Topic 7-01 – General Information and Standards

7-01.1 Introduction

Traffic safety systems are highway features designed primarily to reduce the severity of run-off-road collisions, prevent errant vehicles from crossing the median, and decelerate errant vehicles. These features include, but are not limited to, guardrail, crash cushions, median barrier, end treatments, breakaway supports for signs and light standards, and truck escape ramps. (For more information about the design of truck escape ramp facilities, see Traffic Bulletin No. 24 and NCHRP Report 178.)

7-01.2 Roles and Responsibilities

The District Traffic Safety Office or District Traffic Operations Office is the primary district functional unit responsible for the application of standards and policies for use of traffic safety systems on State highways. The Headquarters Office of Traffic Safety Program ensures quality control of those standards and policies, and the Headquarters Traffic Operations Liaisons have authority over certain standards. The Division of Maintenance ensures the most efficient use of personnel and materials resources for those applications. The Project Engineer signs and stamps the project plans and is responsible for the selection and placement of traffic safety systems used in the project.

The following establishes the role and responsibility of headquarters or district personnel involved in decisions regarding installation or upgrade of traffic safety systems.

1. *Project Engineer:* The Project Engineer specifies traffic safety systems and shows their placement on the project plans. The engineer coordinates with the District Traffic safety Office/Branch to complete the *Exceptions to Traffic Safety System Standards* form.
2. *District Traffic Safety Systems Coordinator*: The District Traffic Safety Systems Coordinator is the primary contact for inquiries about traffic safety systems in the respective districts. The coordinator provides guidance for use of traffic safety systems and makes recommendations for exceptions to traffic safety systems standards that require District and Headquarters approval.
3. *District Traffic Safety Engineer*: The District Traffic Safety Engineer ensures compliance with the traffic safety systems policies in this chapter. The engineer recommends exceptions to traffic safety system standards that require Headquarters approval, and approves exceptions to the traffic safety system standards that require district approval.
4. *Deputy District Director of Traffic Operations*: The Deputy District Director of Traffic Operations, or their designee, along with the Deputy District Director of Maintenance and Headquarters Traffic Operations Liaison, approves the use of cable guardrail and cable median barrier. The Deputy District Director of Traffic Operations concurs with the use of concrete guardrail where the criteria in Topic 7-03.2(2) are not met.
5. *Deputy District Director of Maintenance*: The Deputy District Director of Maintenance, along with the Deputy District Director of Traffic Operations and Headquarters Traffic Operations Liaison, approves the use of cable guardrail and cable median barrier.
6. *Headquarters Traffic Operations Liaison*: The Headquarters Traffic Operations Liaison advises on the use of traffic safety systems and is the first contact in Headquarters Division of Traffic Operations for inquiries from district personnel. The Liaison may consult with the Headquarters Office of Traffic Safety Program, Traffic Safety Systems Branch Chief regarding inquiries from district personnel. The Liaison approves exceptions to the traffic safety system standards that require Headquarters approval.
7. *District Maintenance Engineer*: The District Maintenance Engineer is consulted regarding use of thrie beam barrier as outlined in Table 7-5.

7-01.3 Traffic Safety Systems Standards

This section identifies the traffic safety systems standards which are defined and implemented as follows:

Headquarters Approval Required: Statements of required practice that are considered the most essential are traffic safety system standards that use the word “shall” and are printed in **boldface**

type. Deviations from those standards are approved by the Headquarters Traffic Operations Liaison. The documentation requirements for the approval process for exceptions to traffic safety systems standards requiring Headquarters approval is in the appendix, and the editable format is posted on the Division of Traffic Operations, Office of Traffic Safety Program, Traffic Safety Devices Branch web site. See Table 7-1 for the list of traffic safety systems standards that require Headquarters approval for exceptions.

