as it provides additional joint details.
- 3) Complete standard sheet 5-297.227 by verifying the proposed curb transition lengths and details. Also, in the lower left corner of the sheet, based on the type of joint at the end of the approach panel, cross out the details that do not apply. Note that one end of the panel rests on a concrete sill and is NOT to be tied or doweled to the concrete approach panel in order to allow the approach panel to slide to accommodate the temperature movement of the bridge. The sill is placed under the lanes, shoulders and curbs. When approach panels abut concrete pavement, the concrete pavement (not the approach panel) is rigidly tied to the sill.  
Previously, concrete lugs were provided under the concrete approach panel. They have since been removed from under the approach panel and are now located under the first concrete pavement panel beyond the sill (away from the bridge). This is an important change since many new bridge designs include “integral” abutments, where all of the bridge thermal movement takes place at the E-8H joint. Moving the lugs to the first concrete pavement panel allows the bridge thermal movement to take place and limits the amount of pavement “growth” due to incompressibles entering the pavement joints.
- 4) Include standard 5-297.231 which provides general drainage details. Identify the location and type of proposed drainage. The Road Designer has the prerogative to select an appropriate drainage system, but should provide either a catch basin or a flume at each corner of the bridge in order to reduce the possibility of erosion around the wingwalls, which has been a very significant and all too common problem when this detail is neglected.

Guidance is being developed regarding the use of approach panels adjacent to mechanically stabilized earth retaining walls and will be issued in the future.

Specific questions regarding the Approach Panel Standard Sheets can be directed to the Bridge Standards Engineer.

### **Design Standards CAD Directories**

Because of a few inquiries on how to get information from our CAD directories, here is our present CAD directory on the system:

Standard Plates: <http://standardplates.dot.state.mn.us/StdPlate.aspx>

Standard Plans: <http://standardplans.dot.state.mn.us/StdPlan.aspx>

Also on the internal web (for Mn/DOT only), Design  
Details: <http://ihub/designsupport/standards/design.html>

Mn/DOT Internal Only - When accessing Standard Plan CADD files from ProjectWise, only those file versions marked APPROVED are suitable to be included as a Standard Plan. Those versions marked Historical or Working are not to be included as a Standard Plan.

If you are unfamiliar with our CAD directory, ask your local CAD operator for help. This is the best way to get any information you might need.

### **Standard Plans in CAD Directory**

In the updating of approved standard plan sheets, changes may be of a minor nature, that the sheet does not need to be re-approved. In those cases a date will be put on the drawing in the area to the left of the title box as shown. Final copies of standard CAD drawings should be put into the plans at the district final review, so as to get the most current copy. If modified this date should remain visible. Be careful that you are selecting the latest approved version and not a draft version as both are filed in the same location.

	STANDARD SHEET NO. 5-297.108M	
	STANDARD APPROVED JULY 30, 1991	
Revision Date 11-8-94	STATE PROJ. NO.	----

Be sure to fill in all pertinent cross reference notes on the standard plan sheets. Filling in the sheet numbers is not considered a modification.

### **Modifying Standard Drawings**

Most of our standard drawings are used in plans as is, but on occasion there is a need to change or modify a standard drawing.

If a Standard Plan sheet contains details not associated with your project, it is optional for designers to cross out the undesired details. If any change is made to a Standard Plan sheet, including crossing out details as mentioned above, the following must be done to the plan sheet:

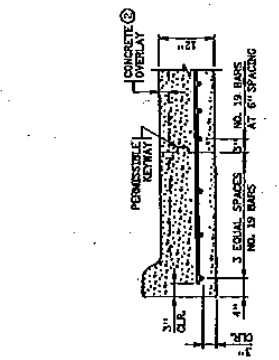
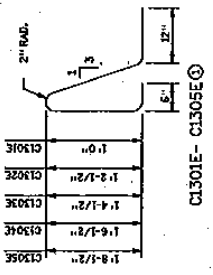
- Clearly cross-out the *Standard Sheet No.* and *Standard Approved* boxes in the sheet border.
- Add “Modified” text just above the Standard Sheet No. to indicate the standard plan has been modified.

