American Association of State Highway and Transportation Officials
AASHTO
The Voice of Transportation

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ERRATA

September 2010

Dear Customer:

Recently, we were made aware of some technical revisions that need to be applied to the *Highway Safety Manual*, 1st Edition.

Please replace the existing text with the corrected text to ensure that your edition is both accurate and current. Users who purchased the CD-ROM need only to make the revisions noted in bold.

AASHTO staff sincerely apologizes for any inconvenience.

Errata to *Highway Safety Manual*, 1st Edition

Page	Existing Text	Corrected Text
3-17	**The term $e^{(-0.4865)}$ is used in Equation 3-4.**	**Change the term to $e^{(-0.312)}$.**
4-46	**Equation 4-16 is incorrect.**	**Replace Equation 4-16 with the following:** $\sigma = \sqrt{kN_{\text{predicted}}^2}$
7-14	Table 12 is referenced in the last paragraph.	Change the reference to Table 7-5.
9-21	Eq. A-10 is referenced in the last column in the table under Step 6.	Change the reference to Eq. 9A.1-11.
C-14	The term $e^{(-0.4865)}$ is used in Equation C-4.	Change the term to $e^{(-0.312)}$.
10-23	Table 10-7 is referenced in the 3rd row (CMF_{3r}) in Table 10-7.	Change the reference to Equation 10-13.
10-25	The calculation 0.98 + 6.875 is used in an equation within the last row in Table 10-9.	Change the calculation to 0.98 – 6.875.
10-42	**A 1,2000-ft horizontal curve radius is used in the 5th bullet under the heading The Facts.**	**Change the horizontal curve radius to 1,200 ft.**
11-56	Worksheet 3A is referenced in column (2) to the Fatal and injury row in Worksheet SP4B.	Change the reference to Worksheet SP4A.
12-114	Worksheet SP4B is referenced in column head (7) to Worksheet 2C.	Change the reference to Worksheet 2B.
12-115	Worksheet SP4B is referenced in column head (7) to Worksheet 2E.	Change the reference to Worksheet 2B.
13-22	There is no specific table referenced the first sentence of the first paragraph to Section 13.5.2.2.	Reference Table 13-21.
13-24	Table 13-2 is referenced in the 2nd paragraph to Section 13.5.2.4.	Change the reference to Table 13-23.
13-35	Table 13-411 is referenced in the 2nd paragraph to Section 13.8.2.7.	Change the reference to Table 13-41.
13-48	Table 13-54 is missing a row for installing pedestrian-activated flashing yellow beacons with overhead signs. In addition, the treatment to provide pedestrian overpasses and underpasses has a trend for urban arterials.	Replace Table 13-54 with the attached revision. Change bars indicate rows that have been revised.
14-10	Exhibit 14-8 is referenced in the last paragraph.	Change the reference to Table 14-4.
14-42	Exhibit 14-38 is referenced in the 3rd paragraph to Section 14.7.2.8.	Change the reference to Table 14-28.