District Approval Required: Statements of recommended, but not essential practice in typical situations, with deviations allowed if engineering judgment or engineering study indicates the deviation to be appropriate, are traffic safety systems standards that appear in underlined type. The verb "should" is typically used. Deviations from those standards are approved by the District Traffic Safety Engineer. The documentation requirements for the approval process for exceptions to traffic safety systems standards requiring District approval is in the appendix, and the editable format is posted on the Division of Traffic Operations, Office of Traffic Safety Program, Traffic Safety Devices Branch web site. See Table 7-2 for the list of traffic safety system standards that require District approval for exceptions.

Procedural Traffic Safety System Requirements: Procedures required for the use of traffic safety systems are indicated by the word "must" and are enclosed with boxes in the text. The procedures may involve actions by the Headquarters Traffic Operations Liaison and/or the District Traffic Safety Engineer, along with the District Maintenance Engineer, or the Deputy District Directors for Traffic Operations and Maintenance. Where documentation is required, the District may determine its type. See Table 7-3 for the list of procedural traffic safety system requirements.

Permissive Traffic Safety Systems Standards: Permissive traffic safety systems standards are statements of practice that are permissive conditions and carry no requirements or recommendations. Permissive statements texts appear in normal type. The verb "may" is typically used for permissive traffic safety systems standards.

7-01.4 Traffic Safety Systems Designs and National Traffic Safety System Crash Testing Guidelines

This topic discusses the use of Caltrans approved traffic safety systems designs and provides overview of the national traffic safety systems crash testing guidelines that are the basis for the designs. It also addresses upgrading traffic safety systems in projects other than projects programmed in the Collision Reduction Category of the State Highway Operation and Protection Program (SHOPP).

1. *Standard Designs*: The Standard Plans contain design details for the construction of some non-proprietary traffic safety systems. These designs are based on full-scale crash tests and controlled conditions generally associated with typical highway features. Standard Plans cannot always be directly applied to all situations on existing roadways, and some design modifications may be needed. Modified or unique non-proprietary traffic safety system designs require review and approval of a Headquarters Traffic Operations Liaison. All approved traffic safety systems are listed on the Department's Pre-Qualified Products List (Authorized Materials List) for Highway Safety Features and available from the Traffic Safety Systems Coordinator.
2. *Overview of Crash Testing Guidelines*: As of October 1, 1998 all new, permanent installations of traffic safety systems shall meet National Cooperative Highway Research Program (NCHRP) Report 350 crash testing criteria, as described in "Recommended Procedures for the Safety Performance Evaluation of Highway Features." Procedures are presented for conducting vehicle crash tests and in-service evaluation of roadside safety features or appurtenances. The procedures promote the uniform testing and in-service evaluation of roadside safety features. Highway engineers may then confidently compare the safety performance of designs that are tested and evaluated by different agencies. The procedures are directed toward the safety performance of roadside safety features; other service requirements such as economics and aesthetics are not considered.

   The crash testing procedures are devised to subject roadside safety features to severe vehicle impact conditions rather than to typical or average highway situations. For vehicle crash testing, specific impact conditions are presented for vehicle mass, speed, approach angle and critical impact point on the safety feature. The crash test results are based on frontal impacts of vehicles; the crash testing

criteria do not include side or rear impacts by vehicles. Three primary appraisal factors are presented for evaluating the crash test performance: structural adequacy, occupant risk and after-collision vehicle trajectory.

NCHRP Report 350 updates the guidelines for in-service evaluation first provided in NCHRP Report 230, which recognized the complex nature of vehicular collisions and the limited resources of agencies responsible for monitoring the performance of new or modified safety features.

3. *Upgrading Traffic Safety Systems*: Standards for traffic safety systems have evolved over time and continue to change in response to changing technology, research findings, and changes in the design and speed of vehicles. Consequently, many existing traffic safety systems do not comply with the latest design standards. It is not always economically feasible or cost-effective to upgrade these existing installations each time revisions are made to the current standards.

   When major work is done in a project, traffic safety systems must be upgraded to current standards.

