

# Project Insights and Best Practices

for  
**MaineDOT Highway Design**  
Session 2: November 5, 2018



## Purpose

To provide a learning opportunity for designers to share their own project specific and general experiences, and receive clarification and answers to questions related to MaineDOT Policies, Engineering Instructions (EI's), and Design Guidance, with the intent of improving the overall quality and consistency of the Highway Design process, submissions received from consultants and internal MaineDOT Highway design teams.

## Process (1 of 5)

- Idea originally raised during a Highway Subcommittee Meeting regarding:
  - potential lack of consistency of design submissions  
*(including different submissions from the same consultant)*
  - passing down/sharing of information with newer staff
  - sharing of information between consultants
- The subcommittee felt this warranted further exploration and took it on as a goal.
- Subcommittee members involved in initial discussions:
  - Tony Grande – VHB
  - Don Ettinger – Gorrill Palmer
  - Dale Mitchell – HNTB
  - Kevin Ducharme – T.Y. LIN

## Process (2 of 5)

- Topics Covered were mainly based on the Highway Design Guide:
  1. Pre-Scoping or General Policy Discussion Points
  2. Typical Sections
  3. Alignment (H/V)
  4. Geometric Layout
  5. Drainage
  6. *Cross Sections*
  7. *Guardrail*
  8. *Quantities/Estimating*
  9. *Geotechnical*

## Process (3 of 5)

- With this list as the focus, polled our own internal design teams, for:
  - Project-specific experiences worth sharing
  - Design questions or areas where clarification would be helpful
  - Any other topics that may not be listed
- Lists from all four firms were then combined
- Held several meetings, included our experienced designers, shared some project experiences, and vetted through each item on the combined list
- Results were then compressed, and refined for discussion with MaineDOT

## Process (4 of 5)

- (3) meetings with MaineDOT, and included our experienced designers
  - September 28, 2017
  - October 20, 2017
  - November 1, 2017
- MaineDOT Highway Program involved in discussions:
  - Brad Foley
  - Steve Bodge
  - Andy MacDonald
  - Atlee Mousseau
  - Shawn Smith
  - Denis Lovely

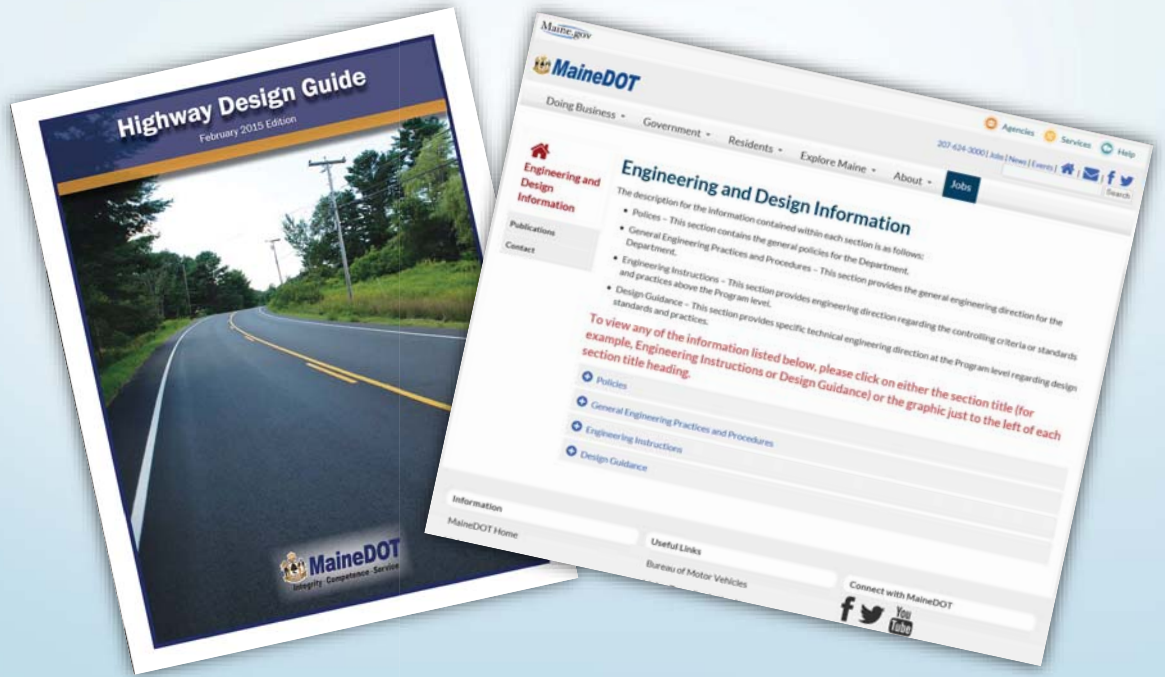
## Process (5 of 5)

- Meetings were very interactive, discussions included:
  - project specific examples,
  - policy discussion points
  - general design issues
  - other issues that came about as a result of discussion

## Today's Meeting

- Review the results
- Interactive discussion
- Meeting feedback included in final document
- Final document available on MaineDOT Highway webpage.

# Presentation of Results



# Cross Sections



## 6. Cross Sections (1 of 11)

- A. Do not show interpretive bedrock surfaces on final cross sections or profiles. Okay to show them through Pre-PS&E for slope development and estimating purposes.**

*In the past, bedrock limits were approximated and shown on the profile and cross sections. Since the bedrock can vary significantly between borings and the strength of bedrock is so variable, MaineDOT is no longer showing this information on the final stamped plans.*

*It is still okay to develop the design based on this information, but bedrock lines will be removed for the PS&E submittal. There is recent MaineDOT discussion regarding not showing bedrock lines on any submittals. Coordinate your work with MaineDOT.*

## 6. Cross Sections (2 of 11)

- A. Do not show interpretive bedrock surfaces on final cross sections or profiles. Okay to show them through Pre-PS&E for slope development and estimating purposes.**

*General Note - Geotechnical information furnished or referred to in the Bid Documents is for the use of the Bidders. No assurance is given that the information or interpretations will be representative of the actual subsurface conditions throughout the construction site. MaineDOT will not be responsible for any interpretations or conclusion drawn from the geotechnical information. The Boring Logs provided in the Bid Documents (if any) present factual and interpretive subsurface information collected at discrete locations. Data provided may not be representative of the subsurface conditions between boring locations.*

## 6. Cross Sections (3 of 11)

- A. Do not show interpretive bedrock surfaces on final cross sections or profiles. Okay to show them through Pre-PS&E for slope development and estimating purposes.

