CHAPTER 1 – INTRODUCTION

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1.1—GENERAL CRITERIA

Highway Safety Design references the latest edition of the AASHTO Roadside Design Guide (RDG) in developing the DOTD's Highway Safety Hardware Design Standards. The RDG is not a standard or a design policy but it is intended to be used as a resource document from which DOTD can develop standards and policies. Although much of the material in the Guide can be considered universal in its application, many recommendations may be subjective and may need modifications to fit local conditions and operational experience.

The DOTD standards and policies include DOTD issued Standard Plans, Specifications, Approved Materials List (AML), Bridge Design Section Technical Memorandums (BDTM) and DOTD Engineering Directives and Standards Manual (EDSM's) for the following:

- Roadside Barriers
- End Treatments – Trailing End Anchorages, Crashworthy Terminals, Crash Cushions
- Median Roadway Barriers
- Bridge Railings and Transitions
- Temporary Barriers for Work Zones
- Breakaway and Overhead Roadside Permanent Signs

Because the dynamics of a crash are complex, the most effective means of assessing barrier performance is typically through full-scale crash tests or in some cases when deemed appropriate computer simulation. The AASHTO Manual for Assessing Safety Hardware (MASH) contains the current recommendations for testing and evaluating the safety performance of highway features and safety hardware. MASH has replaced NCHRP Report 350, "Recommended Procedures for the Safety Performance Evaluation" due primarily to changes in the vehicle fleet.

MASH provides specific test level (TL) impact conditions for conducting vehicle crash tests. The specified test conditions include vehicle weight, impact speed, approach angle and point of impact on the safety hardware device. Standard test vehicle types are defined for small passenger cars, pickup trucks, single-unit van trucks, tractor/van-type trailer units and tractor/tanker trailer units. The specific MASH test conditions and evaluation criteria for each type of roadside hardware device are summarized in the AASHTO MASH document.

The MASH test levels are Test Level 1 (TL-1), Test Level 2 (TL-2), Test Level 3 (TL-3), Test Level 4 (TL-4), Test Level 5 (TL-5) and Test Level 6 (TL-6) and are documented with the design of each specific roadside hardware device. As the test level condition increases from TL -1 to TL-6, the test vehicle types, vehicle weights, impact speeds and impact angles vary with each test level. TL-3 and TL-4 are the most commonly used test levels for our roadside hardware devices. TL-2 may be used for lower speed roadway applications and TL-5 for tractor/trailer applications when needed. TL-6 is very seldom used except in special cases with approval from the Bridge Design Engineer Administrator.

The FHWA maintains a website for roadside departure safety hardware under the FHWA Office of Safety that identifies crash tested hardware and includes copies of the FHWA eligibility letters, guidance/polices, and resources for reference. AASHTO Task Force 13 also has additional information on roadside hardware that can be found on the Task Force 13 website.

1.2—DESIGN PROCESS AND PLAN DETAILS

Many highway roadway and bridge projects for new construction, replacement, rehabilitation or repairs may require the use of highway safety hardware based on the scope of each project. This may include the use of barriers to shield bridge ends, bridge columns, fixed highway signs, roadway slopes and other fixed objects. Cable barriers, guardrail or concrete median barrier are often used to shield highway traffic in divided highway conditions. Bridge railings are required for all bridges to prevent a vehicle from running off the edge of bridge. Permanent or Temporary Crash Cushions may be needed to protect highway gore areas, bridge ends or other fixed objects when guardrail cannot be used for permanent applications or work zone applications. Temporary barriers are often required in work zones for both roadway and bridge projects.

In addition to the use of Standard Plans, Specifications and EDSM's, each project will typically require unique project specific plan layout details and pay items to be designed and detailed by the engineer-of-record that are not included with the previous mentioned Standard Plans for each specific site location. For guardrail this includes layout details indicating site location, designed length of guardrail, guardrail design layout table, and specific guardrail pay items for each project site.

Design guidelines for clear zone distances, run out lengths, shy line offsets, flare rates and horizontal curve adjustments, etc. are based on the latest AASHTO Roadside Design Guide recommendations.