- Add a signature block to the left of the title block for engineer's signature.
- Clearly cross-out and move any *Revision Date* notation, if present, to the left of or above the signature block.
- Identify the changes made to the details.
  - Label the changes using italicized text.
  - Footnote the changes with an asterisk. Place the following footnote above the signature block in italics: \* *DENOTES MODIFICATION FROM STANDARD PLAN*
  - Use the MicroStation custom line style **StdsPlnMod** to place a double line (thick/thin) box around the text to highlight/identify the modification(s).

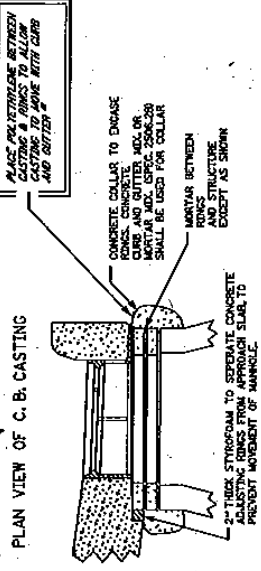
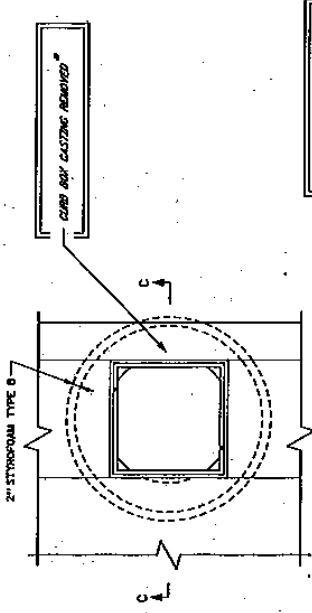
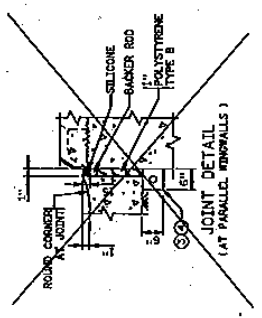
See example below...

**SUMMARY OF QUANTITIES FOR BRIDGE APPROACH PANEL**

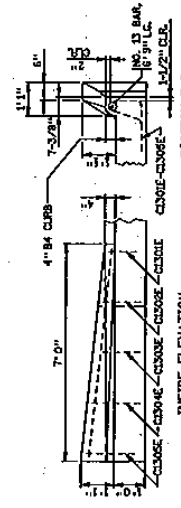
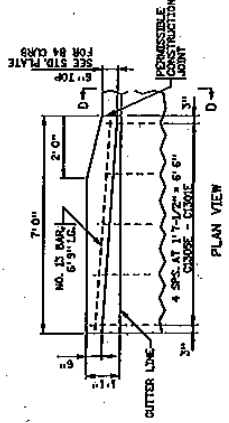
CONCRETE MIX. NO. 3142	CU. YD.
REINFORCEMENT BARS	LB.
CURB DESIGN BA INTEGRANT	LINE FT.
CURB DESIGN BA#24	LINE FT.



**CURB DETAIL**  
(BA INTEGRANT CURB OR BA#1 MODIFIED CURB AND GUTTER)



**SECTION C-C**  
(GRATE NOT SHOWN)



**SECTION D-D**  
CURB TRANSITION DETAILS

**NOTES:**

ALL REBARS ARE IN METRIC DESIGNATIONS

- ALL REINFORCEMENT IN APPROACH PANEL AND CURB SHALL BE BRIDGE 60 AND EXACTLY DATED AS PER SPEC. 3141.
- APPROACH BA IS REINFORCEMENT WHICH INCLUDES ANY CONCRETE OVERLAY THAT MAY BE REQUIRED. REBAR QUANTITIES SHALL BE INCLUDED IN BRIDGE QUANTITIES AND DONE AT THE SAME TIME BY BRIDGE CONTRACTOR.
- 2" MINIMUM DIA. THERMOPLASTIC PIPE AS PER ASTM D1751. SCHEDULE 40. SLOPE PIPE TO DITCH. FURNISHING AND INSTALLING. WRAID SYSTEM SHALL BE INCIDENTAL WITH NO DIRECT PAYMENT. PER 2" MINIMUM SLOPE WITH VERTICAL AS PER SPEC. 3148.
- BACKFILL WITH FINE AGGREGATE SPEC. 3149, MODIFIED TO 0-3% PASSING # NO. 200 SIEVE.