Errata to *Highway Safety Manual*, 1st Edition

Page	Existing Text	Corrected Text
15-4	There are unknown crash effects for modifying ramp type or configuration and for providing pedestrian facilities on ramp terminals.	Replace Table 15-1 with the attached revision. The two rows referring to modifying ramp type or configuration and to providing pedestrian facilities on ramp terminals have been deleted.
15-11	A bulleted item is missing under Section 15A.3.1, Ramp Roadways.	Add the following bulleted item: ■ Modify ramp type or configuration.
15-12	A bulleted item is missing under Section 15A.3.1, Bicyclists and Pedestrians.	Add the following bulleted item: ■ Provide pedestrian facilities on ramp terminals.
16-6	Exhibit 16-5 is referenced in the 2nd sentence to Section 16.4.2.1.	Change the reference to Figure 16-1.
16-6	Figure 16-1 is referenced in the 3rd sentence to Section 16.4.2.1.	Change the reference to Figure 16-2.
17-5	There are unknown crash effects for mitigating aggressive driving through engineering and for implementing older driver education and retesting programs.	Replace Table 17-4 with the attached revision. The two rows referring to mitigating aggressive driving through engineering and to implementing older driver education and retesting programs have been deleted.
17-14	A subsection is missing under Section 17A.4.1.	Add the following subsection and text after the 3rd paragraph to subsection 17A.4.1.6: **17A.4.1.7. Conduct Enforcement to Reduce Red-Light Running** Automated enforcement for red-light running, combined with appropriate enabling legislation, potentially reduces crashes.
17-14 to 17-16	As a result of adding a subsection that was missing under Section 17A.4.1, renumber the remaining subsections.	Renumber ■ Section 17A.4.1.7 as Section 17A.4.1.8 ■ Section 17A.4.1.8 as Section 17A.4.1.9 ■ Section 17A.4.1.9 as Section 17A.4.1.10 ■ Section 17A.4.1.10 as Section 17A.4.1.11 ■ Section 17A.4.1.11 as Section 17A.4.1.12
Throughout	**Some equations using natural logarithm were inadvertently typeset with "*In*" instead of "ln".**	**Please replace the "*In*" with "ln" in these equations.**

Table 13-54. Summary of Roadway Treatments for Pedestrians and Bicyclists

HSM Section	Treatment	Rural Two-Lane Road	Rural Multilane Highway	Freeway	Expressway	Urban Arterial	Suburban Arterial
Appendix 13A.9.1.1	Provide a sidewalk or shoulder	N/A	N/A	N/A	N/A	T	—
Appendix 13A.9.1.2	Install raised pedestrian crosswalks	N/A	N/A	N/A	N/A	T	T
Appendix 13A.9.1.3	Install pedestrian-activated flashing yellow beacons with overhead signs	N/A	N/A	N/A	N/A	T	T
Appendix 13A.9.1.4	Install pedestrian-activated flashing yellow beacons with overhead signs and advance pavement markings	N/A	N/A	N/A	N/A	T	T
Appendix 13A.9.1.5	Install overhead electronic signs with pedestrian-activated crosswalk flashing beacons	N/A	N/A	N/A	N/A	T	—
Appendix 13A.9.1.6	Reduce posted speed limit through school zones during school times	T	T	N/A	N/A	T	T
Appendix 13A.9.1.7	Provide pedestrian overpasses and underpasses	—	—	N/A	N/A	T	T
Appendix 13A.9.1.8	Mark crosswalks at uncontrolled locations, intersection or mid-block	—	N/A	N/A	N/A	T	T
Appendix 13A.9.1.9	Use alternative crosswalk markings at mid-block locations	—	N/A	N/A	N/A	T	T
Appendix 13A.9.1.10	Use alternative crosswalk devices at mid-block locations	—	N/A	N/A	N/A	T	T
Appendix 13A.9.1.11	Provide a raised median or refuge island at marked and unmarked crosswalks	N/A	N/A	N/A	N/A	T	T
Appendix 13A.9.1.12	Provide a raised or flush median or center two-way left-turn lane at marked and unmarked crosswalks	N/A	N/A	N/A	N/A	T	T
Appendix 13A.9.1.13	Install pedestrian refuge islands or split pedestrian crossovers	N/A	N/A	N/A	N/A	T	T
Appendix 13A.9.1.14	Widen median	N/A	—	N/A	N/A	T	T
Appendix 13A.9.1.15	Provide dedicated bicycle lanes (BLs)	N/A	N/A	N/A	N/A	T	—
Appendix 13A.9.1.16	Provide wide curb lanes (WCLs)	N/A	N/A	N/A	N/A	T	—
Appendix 13A.9.1.17	Provide shared bus/bicycle lanes	N/A	N/A	N/A	N/A	T	—
Appendix 13A.9.1.18	Re-stripe roadway to provide bicycle lane	N/A	N/A	N/A	N/A	T	—
Appendix 13A.9.1.19	Pave highway shoulders for bicycles	T	T	N/A	N/A	N/A	—
Appendix 13A.9.1.20	Provide separate bicycle facilities	N/A	N/A	N/A	N/A	T	—

NOTE: T = Indicates that a CMF is not available but a trend regarding the potential change in crashes or user behavior is known and presented in Appendix 13A.
N/A = Indicates that the treatment is not applicable to the corresponding setting.

