Illinois Department of Transportation
2300 South Dirksen Parkway / Springfield, Illinois / 62764

BDE PROCEDURE MEMORANDUM

NUMBER: 19-10

SUBJECT: BDE Manual Revision – Chapters 37, 38, 39, 44, 45, 49 and 50

DATE: November 27, 2019

Chapters 37, 38, 39, 44, 45, 49 and 50 of the BDE Manual have been revised regarding the requirements for roadside safety hardware and roadside safety design. The standard concrete median barrier shape has been updated to the current design shape, and appropriate references to the Manual for the Assessing Safety Hardware (*MASH, AASHTO 2016)* and *Highway Standards* have been added. Please see Chapters 37, 38, 39, 44, 45, 49 and 50 of the BDE Manual on the Department's website to view the revisions.

Background

The majority of the revisions occurred in Chapter 38, Roadside Safety. The chapter has been revised to reflect current crashworthiness requirements, provide updated roadside design guidance, and refine the example problems that serve as guidance for the layout of roadside safety hardware. Specifically:

- The chapter introduction has been supplemented with references to roadside safety information available throughout the BDE Manual for specific applications.
- Section 38-1 has clarified that HSIP projects typically are justified based on an assessment of benefits versus costs.
- Section 38-2, Definitions, has been revised to include an updated reference to MASH 2016.
- Section 38-3 now includes reference to the possibility of a design speed higher than 70 mph (110 km/hr) on certain roadways.
- Section 38-4 now includes an introduction stressing the importance of considering roadside safety issues early in project development.
    + Section 38-4.06 has additional design guidance related to curbs and culverts. Guidance regarding traversable end sections has been supplemented in accordance with current design standards, and the section presents policies for culvert metal end sections and references new Illinois Highway Standards.

- Section 38-5 on Roadside Barriers includes updates related to crashworthiness and the Illinois Highway Standards, with appropriate references to the Illinois Qualified Products Lists (QPLs).

    + 38-5.01(a) describes the variations to the Midwest Guardrail System (MGS) that are currently available for use as Steel Plate Beam Guardrail (SPBGR) and refers to the Illinois Highway Standards. New sub-sections have been added regarding SPBGR attached to culverts, long span SPBGR, and non-blocked SPBGR. Specific information on deflection has been removed from this section, and a reference added to the deflection information in Figure 38-6.V.
    + 38-5.01(b) presents new information on the TL-5 single slope barrier adopted by the department (Highway Standard 637006), as well as guidance on the design of concrete barrier when used as a roadside barrier.
    + 38-5.02 presents the relevant considerations when selecting barriers for specific applications. Information on test levels, dynamic deflection, preferred barriers, and concrete barriers has been adjusted to match current requirements.

- Section 38-6 provides substantial new information on roadside barrier layout.

    + 38-6.01 covers length of need. It describes how the choice of terminal end sections can affect the length of need in design. Six new and modified example problems are provided to show how the required length of need is determined for specific situations. Figure 38-6.A has been revised to incorporate an additional 25 feet of guardrail beyond the length of need point when utilizing a Type 2 guardrail end terminal. The procedures for utilizing the nomograph in determining guardrail length of need, and the sample guardrail length of need problems and resulting figures, reflect the revised procedures. Example problem 4 has been modified as a two-way, two-lane roadway with a recoverable front slope approaching a stream. Example problem 5 has been added as a two-way, two-lane roadway with a non-recoverable front slope approaching a stream. Renumbered example problem 6 and includes revised figures. Other figures in this section have been renumbered appropriately.
    + 38-6.02 has been modified regarding guardrail posts in mow strips less than or equal to 8 inches thick. Reference is made to new Highway Standard 630001.
    + Figure 38-6.V (previously Figure 38-6.T), showing dynamic deflection criteria for different guardrail types, has been updated to add weak post SPBGR and non-blocked SPBGR. Clarification

has been added for placement of SPBGR adjacent to curb in Test Level 3 and Test Level 2 situations.

+ 38-6.06(a) on guardrail end terminals has been revised and expanded to discuss Type 1 Special (Flared), Type 1 Special (Tangent), Type 1B, and Type 2 terminals in more detail.
+ 38-6.06(c) clarifies some limitations on bridge rail connections.
+ 38-6.07 provides additional guidance on minimum SPBGR lengths and gaps.
+ A new Figure showing a detail on non-blocked guardrail terminals (Figure 38-6.DD) has been added in Section 38-6.08.
+ 38-6.09 updates information on short radius guardrail and provides potential alternative design solutions.

- Section 38-7 on Median Barriers has been expanded to address the use of median barrier on both existing and proposed facilities, including updated crash cost information and a suggestion that decisions on installation of median barrier be tied to benefit/cost (B/C) calculations.
  + The section on proposed facilities also includes the recommendation to use the Enhanced Interchange Safety Analysis Tool (ISATe) software as a means to predict crash frequency and severity with and without a median barrier to determine the optimal cross-section for initial construction.
  + In 38-7.01(c) details of the B/C analysis procedures have been added.
  + New guidance on the single slope concrete median barrier is provided in 38-7.02(a).
  + Guidance related to the zone of intrusion (ZOI) has been supplemented in 38-7.04(c).
  + The title of 38-7.05(b) was changed to better reflect its content.
  + The example problem in 38-7.05 has been modified.

- Section 38-8 on Impact Attenuators has been modified to better describe their functions, properties, and selection. Once a corridor design speed is selected for a highway improvement, project devices must meet a particular test level.
  + Section 38-8.03(c) explains that approved devices such as sand module arrays do not need to be adjusted from those shown on *Highway Standard* 643001.
  + Information on impact attenuator systems have been updated in Figures 38-8.H and 38-8.I to match the current Qualified Products List (QPL) and it is clarified that the QPL should always be referenced for questions regarding systems and their MASH testing status.

- Section 38-9 has been revised to make minor clarifications on the treatment of the roadside in urban or restricted environments.

As previously mentioned, several other BDE Manual chapters have been updated to maintain consistency with the revised Chapter 38. These changes are as follows:

References to figures in the other chapters were updated to the new Chapter 38 figure numbers. Specific figure changes to reflect the current concrete median barrier design include:

- Figure 37-4.B
- Figures 39-5.C, 39-5.D, 39-5.I
- Figures 44-2.C, 44-2.D, 44-2.F, 44-2.G, 44-2.K, 44-3.J, 44-3.K, 44-3.L
- Figures 45-2.C, 45-2.F

Several additional figures in Section 39-5 now have notes to clarify the requirements for physical separation between the edges of the travelled way and either sidewalks or side paths on structures. This separation is a safety measure to protect non-motorized users.

Section 44-1.01 now provides a revised reference regarding establishment of a Freeway.

Section 49-3.07(e) was revised to delete redundant design information on culvert end treatment design, instead referring the designer to Section 38-4.06(b).

Section 50-3.02(b) was revised regarding the treatment of existing piers and abutment walls adjacent to the shoulder edge.

Section 50-3.03(a) was modified to refer to Section 38-4.06(b) in addition to Section 49-3.07(e).

Section 50-3.09 was revised regarding median guardrail at dual structures. Also the Figure reference was updated to refer to the re-numbered figure in Chapter 38.

Section 50-3.11 was revised regarding concrete barrier. Reference to an outdated Highway Standard was removed.

Please see the BDE Manual on-line to review the changes.

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