*Boring symbols will still be shown on plans and cross sections.*

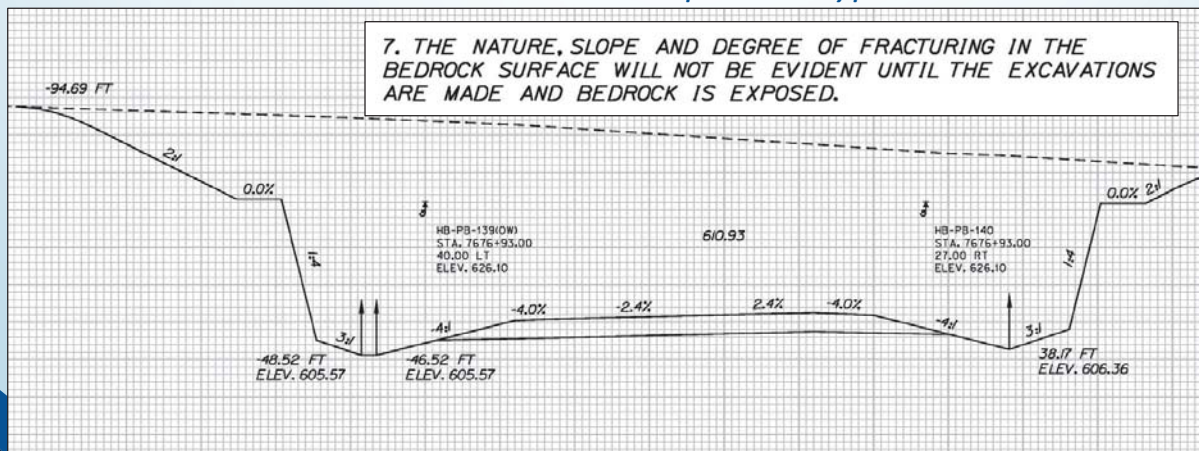
*Coordinate with MaineDOT on limits of right of way takings in bedrock areas (2:1 vs. 1:4 bedrock slope).*

*MaineDOT is looking to collect more subsurface data in the future (GPR data).*

## 6. Cross Sections (4 of 11)

- A. Do not show interpretive bedrock surfaces on final cross sections or profiles. Okay to show them through Pre-PS&E for slope development and estimating purposes.

*Sample XS & typical section note*



## 6. Cross Sections (5 of 11)

### B. Benching, don't show on cross sections, just add label?

*General Note - existing inslopes in proposed fill areas shall be benched by excavating steps of sufficient width to permit placing and compacting the fill material along with the material removed.*

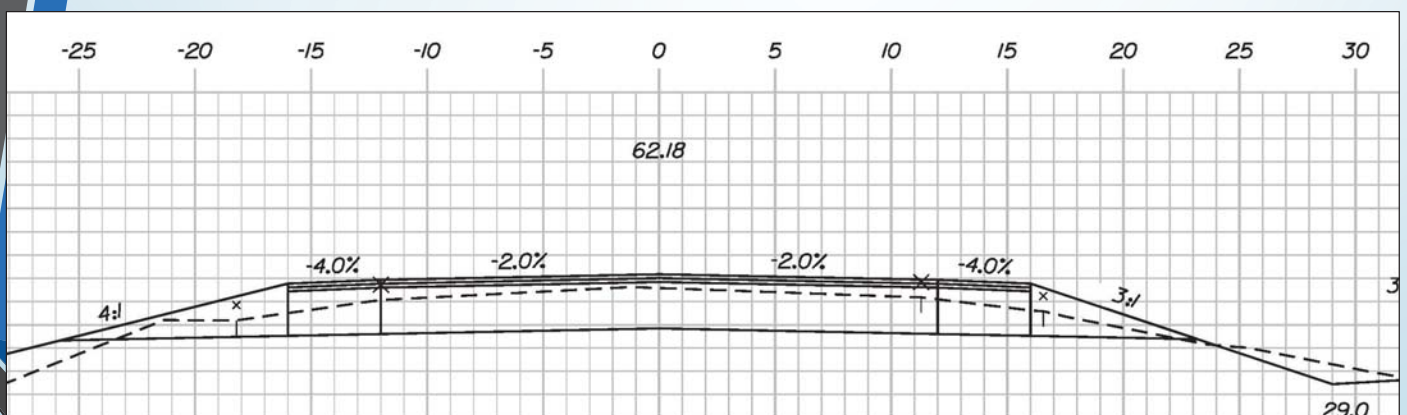
*Similar language in MaineDOT Repair Spec, Section 203.09*

*Benching is no longer shown on the cross sections. Benching everywhere but not showing anywhere.*

*Excavation for benching to receive embankments will not be paid for directly. Is considered incidental to other contract items.*

## 6. Cross Sections (6 of 11)

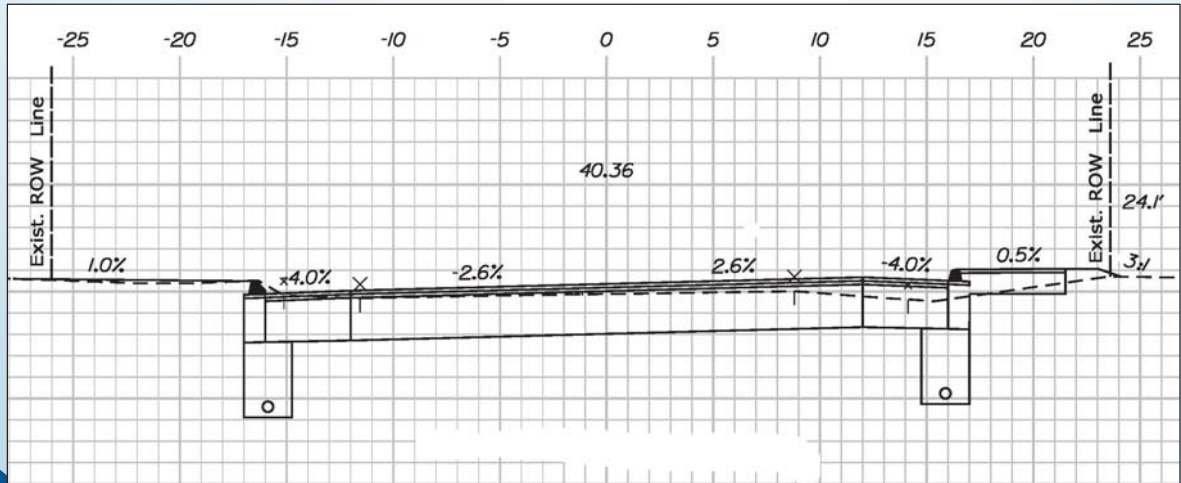
### C. Labeling of cross slopes, positive (+) sloping above CL/BL vs. minus (-) sloping below CL/BL