Table 7-1
Standards Requiring Headquarters Approval for Exceptions

Topic 7-03 Guardrail

Index 7-03.2(2) Concrete Guardrail Offset

7-03.6(2)(d) Guardrail and Curb/Dike

7-03.6(2)(e) Cross Slopes 10:1 or Flatter

7-03.6(5)(d) Pavement Overlays and Rehab Projects

Topic 7-04 Median Barrier

Index 7-04.5(2) Thrie Beam Barrier Maintenance Offset

7-04.6(1) Type 60 Barrier Selection

7-04.7(1) Longitudinal Median Dikes

7-04.7(6) Planted Medians

7-04.7(11) Pavement Overlays

7-04.8(3) Access Opening Intervals

Topic 7-05 Outer Separation Barrier

Index 7-05.2 Outer Separation Barrier Criteria

Table 7-2
Standards Requiring District Approval for Exceptions

Topic 7-02 Clear Recovery Zone Concept

Index 7-02.3 United States Postal Service Mailboxes

Topic 7-03 Guardrail

Index 7-03.2(1) Mixing Guardrail Post Types

7-03.5 Shielding Median Structure Columns

Guardrail on Two-Lane Highways

Guardrail on Two-Way, Multi-Lane Highways

7-03.6(1) Guardrail within 4 feet of Fixed Objects

7-03.6(2) Transition Railing Type WB at structure approaches or concrete barrier

7-03.6(2)(a) Two-Way Conventional Highway

7-03.6(2)(b) Multi-Lane Highway with Separate Structures

7-03.6(2)(c) Multi-Lane Freeways or Expressways with Decked Medians

7-03.6(2)(d) Curb and Dike

7-03.6(3) Intermediate Guardrail Anchorages

Concrete Guardrail Support Pads

7-03.6(4) Gaps Between Guardrail Installations

7-03.6(5)(a) Restricted Horizontal Clearance to Hinge Point

7-03.6(5)(b) Multiple blocks

Long Span Nested Guardrail

Topic 7-04 Median Barrier

7-04.7(4) Median Barriers on Raised Medians

Topic 7-06 Crash Cushions

Index 7-06.3 Crash Cushion Height

Table 7-3
Procedural Standards

Documentation in Project Files Required

Topic 7-03 Guardrail

Index 7-03.6(2)(e) Vehicle Trajectory and Guardrail

Topic 7-04 Median Barrier

Index 7-04.4(4) 2- and 3-Lane Conventional Highways

7-04.9 Glare Screens

District Traffic Safety Engineer Approval Required

Topic 7-03 Guardrail

Index 7-03.2(2) Attachments on Concrete Guardrail

7-03.4 Guardrail at Embankment Slopes

7-03.5 Guardrail at Fixed Object

7-03.6(1) Guardrail Length of Need

Topic 7-04 Median Barrier

Index 7-04.5(1) Attachments on Concrete Barrier

7-04.7(12) Wildlife Passageways

Topic 7-06 Crash Cushions

Index 7-06.3 Crash Cushion Placement

Headquarters Traffic Operations Liaison Approval Required

Topic 7-03 Guardrail

Index 7-03.6(2)(d) Curb and Dike

7-03.6(5)(a) Cast-In-Drilled-Hole Piles

7-03.6(5)(b) Special Post Footing

Topic 7-04 Median Barrier

Index 7-04.4(4) 2- and 3-Lane Conventional Highways

7-04.5 Modification of Barrier Type Selection Criteria

7-04.6(2) Sawtooth Thrie Beam Barrier

District Traffic Safety Engineer Approval and Documentation in the Project Files Required

Topic 7-03 Guardrail

Index 7-03.6(6) Deviation from Typical Layouts

Topic 7-04 Median Barrier

Index 7-04(1) Freeway Median Barrier

7-04.7(8) Median Barrier and Cross Slope

7-04.8 Barrier Openings

Headquarters Traffic Operations Liaison and Deputy District Directors of Traffic Operations and Maintenance Approvals Required

Topic 7-03 Guardrail

Index 7-03.2(3) Cable Guardrail

Topic 7-04 Median Barrier

Index 7-04.5(3) Cable Barrier

District Traffic Safety Engineer and Headquarters Traffic Operations Liaison Approval Required

Topic 7-03 Guardrail

Index 7-03.2(2) Concrete Guardrail