

June 2022 ERRATA for *Manual for Assessing Safety Hardware*, 2nd Edition (MASH-2-UL)

June 2022

Dear Customer:

AASHTO has issued a fourth erratum, which includes technical revisions, for the *Manual for Assessing Safety Hardware*, 2nd Edition (MASH-2). Attached please find the full errata listing of changes that shows when each set of changes were made. Those changes detailed in the table are displayed in **bold** on those pages within the text.

Please feel free to download this listing from the AASHTO online Store at:
<http://downloads.transportation.org/MASH-2-UL-Errata.pdf>

AASHTO staff sincerely apologizes for any inconvenience.

List of Errata for AASHTO *Manual for Assessing Safety Hardware*, 2nd Edition (MASH-2-UL)

Original Page	Section	Existing Text	Corrected Text
June 2020 Errata			
16	Table 2-2B	Title: Recommended Test Matrices for Longitudinal Barriers	Title: Recommended TL-3 Test Matrix for Single Cable Median Barrier Designed for Placement Anywhere in 4H:1V V-Ditch
16–19	Tables 2B-2E		In table titles, change “Median Barrier” to “Cable Median Barrier”
19	Table 2-2E. Test 3-13. Barrier Location.	9 ft from Front SBP	4 ft from Front SBP
19	Table 2-2E. Test 3-14 Barrier Location.	9 ft from Front SBP	4 ft from Front SBP
21–22	Fig 2-2A and 2-2B		Add Test 17 (1500A) [See Note 3] to first cross section on each; remove heading at top of figure.
24	2.2.1.2 Test 17	For cable barriers installed on mostly level terrain or adjacent to steep roadside slopes (i.e., steeper than 3H:1V), Test 17 is recommended for evaluating the risk for passenger vehicles to penetrate between cables depending on barrier configuration (i.e., cable spacing, cable heights, etc.).	For cable barriers installed on mostly level terrain or adjacent to steep roadside slopes (i.e., steeper than 3H:1V), Test 17 evaluates the risk for passenger vehicles to penetrate between cables depending on barrier configuration (i.e., cable spacing, cable heights, etc.).
27	Table 2-3 for Non-redirective Crash Cushions Impact Tolerances Acc. Range for Tests:	1-40: ≥ 26 (35.6) 1-41: ≥ 54 (73.5) 1-42: ≥ 116 (158.0) 1-43: ≥ 26 (35.6) 1-44: ≥ 54 (73.5) 1-45: ≥ 98 (133.0)	1-40: ≥ 72 (98) 1-41: ≥ 149 (201) 1-42: ≥ 72 (98) 1-43: ≥ 149 (201) 1-44: ≥ 149 (201) 1-45: ≥ 98 (133)
28	Table 2-3 for Non-redirective Crash Cushions Impact Tolerances Acc. Range for Tests:	2-40: ≥ 51 (69.7) 2-41: ≥ 106 (144.0) 2-42: ≥ 228 (309.0) 2-43: ≥ 51 (69.7) 2-44: ≥ 106 (144.0) 2-45: ≥ 192 (261.0)	2-40: ≥ 141 (191) 2-41: ≥ 291 (395) 2-42: ≥ 141 (191) 2-43: ≥ 291 (395) 2-44: ≥ 291 (395) 2-45: ≥ 192 (261)
29	Table 2-3 for Non-redirective Crash Cushions Impact Tolerances Acc. Range for Tests:	3-40: ≥ 105 (142) 3-41: ≥ 216 (294) 3-42: ≥ 465 (631) 3-43: ≥ 105 (142) 3-44: ≥ 216 (294) 3-45: ≥ 392 (532)	3-40: ≥ 288 (390) 3-41: ≥ 594 (806) 3-42: ≥ 288 (390) 3-43: ≥ 594 (806) 3-44: ≥ 594 (806) 3-45: ≥ 393 (532)

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35	Test 44	Test 44 is designed to evaluate the ability of a non-redirective crash cushion to safely stop a large passenger vehicle in a side impact.	Test 44 is designed to evaluate the ability of a non-redirective crash cushion to safely stop a large passenger vehicle in an impact along the side of the device.
37	Table 2-4. for Test Level 1, Test 1-50, Kinetic Energy Tolerance	≥ 72 (97)	≥ 72 (98)
39	Test 54	TEST 54 (Optional) Test 54 is designed to evaluate the staging of energy absorbers in a TMA for impacts involving mid-size automobiles. It is desirable that TMAs provide acceptable levels of protection for all passenger vehicles. There is some concern that existing designs are finely tuned to minimize the TMA length while meeting the requirements of the small passenger car and heavy pickup truck tests, and designers do not consider occupant risk parameters for mid-sized car impacts. On the other hand, if existing designs must be lengthened to meet the requirements of this new test, there is concern that costs and operational problems may increase greatly and that durability will be diminished. Therefore, Test 54 is considered optional. However, manufacturers and user agencies are encouraged to develop and implement TMAs that can safely accommodate mid-sized vehicles. As presented previously in the description of Tests 38 and 45, this test can be waived with an analysis of the accelerometer data from Test 51 that indicates proper attenuator staging.	TEST 54 Test 54 is designed to evaluate the staging of energy absorbers in a TMA for impacts involving mid-size automobiles. It is desirable that TMAs provide acceptable levels of protection for all passenger vehicles. There is some concern that existing designs are finely tuned to minimize the TMA length while meeting the requirements of the small passenger car and heavy pickup truck tests, and designers do not consider occupant risk parameters for mid-sized car impacts. On the other hand, if existing designs must be lengthened to meet the requirements of this new test, there is concern that costs and operational problems may increase greatly and that durability will be diminished. Manufacturers and user agencies are encouraged to develop and implement TMAs that can safely accommodate mid-sized vehicles. Test 54 will be necessary unless, as presented previously in the description of Tests 38 and 45, with an analysis for the occupant risk parameters through the accelerometer data from Test 51 indicates proper attenuator staging is obtained. Test 54 should be conducted with the heaviest support vehicle mass or a blocked support vehicle similar to tests 50, 51, and 52, in order to maximize occupant risk for the mid-size sedan occupants.