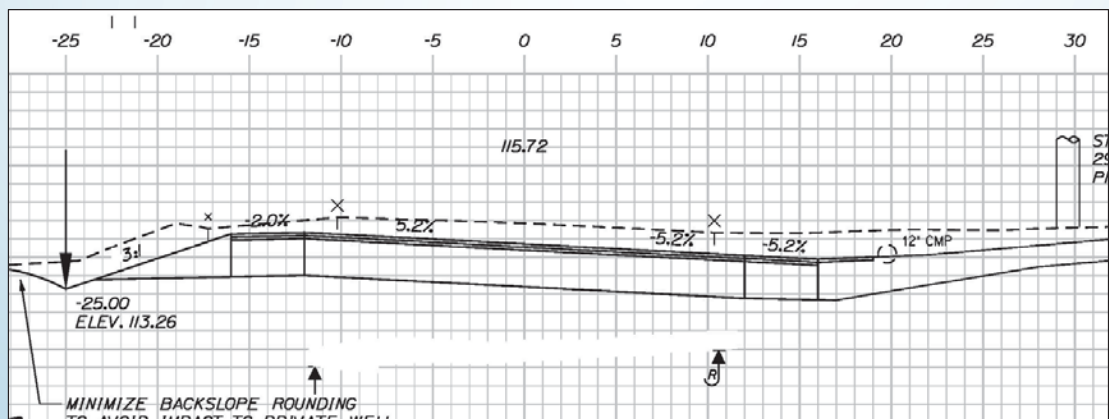
## 6. Cross Sections (7 of 11)

- C. Labeling of cross slopes, positive (+) sloping above CL/BL vs. minus (-) sloping below CL/BL



## 6. Cross Sections (8 of 11)

- C. Labeling of cross slopes, positive (+) sloping above CL/BL vs. minus (-) sloping below CL/BL



## 6. Cross Sections (9 of 11)

### D. Stone Ditch Protection @ 6% grade or steeper

*Chapter 14 of HDG discusses uses for stone ditch protection, riprap and erosion control blanket in roadside ditch areas (to be removed).*

*Stone Ditch Protection – use in roadside ditches with slopes 6% or steeper. Depth = 12". Width = 6' min.*

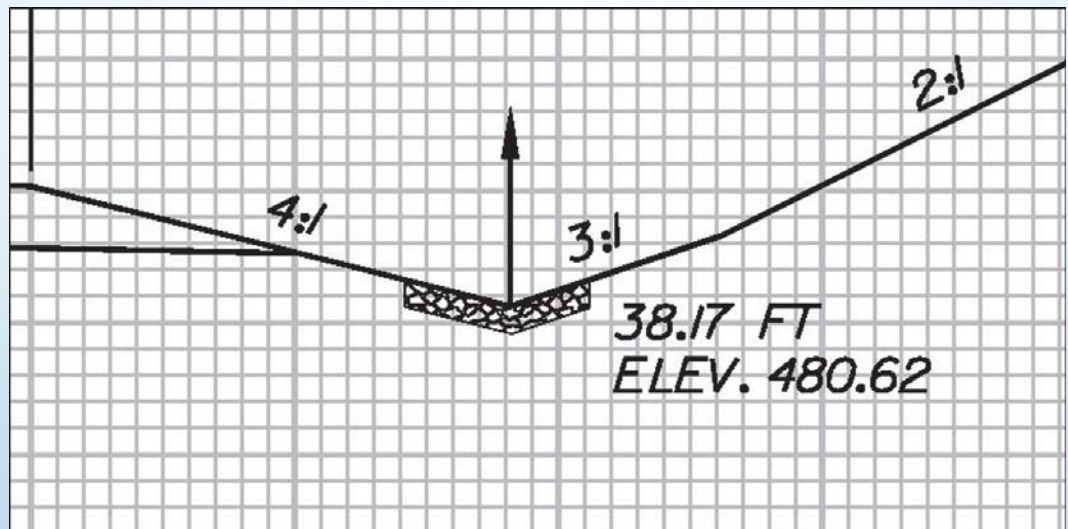
*Riprap – use in roadside ditches with slopes 6% or steeper with substantial flows (high velocities). Depth = 18". Width = 6' min.*

*Erosion Control Blanket – use in roadside ditches with slopes less than 6%. Width = 6' min.*

## 6. Cross Sections (10 of 11)

### D. Stone Ditch Protection @ 6% grade or steeper

*Provide 1.0' min. depth of protected ditch (example below provides 7' SDP width)*



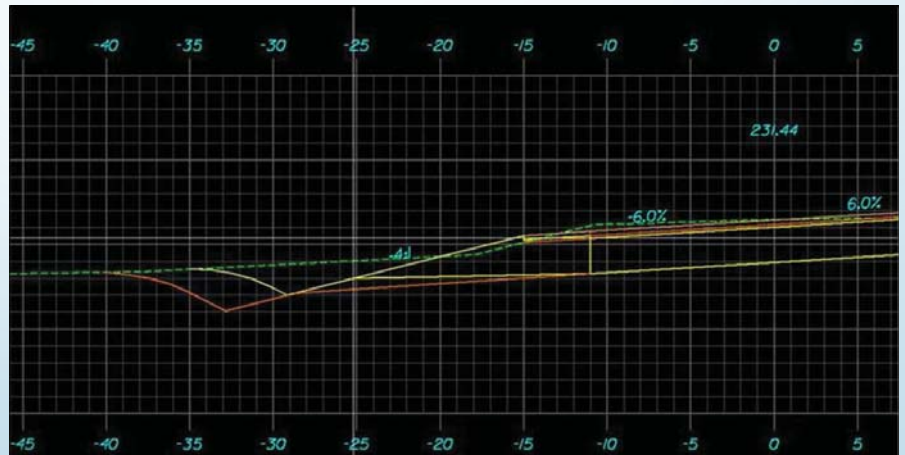
## 6. Cross Sections (11 of 11)

### E. Subgrade Design for the Low-Side of Superelevated Curves

*In the past, break the shoulder subgrade at the edge of travelway at 2% subgrade slope to the side-slope intercept (yellow lines).*

*New practice, continue the shoulder subgrade slope at the same slope as travelway subgrade slope (orange lines).*

*Maintain 1.0' min. ditch depth below side-slope intercept*



## Guardrail / Terminals / End Treatments







# 7. Guardrail / Terminals / End Treatments (3 of 21)

## B. End Treatments – Tangential vs. Flared ends

**Title:** Guardrail and Guardrail Terminal Policy  
**Discipline:** General Engineering  
**Originator:** Highway Program  
**Issue Date:** August 14, 2014  
**Approved by:** Jason Taylor, P.E., Chief Engineer  
**Revised Date:** August 15, 2017

**APPLICABILITY**  
 This Policy shall apply to all Maine Department of Transportation (MaineDOT) Capital Improvement projects on Highway Corridor Priority 1-4, except for Light Capital Project.