MODIFIED

BRIDGE DESIGN NO. 6-237-224

DATE: NOVEMBER 9, 1989

STATE PROJ. NO. \_\_\_\_\_ (TH \_\_\_\_\_) SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_ SHEETS

OPTION FINAL

BRIDGE APPROACH PANEL  
BIRMINGHAM MAINLINE ROADWAY  
(MISCELLANEOUS DETAILS)

DESIGNED BY: \_\_\_\_\_

CHECKED BY: \_\_\_\_\_

DATE: \_\_\_\_\_

PROJECT NO. \_\_\_\_\_

SCALE: \_\_\_\_\_

DATE: \_\_\_\_\_

PROJECT NO. \_\_\_\_\_

SCALE: \_\_\_\_\_

DATE: \_\_\_\_\_



### **Old Details**

Before using an old detail in the plan, check the Project wise design detail index to see if the detail sheet has been updated. Standards is constantly updating and adding standard sheets to their computer library. Be careful that you are selecting the latest version and not a draft version.

### **Reinforcement Bar Marks**

All plans should display the new approved English size designations as specified in Technical Memorandum No. 13-06-B-03. In the past metric rebar designations had been used. As of July 1, 2013 all plans shall be using the English rebar designations.

English bar designations are indicated by a one or two digit number, equal to the bar diameter in eighths of an inch (i.e., a No. 4 bar has a nominal diameter of 4/8 or ½ inch).

<b>REINFORCEMENT BARS</b>		
<b>English Rebar Designation</b>	<b>Old Metric Bar Designation</b>	<b>Diameter In (mm)</b>
3	10	0.375 (9.5)
4	13	0.500 (12.7)
5	16	0.625 (15.9)
6	19	0.750 (19.1)
7	22	0.875 (22.2)
8	25	1.000 (25.4)
9	29	1.128 (28.7)
10	32	1.270 (32.3)
11	36	1.410 (35.8)
14	43	1.693 (43.0)
18	57	2.257 (57.3)

The English Rebar Designations should be used in all notes, tables, and details. The standard plan sheets have been updated to reflect the new numbers.

### **Concrete Median Islands**

Concrete median islands placed on overlay projects that are 4 ft. (1.2 m) or less in width and have only a 1 ½ in. (40 mm) wearing course holding it in place should be pinned in place. A dowel 1 in. x \_\_\_ in. (25 mm x \_\_\_ m) long reinforcement bar spaced at about 4 ft. - 5 ft. (1.2 m - 1.5 m) shall be used to pin median in place. The dowel bar will incidental. The length of dowel will vary according to thickness of concrete median. Bar should begin in 1 ½ in (25 mm) below the top of concrete median to an embedment of approximately 6 in. - 8 in. (150 mm - 200 mm).

### **Standard Plate No. 3006**

On all construction plans whenever you have (2501) RC Pipe, (2501) Reinforced Concrete Dissipator Ring, (2502) Reinforced Concrete Pipe, (2503) Reinforced Concrete Pipe Sewer, or (2506) Reinforced Concrete Pipe. Add Standard Plate 3006 to the plan.

### **Curbs**

Curbs on high-speed roadways should be discouraged. But if they are deemed necessary, use a B4 design. On ramps a D4 should be used. For loops, use a D4 on the outside and a B4 on the inside.

### **Unapproved Drawings**

**(These drawings are frequently used in plans; they have not been fully tested and approved. Some of the drawings show proprietary products.)**

Unapproved Drawings are available in MicroStation format for internal Mn/DOT. These details can be found on ProjectWise at ...

OTS\DesignStandards\DesignDetails and/or  
OTS\DesignStandards\DesignDetails\Development

***The “Reference Date” shown on the Unapproved Drawing must be kept in the drawing (and not altered) when preparing the sheet for insertion into the plan.***

