

SUBSECTION 2.3: ROADSIDE HARDWARE

The data items in this subsection identify crash tested roadside hardware on the bridge. These data items are considered part of the Primary Data Set and have a one-to-one relationship with a bridge.

The data for these items typically remain static once a bridge has been inventoried. The following data items are included in this subsection.

<u>Item ID</u>	<u>Data Item</u>
B.RH.01	Bridge Railings
B.RH.02	Transitions

Roadside hardware is commonly associated with bridges and serves as a traffic safety feature to redirect errant vehicles and reduce crash severity. The items in this subsection are inventoried to indicate if hardware at the bridge is required, present, or has been crash tested. Do not consider the condition of the hardware when reporting these items.

Table 6 contains the applicable crash testing codes used for all the roadside hardware items in this subsection. The applicable code may be based on an approved analytical equivalency evaluation.

Refer to the FHWA Office of Highway Safety website for policy and guidance on roadside hardware (http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/). Also, refer to the Task Force 13 – Hardware Guide website for roadside hardware, systems specifications, and individual component details.

The AASHTO LRFD Bridge Design Specifications are currently used to design bridge railings. The AASHTO Manual for Assessing Safety Hardware (MASH), which replaces NCHRP Report 350, is currently used for testing and evaluating the safety performance of roadside hardware.

The AASHTO Roadside Design Guide addresses appropriate bridge railings, roadside barriers, barrier end treatments, and crash cushions.

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Table 6. Roadside Hardware codes.

Code	Test Level Code						Description
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	
N							Not applicable – roadside hardware is not required.
	MYY1	MYY2	MYY3	MYY4	MYY5	MYY6	Roadside hardware successfully crash-tested for AASHTO MASH.
	3501	3502	3503	3504	3505	3506	Roadside hardware successfully crash-tested for NCHRP Report 350.
	2301	2302	2303				Roadside hardware successfully crash-tested for NCHRP Report 230.
	2391	2392	2393				Roadside hardware successfully crash-tested for NCHRP Report 239.
	891	892	893				Roadside hardware successfully crash-tested for 1989 AASHTO Guide Specifications for Bridge Railings.
X							Roadside hardware successfully crash-tested for other criteria.
AYY							Roadside hardware has not been crash-tested but meets AASHTO Standard Specifications for Highway Bridges.
SYY							Roadside hardware has not been crash-tested but meets approved agency standards.
I							Roadside hardware has not been crash-tested and does not meet approved agency standards.
0 (zero)							None - roadside hardware is required, but required roadside hardware is not present.

Note that YY, for codes in *Table 6*, represents the last two digits of the year for the crash testing publication, AASHTO Specifications, or agency approved standards.

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<i>Bridge Railings</i>		
<u>Format</u> AN (4)	<u>Frequency</u> I	<u>Item ID</u> B.RH.01
Specification	Commentary	
<p>Report the crash-test level for the bridge railings using one of the codes in <i>Table 6</i>.</p>	<p>This roadside hardware includes all types and shapes of bridge railings (parapets, median barriers, or structure mounted) located on the bridge or that cross over culverts.</p> <p>Use the code that first applies going from the bottom (Code 0) of <i>Table 6</i> to the top (MY), if there are more than one type of bridge railing on the bridge.</p>	
Commentary Continued		
<p>A list of crash-tested bridge railings may be obtained from the FHWA Office of Highway Safety website at: http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/.</p> <p>Bridge railings designed to meet AASHTO specifications prior to 1964 may not meet current specifications.</p> <p>Prior to 1993, bridge railings were tested according to the AASHTO Guide Specifications for Bridge Railings, NCHRP Report 230, or NCHRP Report 239.</p> <p>Since 1993, bridge railings were crash-tested and classified according to the guidelines shown in NCHRP Report 350.</p> <p>Refer to the May 30, 1997 memo at the FHWA Office of Highway Safety website for a list of crash-tested bridge railings with equivalent NCHRP Report 350 test levels.</p> <p>In 2009 the AASHTO Manual for Assessing Safety Hardware (MASH) replaced NCHRP 350. In 2015 AASHTO and FHWA entered into a MASH joint implementation agreement.</p> <p>Refer to State, Federal agency, or Tribal government policies for acceptable bridge railing standards.</p> <p>Use code I when no information is known about the crash test level or an agency approved standard. Also, use code I when an overlay is applied to the deck/slab and the height no longer meets the original geometry requirements of the crash-tested rail.</p>		