**COMPLIANCE REQUIREMENTS**  
 Guardrail and guardrail terminals shall comply with the requirements of the National Cooperative Highway Research Program Report TRR 16C (NCHRP 350) as the standard for Absorbing Energy Hardware (AEH) as established by this Policy. Where compliance is not required by Policy, consideration shall always be given to the potential safety and economic benefits of upgrading noncompliant guardrail or guardrail terminals.

**NEW GUARDRAIL/GUARDRAIL TERMINALS**  
**Standard**  
 New permanent guardrail installations shall be MASH compliant.  
**Guardrail Terminals**  
 New permanent guardrail terminal installations shall be listed on MaineDOT's Qualified Products List (QPL). Flared in back scope and flared terminals are preferred. Flared terminals shall be installed with a four-foot offset. Where adequate vehicle recovery area cannot be provided, energy absorbing flared terminals should be considered. Tangent terminals are more likely to experience head-on and rear-end hits, and should be avoided.

Revision 6/15/2017 Page 3 of 3

Installed with a two-foot offset whenever possible. Safety and maintenance concerns should be weighed against potential cost savings and impact minimization when considering tangent terminals.

The following exceptions apply:

- If an entrance or access point is located within the length of flared required to properly shield an area of concern, one of the following three options shall be installed: a guardrail terminal listed on the QPL, an anchored flared, or an anchored table.
- On one-lane roadways or divided highways, a compliant guardrail terminal is not required on the trailing end.

**EXISTING GUARDRAIL/GUARDRAIL TERMINAL**  
 Treatment of existing guardrail and guardrail terminals shall be determined by one of the following project scopes: New Construction/ Reconstruction, Rehabilitation, or Restoration/Resurfacing. Projects cannot always be categorized neatly by scope, and terminology varies by Program within MaineDOT. The intent of this Policy is that when the nature of the work to which that guardrail system is impacted, the New Construction/ Reconstruction or Rehabilitation section should be used. When the nature of the work is such that guardrail systems are not impacted, the Restoration/Resurfacing section should be used.

Subsections to rules of existing guardrail shall be NCHRP 350 or MASH compliant.

For existing guardrail runs that extend beyond the limit of work by more than 120 feet, only the sections within project limits need to be replaced for adjustment or replacement.

**New Construction/Reconstruction**  
**Standard**  
 Existing guardrail shall be fully replaced with MASH compliant guardrail.  
**Guardrail Terminals**  
 Existing guardrail terminals shall be fully replaced with terminals listed on MaineDOT's QPL. See the New Guardrail Terminal section for additional considerations.  
**Rehabilitation**  
**Standard**  
 Existing guardrail shall be adjusted as follows:  
 • Corridor Priority 1-2: Guardrail shall be adjusted to meet NCHRP 350 compliance requirements.  
 • Corridor Priority 3-4: Guardrail in good condition may remain in place.  
 Existing NCHRP 350 or MASH compliant guardrail may remain in place and any necessary adjustments or repairs may be made. Full replacements of existing guardrail shall be MASH compliant.

Revision 6/15/2017 Page 3 of 3

**Guardrail Terminals**  
**Projects advertised before January 1, 2020**  
 Existing NCHRP 350 compliant guardrail terminals in good condition may remain in place. All other terminals shall be replaced with a system listed on MaineDOT's QPL. See the following exceptions:  
 • Corridor Priority 1-4: MASH in good condition may remain in place if there are no crashes recorded at that location.  
 • Corridor Priority 4: Low Volume Roads in good condition may remain in place on low volume roads if the design year ADOT is less than 1,000.  
**Projects advertised on or after January 1, 2020**  
 Existing NCHRP 350 compliant guardrail terminals in good condition may remain in place. All other terminals shall be replaced with a system listed on MaineDOT's QPL. See the following exceptions:  
 • Corridor Priority 1-4: MASH in good condition may remain in place if there are no crashes recorded at that location.

**Restoration/Resurfacing**  
**Standard**  
 Existing guardrail in good condition may remain in place.  
**Guardrail Terminals**  
**Projects advertised before January 1, 2020**  
 Existing guardrail terminals in good condition may remain in place.  
**Projects advertised on or after January 1, 2020**  
 Existing NCHRP 350 compliant guardrail terminals in good condition may remain in place. All other terminals shall be replaced with a system listed on MaineDOT's QPL. See the following exceptions:  
 • Corridor Priority 1-4: MASH in good condition may remain in place if there are no crashes recorded at that location.

Revision 6/15/2017 Page 3 of 3

# 7. Guardrail / Terminals / End Treatments (4 of 21)

## B. End Treatments – Tangential vs. Flared ends

Shall be on Qualified Products List (QPL).  
<https://www1.maine.gov/mdot/research/products/#undefined2>

**MaineDOT Terminals for W-Beam Guardrail Systems** 12/16/2018

Manufacturers must immediately notify MaineDOT of any changes to the products on this list

MASH			
Tangent/Energy Absorbing			
Product Name:	MASH Tension	Maine DOT #:	17-617
Manufacturer:	Lindsay Transportation Solutions	Test Level:	3
WebPage:	<a href="http://www.lindsaytransport.com">www.lindsaytransport.com</a>	Terminal Height:	31
	<a href="#">Manual</a> <a href="#">Checklist</a> <a href="#">MDSU Value</a>	*See the Lindsay Guide App for more information	
Product Name:	MST-CP-MGS	Maine DOT #:	16-048
Manufacturer:	Road Systems, Inc.	Test Level:	2, 3
WebPage:	<a href="http://www.roadsystems.com">www.roadsystems.com</a>	Terminal Height:	31
	<a href="#">Manual</a> <a href="#">Checklist</a> <a href="#">MDSU Value</a>		
Product Name:	SFT330p	Maine DOT #:	13-053
Manufacturer:	Trinity Highway Products (TH)	Test Level:	2, 3
WebPage:	<a href="http://www.thproducts.com">www.thproducts.com</a>	Terminal Height:	31
	<a href="#">Manual</a> <a href="#">Checklist</a> <a href="#">MDSU Value</a>		
NCHRP 350			
Flared/Energy Absorbing			
Product Name:	FLAT-CP-MGS	Maine DOT #:	10-025b
Manufacturer:	Road Systems, Inc.	Test Level:	2, 3
WebPage:	<a href="http://www.roadsystems.com">www.roadsystems.com</a>	Terminal Height:	31
	<a href="#">Manual</a> <a href="#">Checklist</a> <a href="#">MDSU Value</a>		
Product Name:	FLAT-CP	Maine DOT #:	10-025a
Manufacturer:	Road Systems, Inc.	Test Level:	2, 3
WebPage:	<a href="http://www.roadsystems.com">www.roadsystems.com</a>	Terminal Height:	27
	<a href="#">Manual</a> <a href="#">Checklist</a> <a href="#">MDSU Value</a>		
Flared/Energy Absorbing			