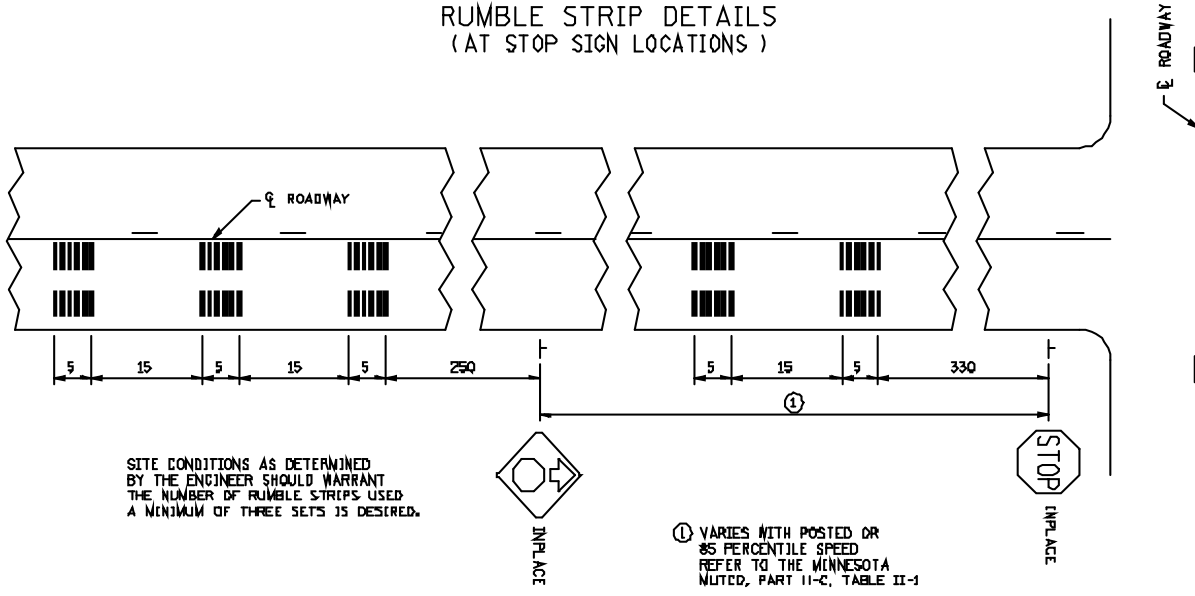
### **Rumble Strip Details (At Stop Sign Locations)**

The detail shown on the next page shall be considered an unapproved standard detail to be used at stop sign locations (all units are in inches). However, the usage shall be a District/Division Traffic Engineers recommendation as to when and where to be used.

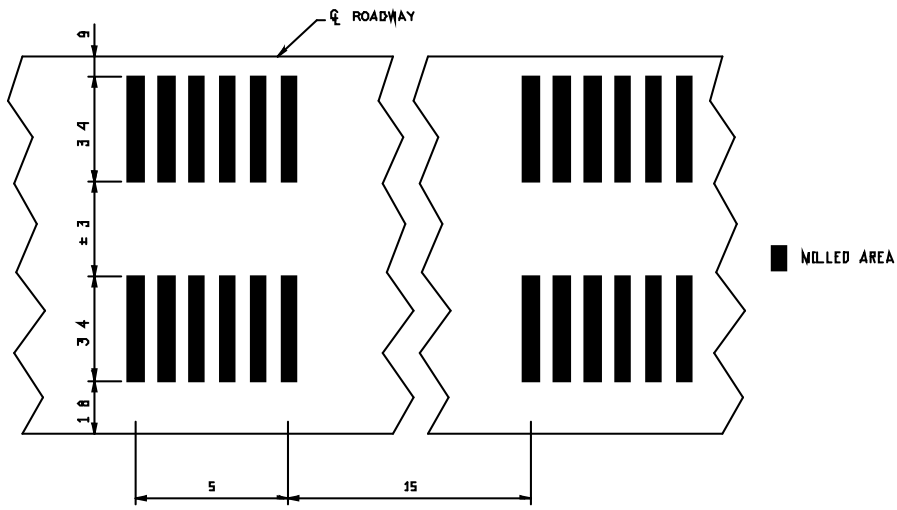
This detail can also be found on ProjectWise at

OTS\DesignStandards\DesignDetails\Development\rumstop\_dd.dgn

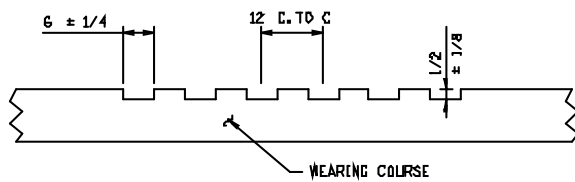
RUMBLE STRIP DETAILS  
( AT STOP SIGN LOCATIONS )