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<i>Transitions</i>		
<u>Format</u> AN (4)	<u>Frequency</u> I	<u>Item ID</u> B.RH.02
Specification	Commentary	
<p>Report the crash-test level for transition railings using one of the codes in <i>Table 6</i>.</p>	<p>This roadside hardware serves as the transition from the roadside approach railing to the bridge railing and is firmly attached and anchored to the bridge railing to provide sufficient tension in the transition rail upon impact.</p> <p>Use the code that first applies going from the bottom (Code 0) of <i>Table 6</i> to the top (MYY), if there are more than one type of transition.</p>	
Commentary Continued		
<p>A list of crash-tested transitions may be obtained from the FHWA Office of Highway Safety website at: http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/.</p> <p>Since 1993, transitions to bridge railings have been crash tested and classified according to the guidelines shown in NCHRP Report 350.</p> <p>In 2009 the AASHTO Manual for Assessing Safety Hardware (MASH) replaced NCHRP 350. In 2015 AASHTO and FHWA entered into a MASH joint implementation agreement.</p> <p>Refer to State, Federal agency, or Tribal government policies for acceptable transition railing standards.</p> <p>Use code I when no information is known about the crash test level or an agency approved standard. Also, use code I when an overlay is applied to the deck/slab and the height no longer meets the original geometry requirements of the crash-tested transition.</p>		

Examples – Bridge Railings/Transitions



Figure 11. Metal bridge railing and transition. (Source: Alaska DOT)

Bridge carries an NHS route with the following roadside hardware.

Alaska Multi-State Bridge Rail successfully crash-tested for NCHRP 350 Test Level 4.

- Report 3504 for Item B.RH.01 (*Bridge Railings*).

Alaska Multi-State Bridge Rail Thrie-Beam Transition successfully crash tested for NCHRP 350 Test Level 4.

- Report 3504 for Item B.RH.02 (*Transitions*).



Figure 12. Metal bridge railing and transition for long-span application. (Source: Delaware DOT)

Concrete pipe bridge that carries a non-NHS route with the following roadside hardware.

Steel W-beam bridge rail with wood posts (long-span application) successfully crash tested to MASH 2009 Test Level 3.

- Report M093 for Item B.RH.01 (*Bridge Railings*).

Steel W-beam transition with wood posts (long-span application) successfully crash tested to MASH 2009 Test Level 3.

- Report M093 for Item B.RH.02 (*Transitions*).

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Example Roadside Hardware Data for Bridge Number 15558X



Figure 13. Reinforced concrete bridge railing and metal transition railing for Bridge Number 15558X.

The bridge has a 32" tall New Jersey Concrete Safety Shape bridge railing system with details equivalent to the system that was crash-tested using the 1989 AASHTO Guide Specifications for Bridge Railings that resulted in a PL-2 performance level. This bridge railing system was determined through FHWA memo to have an NCHRP 350 TL-4 equivalency. Report 3504 for Item B.RH.01 (*Bridge Railings*).

The bridge has a Thrie-Beam transition system for which there is no known information about crash-testing. However, the transition system was built using approved agency standards from 1992. Report S92 for Item B.RH.02 (*Transitions*).

Table 7. Roadside Hardware. Data items in the Primary Data Set for Bridge Number 15558X.

Item ID	Data Item	Value
B.RH.01	<i>Bridge Railings</i>	3504
B.RH.02	<i>Transitions</i>	S92