Page 1 of 3

Manufacturers must immediately notify MaineDOT of any changes to the products on this list

Product Name:	SFT 350 31	Maine DOT #:	09-031
Manufacturer:	Trinity Highway Products (TH)	Test Level:	3
WebPage:	<a href="http://www.thproducts.com">www.thproducts.com</a>	Terminal Height:	31
	<a href="#">Manual</a> <a href="#">Checklist</a> <a href="#">MDSU Value</a>		
Product Name:	SFT 350 27P	Maine DOT #:	09-018
Manufacturer:	Trinity Highway Products (TH)	Test Level:	3
WebPage:	<a href="http://www.thproducts.com">www.thproducts.com</a>	Terminal Height:	27
	<a href="#">Manual</a> <a href="#">Checklist</a> <a href="#">MDSU Value</a>		

Attention: End treatments not listed above may not be incorporated into any MaineDOT work without prior approval. Prequalification Criteria: One of the following: NCHRP-350 MASH

Additional Information:  
 Test Level 3 = for design speeds < 45mph  
 Test Level 2 = for use at all design speeds

**PLEASE NOTE:**  
 MaineDOT requires re-qualification by all manufacturers every five years to ensure that product names and formulations have remained the same since the product was originally placed on this list and that products are still relevant and in production. This shall include the most recent NTEEP testing. NTEEP provides for missing of this product category for a 3-year basis. A lapse of NTEEP test results may result in de-qualification of the product.

The Department continues to evaluate its Acceptance Criteria and reserves the right to revise the criteria and/or withdraw product qualification at any time for any reason without notice. Furthermore, the ability of a product to meet these requirements does not necessarily guarantee addition to the Qualified Products List. Remember that, products are placed on the Qualified Products List are to be considered prequalified for use only, meaning that they have undergone preliminary review for compliance with MaineDOT and AASHTO specifications. As with all products, final approval rests with the Designer, Project Manager, Supplier and/or Resident to determine if a product best suits the need of a particular project.

If you are experiencing difficulties reading or printing this page, or have questions regarding the Qualified

Page 2 of 3

## 7. Guardrail / Terminals / End Treatments (5 of 21)

### B. End Treatments – Tangential vs. Flared ends

*Grading requirements in advance of GR terminals.*

*Curbing limitations under GR and in advance of GR terminals.*

- 4" curb height under GR
- No curb or 1.5" curb height at GR terminals (RDG)

*Discussed in manufacturers literature and RDG.*

## 7. Guardrail / Terminals / End Treatments (6 of 21)

### B. End Treatments – Tangential vs. Flared ends

*Grading requirements in advance of GR terminals (RDG)*

*See manufacturers literature.*

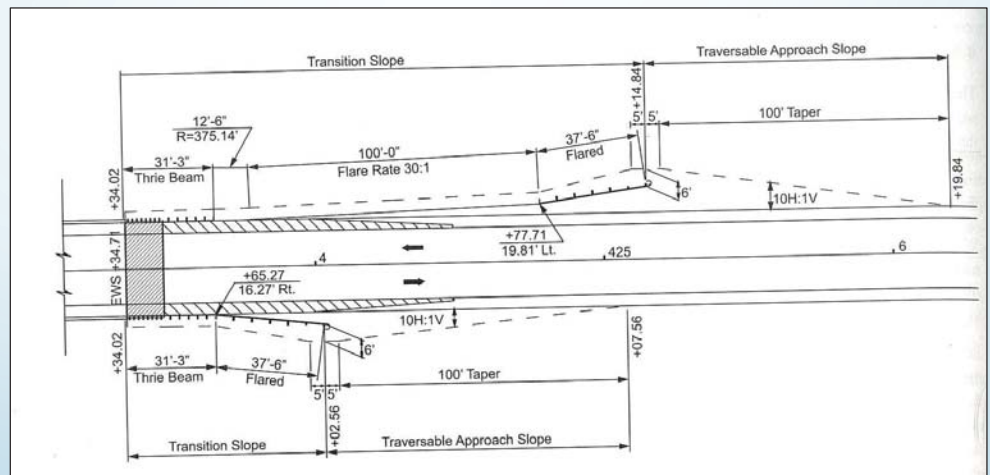
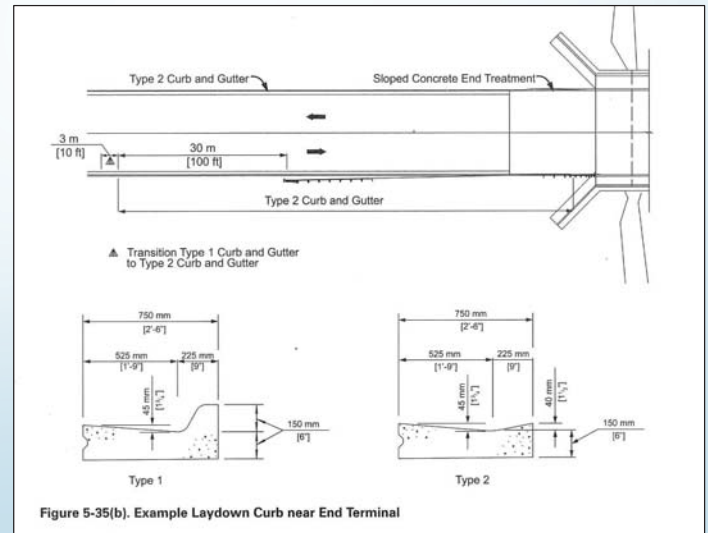


Figure 5-32. Example Guardrail and Embankment Layout Sheet

## 7. Guardrail / Terminals / End Treatments (7 of 21)

### B. End Treatments – Tangential vs. Flared ends

*Curbing limitations under GR and in advance of GR terminals.*



## 7. Guardrail / Terminals / End Treatments (8 of 21)

### B. End Treatments – Low Volume ends

*Low Volume Ends -  
See GR and GR Terminal Policy.*

*Existing low volume ends are okay on Priority 4 roadways with  
AADT less than 1,000.*

*Not allowed on new projects.*

## 7. Guardrail / Terminals / End Treatments (9 of 21)

### B. End Treatments – Driveway / Side Road Termination

#### Driveway Termination -

Consider running standard GR radius beyond LON. Might eliminate need for crashworthy end treatment.