PLAN VIEW



ENLARGED PLAN VIEW



SECTION

### **Rumble Strip/Stripe**

Technical Memorandum No. 11-02-T-02 Rumble Strips and StripEs on Rural Trunk Highways was issued on November 8, 2011. As a result the standard plan sheets for the rumble strips are in the process of being updated and no longer accessible. While these standard plan sheets are being revised the unapproved details for the rumble strips and rumble stripes can be found at...

pw:\\PW8i.ad.dot.state.mn.us:cadp\Documents\OTS\DesignStandards\DesignDetails\rumbles\_dd.dgn

Do not use all the details but only those that apply to your project. For non-MnDOT designers you will need to contact your project manager to get a copy of the details.

Since the new tech memo has some relaxed requirements. The designer should follow the Informal Design Exceptions guidelines as outlined in the Road Design Manual Chapter 2-6.03.02 for their design decisions in the lenient areas.

### **Concrete Joint Repair**

The concrete joint repair details and construction notes are now available on the internet. They can be found at

<http://www.dot.state.mn.us/materials/concretedocs/pvmt2005b.pdf>

The joint repair and construction notes should be placed in the construction plans not in the Special Provisions. Contact the concrete office for the latest information.

### **Standard plate 4134**

Standard plate 4134, Curb Box Casting for Catch Basin (for Design B Curbs), was created specifically for use with 4" B curb. Some problems have occurred with this curb box. Input from the districts and the Bridge Hydraulics Section indicate that breakage has been caused by installation problems. Curb boxes are considered effective only at low-points and should normally not be used at structure locations on-grade. Proper field installation of curb boxes is important, but designers should avoid their use except at low-points. This is especially important when designing for 4" curb and gutter.

### **Parrallel Pipes and Aprons in the Median**

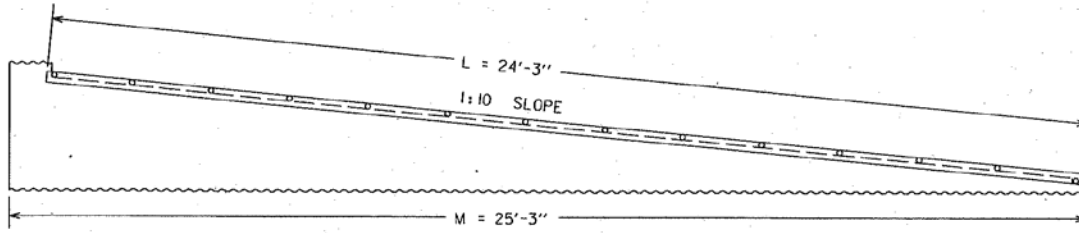
Parrallel pipes located in the median require safety aprons, must be grated, and the slope modified to a 1:10. The only apron design that must be used is Apron and Grate Design 3128. If concrete pipe is used standard plate 3128 covers the connection to the concrete pipe. The plan must also include a design detail for the 1:10 apron.

Examples of this detail can also be found on ProjectWise at ...

OTS\DesignStandards\DesignDetails\SafeAprn1\_10b\_dd.dgn  
OTS\DesignStandards\DesignDetails\SafeAprn1\_10sm\_dd.dgn  
OTS\DesignStandards\DesignDetails\SafeAprn1\_4\_dd.dgn

36" CS SAFETY APRON & GRATE DESIGN 3128

(MODIFIED TO 1:10 SLOPE)



NUMBER OF BARS = 14    DIA OF BARS = 1-1/2"  
 NUMBER OF GRATE SECTIONS = 8  
 NUMBER OF LONGITUDINAL BARS = 1  
 SEE STANDARD PLATE 3128 FOR OTHER DETAILS

**Standard Plan 5-297.221**

Standard plan sheet 5-297.221 (Sheet 1 of 2) includes a DOWEL BAR DIAMETER TABLE. This table should be modified as follows whenever the concrete thickness is between 6.5" to 10.5".

PAVEMENT THICKNESS	DOWEL BAR DIAMETER
LESS THAN 6"	NONE
6" TO 8"	1"
8" TO 10"	1 1/4"
GREATER THAN 10"	1 1/2"