The safety performance of an existing site may provide the designer with insight and if a location experiences a poor safety performance (Level of Service of Safety 4), the design may consider additional countermeasures for preventing and/or mitigating crashes. Designers may contact the DOTD Highway Safety Office for access to this information and for technical assistance in determining the existing safety performance and appropriate countermeasures.

1.3—STANDARD PLANS, SPECIFICATIONS, EDSM'S

Highway safety hardware Standard Plans and specifications are available upon request for use on DOTD projects. Requests must be made to the Bridge Design Section. The DOTD Bridge Design website provides an index of all published standards and additional instructions for requesting Standard Plans and how to use an online request form to obtain these in different formats. You may also refer to Part I, Chapter 9 of this manual for more information.

For permanent overhead sign details, permanent roadside breakaway sign details and design guidelines refer to the DOTD Standard Plans and Volume 3, Structural Supports for Permanent Highway Signs of this manual for further information.

The following is a list of current DOTD Standard Plans, DOTD specifications and DOTD EDSM's related to highway safety hardware and permanent signing:

- Standard Plans
    - Guardrail (MASH TL-3) - Common Details for Bridge End and Non-Bridge End Applications
    - Guardrail (MASH TL-3) - Off-System Bridge
    - Guardrail (MASH TL-3) - Box Culvert Details
    - Guardrail (NCHRP 350 TL-3), GR-200, 201, 202, 203 (Used only for repairs to existing guardrail by DOTD Districts or DOTD Maintenance Section or with permission from the Bridge Design Engineer Administrator)
    - Guardrail and Bridge Railing Rehabilitation Details (MASH TL-3 and NCHRP 350 TL-3*) - Used for rehabilitation on existing guardrail and bridge rail generally in District roadway preservation projects.

(MASH TL-3 Letter Size, MASH TL-3 Full Size, NCHRP 350 TL-3 Letter Size, NCHRP 350 TL-3 Full Size)

- Guardrail End Treatments (Flared, 12'-6" and 18'-9") (NCHRP 350 TL-2)*
  (Letter Size, Full Size)
- Guardrail Layout for T-intersections (NCHRP 350 TL-2)*
  (Letter Size, Full Size)
- Temporary Precast Concrete F-shaped Barrier Details (MASH TL-3** and NCHRP 350 TL-3) for Work Zone applications
  (Temporary Concrete F-Shape Barrier (NCHRP 350 TL-3), Temp. Precast Barrier Transition F-Shape to NJ Shape)
- Permanent Roadside Traffic Signs (NCHRP 350 TL-3 and MASH TL-3**)
- Permanent Overhead Roadside Signs
- Bridge Barrier Details (NCHRP 350 TL-4 and MASH TL-4**)
  (F-Shape Barrier, Single-slope Barrier)
- Concrete Single Slope Roadway Median Barrier (MASH TL-4**)

- Construction Specifications, latest LA DOTD Standard Specifications for Roads and Bridges
  - Section 704 Guardrail
- DOTD Non Standard (NS) Special Provisions and Pay items
  - Cable Barrier System (NCHRP 350 TL-3 or TL-4)**
  - Cable Barrier Concrete Strips – concrete mow strips used with cable barrier
  - Impact Attenuator/Crash Cushion for permanent applications (NCHRP 350 and AASHTO MASH)
  - Impact Attenuator/Crash Cushion for construction zone applications (NCHRP 350 and AASHTO MASH)
- DOTD Engineering Directives and Standards Manual (EDSM)
  - EDSM II.3.1.3, Guardrail for Existing highways and Bridges
  - EDSM II.3.1.4, Guardrail, Other Bridge Rail End Treatment, Curbs and Sidewalks on Urban Bridges.

* Use only with permission from the DOTD Bridge Design Engineering Administrator and with an approved design exception.

** Currently working on new MASH details that will be issued in the future.

1.4—LA DOTD APPROVED MATERIALS LIST

For proprietary highway safety hardware, the following DOTD Approved Materials List (AML) are available on the DOTD web site under the DOTD Materials Lab Section AML.

- Guardrail End Treatments (MASH)
- Guardrail End Treatments (NCHRP 350)**
- Impact Attenuator (Low Maintenance)
- Impact Attenuator (Reusable)

** NCHRP 350 end treatment systems are to be used only when a MASH system is not available.