Only use anchoring at end of driveway if extreme hazard

Assess on case by case basis.

#### Side Roads -

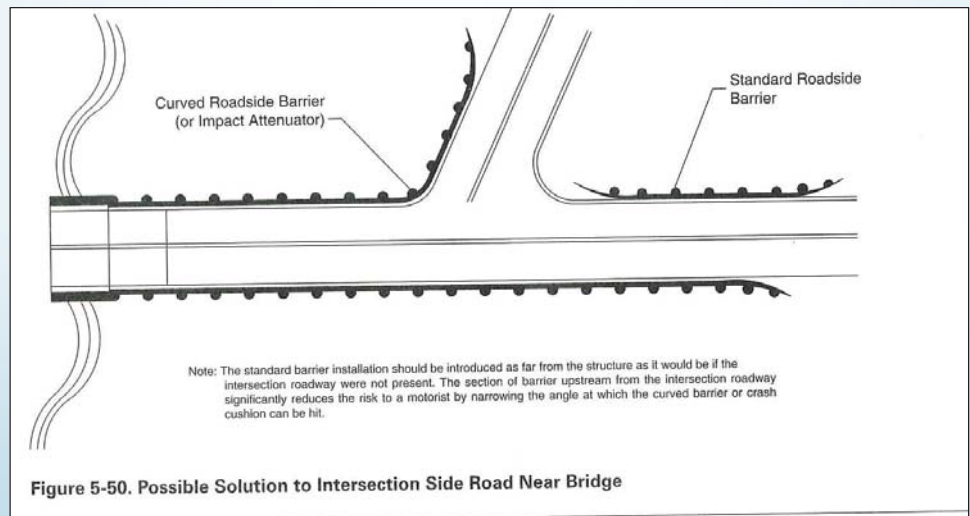
Follow higher roadway priority when designing GR.

Crashworthy end treatment will be required.

## 7. Guardrail / Terminals / End Treatments (10 of 21)

### B. End Treatments – Driveway Termination

Example:



## 7. Guardrail / Terminals / End Treatments (11 of 21)

### B. End Treatments – use of Anchored vs. Unanchored (non-crashworthy).

*Anchored ends typically used on trailing end of one-way roadways or on interstate systems. Anchored ends can be used on two-way roadways if the anchored end is protected from impacts.*

*Unanchored ends requires the GR length to be extended at least 50' beyond hazard or 8 additional GR anchor bolts, in order to provide GR strength at hazard location.*

*Generally speaking, two-way roadways will have crashworthy end treatments on leading and trailing ends.*

## 7. Guardrail / Terminals / End Treatments (12 of 21)

### C. Mid-way Splice/MASH compliance

*See GR and GR Terminal Policy –  
Either NCHRP 350 or MASH compliance*

*New Construction/Reconstruction – MASH Compliant*

*Rehabilitation – Existing NCHRP 350 can remain, be adjusted or repaired, however any new or replacement GR shall be MASH compliant.*