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Original Page	Section	Existing Text	Corrected Text
42	Table 2-5. Acceptable KE Range	1-61: ≥ 72 (97) 1-71: ≥ 72 (97) 1-80: ≥ 94 (115) 1-90: ≥ 72 (97) 2-80: ≥ 94 (115) 3-80: ≥ 94 (115) 3-90: ≥ 141 (191) 3-91: ≥ 291 (395)	1-61: ≥ 72 (98) 1-71: ≥ 72 (98) 1-80: ≥ 72 (98) 1-90: ≥ 72 (98) 2-80: ≥ 72 (98) 3-80: ≥ 72 (98) 3-90: ≥ 288 (390) 3-91: ≥ 594 (806)
102	Table 5-1A. Applicable tests for Evaluation Criteria A.	10, 11, 12, 20, 21, 22, 30 ^a , 31 ^a , 32 ^a , 33 ^a , 34 ^a , 35, 36, 37 ^a , 38 ^a	10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 30 ^a , 31 ^a , 32 ^a , 33 ^a , 34 ^a , 35, 36, 37 ^a , 38 ^a
103	Table 5-1B. Applicable tests for Evaluation Criteria H- Longitudinal and Lateral	10, 11, 20, 21, 30, 31, 32, 33, 34, 35, 36, 37, 38, 40, 41, 42, 43, 44, 50, 51, 52, 53, 80, 81, 82, 90, 91	10, 11, 13, 14, 15, 16, 17, 18, 20, 21, 30, 31, 32, 33, 34, 35, 36, 37, 38, 40, 41, 42, 43, 45, 50, 51, 52, 53, 80, 81, 82, 90, 91
103	Table 5-1B. Applicable tests for Evaluation Criteria I- Longitudinal and Lateral	10, 11, 20, 21, 30, 31, 32, 33, 34, 35, 36, 37, 38, 40, 41, 42, 43, 45, 50, 51, 52, 53, 54, 60, 61, 62, 70, 71, 72, 80, 81, 90, 91	10, 11, 13, 14, 15, 16, 17, 18, 20, 21, 30, 31, 32, 33, 34, 35, 36, 37, 38, 40, 41, 42, 43, 45, 50, 51, 52, 53, 54, 60, 61, 62, 70, 71, 72, 80, 81, 82, 90, 91
104	Table 5-1C. Applicable Tests for Evaluation Criteria N	30 ^b , 31 ^b , 32 ^b , 33 ^b , 34 ^b , 37 ^b , 38 ^b , 40, 41, 42, 43, 44, 45, 60, 61, 70, 71, 72, 80, 81, 82, 90, 91	30 ^b , 31 ^b , 32 ^b , 33 ^b , 34 ^b , 37 ^b , 38 ^b , 40, 41, 42, 43, 44, 45, 60, 61, 62, 70, 71, 72, 80, 81, 82, 90, 91
106	5.2.2 Occupant Risk. Last paragraph on Page 106 ("It is essential...")	Paragraph ends with "... permit direct comparisons of before- and after-test conditions."	To the end of the paragraph, add: "The procedure given in Appendix E may be used to document the three-dimensional coordinates of the vehicle interior, prior to and after the test. By comparing the pre- and post-test interior coordinates, the extent of occupant compartment deformation can be calculated."
122–276	General Note: Due to the addition of larger sections of text, the pagination has changed from this point of the book and beyond.		

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135	A2.2.1 Longitudinal Barriers.	Text is missing after the first paragraph.	After the first paragraph, insert new paragraph: Note that target IS values for Test Levels 1 through 4 have been increased significantly. The increased severity will produce higher barrier impact loadings. It is therefore recommended that barrier design loads presented in AASHTO's Standard Specifications for Highway Bridges (4) be adjusted upward to reflect the new impact conditions.
135–139	A2.2.1 Longitudinal Barriers.	Text is missing.	Add text in section labeled A below.
144–145	A2.3 Impact Point for Redirective Devices.	Text is missing.	Add text in section labeled B below.
165	A5.2.2 Bullet for Windshield.	Text is missing.	Add text in section labeled C below.
166	A5.2.2 Bullet for Window.	Text is missing.	Add text in section labeled D below.
167	A5.2.2 Last paragraph.	Text edits are missing.	Add text in section labeled E below.
170	A5.2.3 Post-Impact Vehicular Response.	New text missing	Add text in section labeled F below.
176 and 180	Appendix B Text and Figures B.2 and B.4 depict a 2-ft diameter hole for use with post placement.	Text and figures depict a 2-ft diameter hole for use with post placement.	Text and figures should show a 3-ft diameter hole for use with post placement.
224 (Cont'd. on next page)	D1.8 Bogie Test. Second paragraph	Bogie vehicles may be used to simulate impacts with breakaway structures, work-zone traffic control devices, longitudinal barriers, or components of such systems. As discussed in Section 4.2.2, bogie vehicles must be revalidated periodically to ensure that the devices are representative of modern vehicles.	Replace paragraph entirely with: As discussed in Section 4.2.2, bogie vehicles must be revalidated periodically if the devices are to be representative of modern vehicles. Existing bogies have been designed to replicate vehicular crush characteristics and inertial properties of vehicles more than 25 years old. These bogie vehicles have been shown to be capable of simulating impacts with breakaway structures. However, significant improvements to the