*Resurfacing – Existing GR in good condition can remain.*



## 7. Guardrail / Terminals / End Treatments (13 of 21)

### C. Mid-way Splice/MASH compliance

Mid-Way Splice GR System –

*Being used on all Highway Program projects moving forward.*

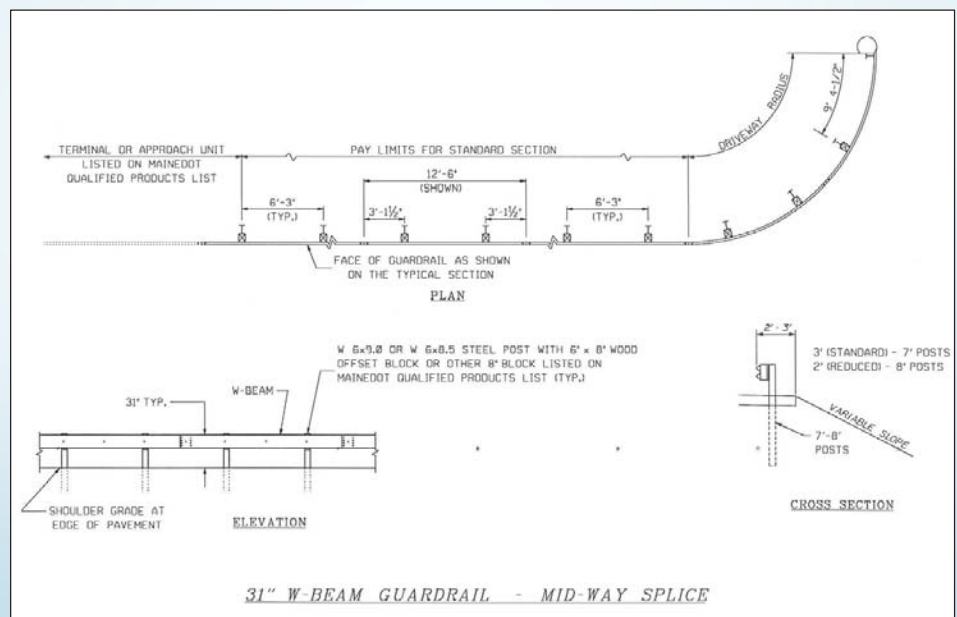
*GR height = 31"*

*Coordinate with your Project Manager*

## 7. Guardrail / Terminals / End Treatments (14 of 21)

### C. Mid-way Splice/MASH compliance

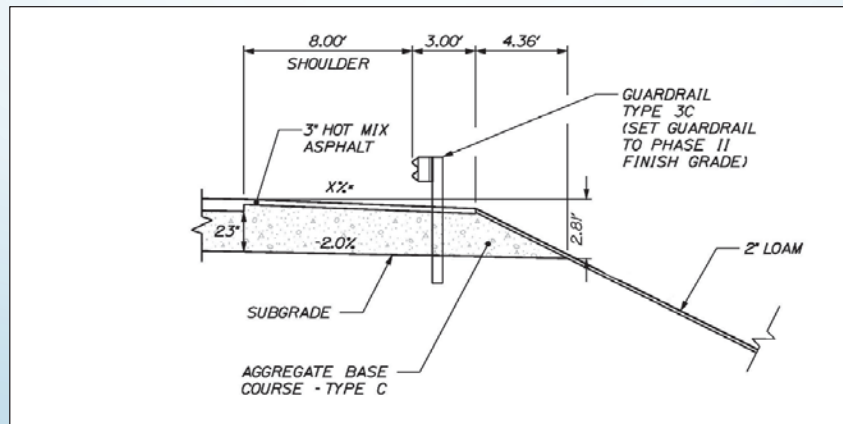
*Be aware of pay limits*



## 7. Guardrail / Terminals / End Treatments (15 of 21)

### D. Pave under GR? With curbing? (Difference between Bridge vs. Highway Program)

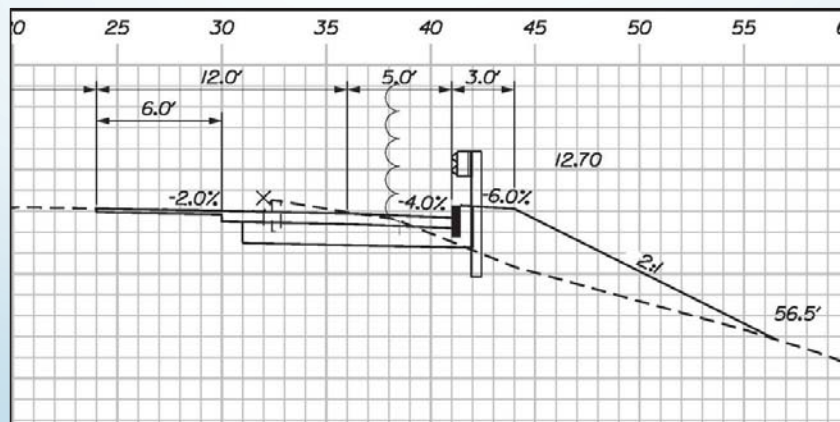
*In areas of GR panels and no curbing, the GR panel shall be paved.*



## 7. Guardrail / Terminals / End Treatments (16 of 21)

### D. Pave under GR? With curbing? (Difference between Bridge vs. Highway Program)

*In areas of GR and curbing, the GR panel does not need to be paved.*



## 7. Guardrail / Terminals / End Treatments (17 of 21)

### D. Pave under GR? With curbing? (Difference between Bridge vs. Highway Program)

*In areas of GR and curbing and sidewalk, the GR panel/berm does not need to be paved if placed behind the sidewalk.*

*If GR is placed at face of curb in front of the sidewalk, GR panel/berm shall be paved. Discuss with Project Manager.*

## 7. Guardrail / Terminals / End Treatments (18 of 21)

### E. Superelevation low side with GR and curb?

*Old Practice (HDG) – curbing should be placed under GR on the low side when super elevation is occurring.*

*New Practice – curbing is not always required under GR on the low side of super elevation. Consider factors such as superelevation rate, profile grade, embankment height, existing conditions, amount of runoff.*

*If curb is provided, consider both a curb break with a riprap downspout at the low point or a catch basin and drainage pipe outlet (no curb break).*

## 7. Guardrail / Terminals / End Treatments (19 of 21)

### F. GR at back of SW; thrie beam rail with rub rail

*Old Practice (HDG) – Place GR at face of curb. If GR is placed at back of sidewalk, see below:*

- *Provide 6' minimum GR offset from face of curb (less than 45 mph).*
- *If GR is closer than 6' from face of curb, provide thrie rail or rub rail.*

## 7. Guardrail / Terminals / End Treatments (20 of 21)

### F. GR at back of SW; thrie beam rail with rub rail

*Old Practice  
(HDG)*

Design Speed (mph)	Recommended Distance Behind Face of Curb <sup>7</sup> for Placement of Barrier	
	<i>Desirable</i>	<i>Acceptable</i>
< 45		≥ 6 ft.
≥ 45	Barrier will be flush with face of curb at gutter line.	> 11 ft.

- Notes:*
1. These criteria apply to both sloping and vertical curbs.
  2. Where barrier will be placed closer to curb than recommended distance, a thrie beam or rub rail should be used.

**BARRIER PLACEMENT BEHIND CURBS**

**Table 10-6**

## 7. Guardrail / Terminals / End Treatments (21 of 21)

### F. GR at back of SW; thrie beam rail with rub rail

*New Practice –*

- *No rub rail or thrie rail needed.*
- *Continue to provide W-beam GR behind sidewalk regardless of the curb offset.*
- *If GR is placed at face of curb with sidewalk, consider a double-sided rail. Challenges with end treatments exist for this scenario.*

## Quantities / Estimating

*(Guidance currently being updated by MaineDOT)*





## 8. Quantities/ Estimating (1 of 13)

- A. Can Consultants receive MaineDOT Average Unit Price list, similar to what MaineDOT uses internally?

*Average unit price information is no longer provided to consultants.*

## 8. Quantities/ Estimating (2 of 13)

- B. Can we establish appropriate contingencies at each submission level for consistency?

*Contingency Rules of thumb:*

- *Provide 20-25% contingency at HVAC.*
- *Provide 10-15% contingency at PDR.*
- *Provide 5-10% contingency at PIC.*
- *Provide 0% contingency at PSE.*

*Contingency can and should vary per cost estimate and per project due to project and site variables.*

*Be realistic with your cost estimate, whether or not the project is funded for construction.*

## 8. Quantities/ Estimating (3 of 13)

### C. Box Culverts – single item vs. fully itemized; what is preferred method?

*Provide fully itemized cost estimate on box culvert projects.*

*Do not provide one lump sum item for the project.*

*Consider special detour LS pay item in estimate (510.10).*

*Consider temporary structural support LS pay item in estimate (524.30).*

*MaineDOT developing Special Provision for large culvert construction  
(all-inclusive, staged construction)*

## 8. Quantities/ Estimating (4 of 13)

### D. Tree Removals – less than 12” (no pay) but still labeled to remove; 12” or greater (pay)

#### **201.23 Removing Single Tree Top Only - Each**

Trees less than 1-foot in diameter will not be considered as trees under this item. Trees in clearing areas will be paid for as clearing.

## 8. Quantities/ Estimating (5 of 13)

### E. Use of Dirty Borrow vs. Loam? 2" vs. 4"

*Provide 4" loam in lawn and urban areas.*

*Provide 2" loam in all other areas.*

*Provide dirty borrow instead of loam in rural non-residential areas, on a project specific basis.*

*Earthwork summary – should account for loam volumes. DOT will be providing additional guidance on this.*

## 8. Quantities/ Estimating (6 of 13)

### F. Seeding Method – Type 3 no longer used

*Use seeding method #1 for lawns*

*Use seeding method #2 everywhere else.*

*Seeding Method #3 NO LONGER USED*

## 8. Quantities/ Estimating (7 of 13)

### G. Benching not included in common excavation

*General Note - existing inslopes in proposed fill areas shall be benched by excavating steps of sufficient width to permit placing and compacting the fill material along with the material removed.*

*Similar language in MaineDOT Repair Spec, Section 203.09*

*Benching is no longer shown on the cross sections. Benching everywhere but not showing anywhere.*

*Excavation for benching to receive embankments will not be paid for directly. Is considered incidental to other contract items.*

## 8. Quantities/ Estimating (8 of 13)

### H. Maintenance of Traffic Control Devices – CD or LS

*Use Calendar Day for most projects.*

*Lump sum may be used on very simple projects (not commonly used).*

*Coordinate with Project Manager.*



## 8. Quantities/ Estimating (9 of 13)

### I. Flagger Hours – Guidance on estimating

*This item is often estimated too low.*

*Review anticipated construction duration (how long). Review number of work zones (how many flaggers). Review construction activities where flaggers are needed. Estimate length of need.*

*Review TAMING results.*

*Flagger Hours: Proper consideration of breaker flagger hours (SP 652); could increase flagger hours by up to 20%.*

## 8. Quantities/ Estimating (10 of 13)

### J. Use of Police Officers? Signalized intersections?

*Use of police officers is required for some construction activities on Interstate projects.*

*Police Officers are required to direct traffic at a signalized intersection, unless the signal system is turned off.*

## 8. Quantities/ Estimating (11 of 13)

### K. Temporary Signals – When to use? What type?

*Use of temporary signals is considered on a project case by case basis.*

*May be required at existing signalized intersections.*

*May be required for maintenance of traffic through a work zone when a long duration single lane operation (MOT) is needed (> one day).*

*Examples – Culvert installations, retaining wall installations, utility installations, road realignments, major profile changes, special detours.*

*A temporary traffic signal system is required for all drives within a work zone using single lane approaches.*

## 8. Quantities/ Estimating (12 of 13)

### L. Paving around field basin, when to use, when not to?

*Old Practice (general notes) – provide paved apron around all field basins.*

*New Practice – not required unless erosion is a concern. General note has been removed. Loam and seed around field basins is acceptable.*

## 8. Quantities/ Estimating (13 of 13)

### M. Green Acrylic for Paved Islands – proper item?

*Same pay item.*

*658.20 – Acrylic Latex Finish, Green.*

*New specification and color being used.*

**Geotechnical**



## 9. Geotechnical (1 of 6)

### A. Plans – Show exploration locations with appropriate symbols on plans

*Turn on GEOPLAN.dgn to show exploration locations on plan views.*

*No geotechnical information is shown on the profiles.*

*Coordinate with MaineDOT Geotechnical Team member (Kate Maguire).*

## 9. Geotechnical (2 of 6)

### B. Updated CADD legends from MaineDOT reflecting latest symbology

*Geotech symbols added recently.*

PLAN LEGEND			
Town, County, State	-----	Catch Basins	▣ Existing ■ Proposed
Property Lines	-----	Manholes	○ Existing ● Proposed
R/W Lines-Existing	-----	Proposed Underdrain	-----
R/W Lines-Proposed	-----	Proposed Ditch	-----
Culvert-Existing	-----	Existing Ditch	-----
Culvert Proposed	-----	Utility Poles	⊕ Existing ⊕ Proposed
Curbing	Existing Proposed	Fire Hydrants	⊕ Existing ⊕ Proposed
Type 1	-----	Existing Water Line	-----
Type 3	-----	Existing San. Sewer	-----
Type 5	-----	Existing San. Sewer Manhole	⊙
Outline of Bodies of Water	-----	Guardrail-Existing	-----
Exposed Bedrock	-----	Guardrail-Proposed	-----
Buildings	-----	Guardrail-Cable, Other	-----
Trees	◀ Conifer ⊗ Deciduous	Centerline-Existing	-----
Tree Line	-----	Centerline-Proposed	-----
Clearing Limit Line	-----	Travelway-Existing	-----
Railroad	-----	Travelway-Proposed	-----
Boring	⊕ HB-XXX-###	Probe	⊕ P-#. #X
Pavement Core	● PC-#	#, # = Depth	
Test Pit	▣ TP-XXX-###	X = W (Weathered Rock)	
		R (Refusal)	
		NR (No Refusal)	



## 9. Geotechnical (3 of 6)

### C. Stone Ditch Protection vs. Riprap?

*Typically, stone ditch protection is sufficient on ditch slopes that are 6% or greater.*

*Stone ditch protection is 12" deep.*

*In high velocity areas (major drainage flows or long steep grades), riprap should be considered instead of stone ditch protection.*

*Riprap is required on slopes steeper than 2:1.*

*Geotechnical analysis is required to determine depth of riprap.*

*2 ft. of riprap is typically required for stability on slopes steeper than 2:1. Actual required thickness will be determined by Geotech.*

## 9. Geotechnical (4 of 6)

### D. Stone sizing

*For typical situations, plain riprap is acceptable.*

*In areas along rivers, possibly along lake edges and near bridge abutments, heavy riprap may be required.*

*Use heavy riprap where scour and ice impact are likely.*

*Thickness of riprap on over-steepened slopes (steeper than 2:1) will be determined by Geotech.*

## 9. Geotechnical (5 of 6)

### E. Geotechnical sheets, what to include? *Depends on the project...*

*If geotechnical explorations were completed for the project, the following sheets may be included in the plan set.*

- 1. Boring Location Plan*
- 2. Boring Logs*
- 3. Interpretive Subsurface Profile (NOTE: This is the only place interpretation can be shown.)*
- 4. Boring Location Plan with Foundation Design Recommendations for lighting, signs, and signals, if there are any on the project.*

*The Geotechnical Sheets will be prepared and stamped by MaineDOT Geotech or by their Geotechnical Consultant.*

*[Details of symbols and labels for Geotech information on cross sections are included in a MicroStation Cell library called GOETECH.XSECT.cel]*

## 9. Geotechnical (6 of 6)

### F. Over-Steepened Slopes (steeper than 2:1)

*Any slopes steeper than 2:1 will require a geotechnical evaluation by MaineDOT.*

*All slopes steeper than 2:1 require riprap.*

*Thickness of riprap will be determined by Geotech.*

*1:1 slopes are not permitted unless reinforced, and designed by Geotech.*

*Reinforced slope design will require a Details Sheet included in the plan set.*



## Next Steps

## Next Steps

- Document input/feedback received during these sessions.
- Update the list of topics
- Include additional questions/clarifications
- Confirm answers with MaineDOT
- Provide updated document to all GCA consultants and make available on MaineDOT Highway Design web page.

# Questions



*Send any additional questions or comments to:  
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