15.4. CRASH EFFECTS OF INTERCHANGE DESIGN ELEMENTS

15.4.1. Background and Availability of CMFs

Table 15-1 lists common treatments related to interchange design and the CMFs available in this edition of the HSM. Table 15-1 also contains the section number where each CMF can be found.

Table 15-1. Treatments Related to Interchange Design

HSM Section	Treatment	Trumpet	One Quadrant	Diamond	Single Point Urban	Partial Cloverleaf	Full Cloverleaf	Directional
15.4.2.1	Convert intersection to grade-separated interchange	✓	✓	✓	✓	✓	✓	✓
15.4.2.2	Design interchange with crossroad above freeway	✓	—	✓	—	✓	✓	—
15.4.2.3	Modify speed change lane design	✓	✓	✓	✓	✓	✓	✓
15.4.2.4	Modify two-lane-change merge/diverge area to one-lane-change	✓	✓	✓	✓	✓	✓	✓
Appendix 15A.2.2.1	Redesign interchange to modify interchange configuration	T	T	T	T	T	T	T
Appendix 15A.2.2.2	Modify interchange spacing	T	T	T	T	T	T	T
Appendix 15A.2.2.3	Provide right-hand exit and entrance ramps	T	T	T	T	T	T	T
Appendix 15A.2.2.4	Increase horizontal curve radius of ramp roadway	T	T	T	T	T	T	T
Appendix 15A.2.2.5	Increase lane width of ramp roadway	T	T	T	T	T	T	T
Appendix 15A.2.2.6	Increase length of weaving areas between adjacent entrance and exit ramps	T	T	T	T	T	T	T
Appendix 15A.2.2.7	Redesign interchange to provide collector-distributor roads	T	T	T	T	T	T	T
Appendix 15A.2.2.8	Provide bicycle facilities at interchange ramp terminals	T	T	T	T	T	T	T

NOTE: ✓ = Indicates that a CMF is available for this treatment.
T = Indicates that a CMF is not available but a trend regarding the potential change in crashes or user behavior is known and presented in Appendix 15A.
— = Indicates that a CMF is not available and a crash trend is not known.

islation, and enforcement levels. Road-use culture evolves as individuals influence society and as society influences individuals. Additional information regarding road-use culture can be found in Appendix 17A.

Table 17-4 summarizes treatments related to road-use culture and the corresponding CMFs available. The treatments summarized below encompass engineering, enforcement, and education.

Table 17-4. Road-Use Culture Network Considerations and Treatments

HSM Section	Treatment	Urban	Suburban	Rural
17.5.2.1	Install automated speed enforcement	✓	—	✓
17.5.2.2	Install changeable speed warning signs	✓	✓	✓
Appendix 17A.4.1.1	Deploy mobile patrol vehicles	T	T	T
Appendix 17A.4.1.2	Deploy stationary patrol vehicles	T	T	T
Appendix 17A.4.1.3	Deploy aerial enforcement	T	T	T
Appendix 17A.4.1.4	Deploy radar and laser speed monitoring equipment	T	T	T
Appendix 17A.4.1.5	Install drone radar	T	T	T
Appendix 17A.4.1.6	Modify posted speed limit	T	T	T
Appendix 17A.4.1.7	Conduct enforcement to reduce red-light running	T	T	T
Appendix 17A.4.1.8	Conduct enforcement to reduce impaired driving	T	T	T
Appendix 17A.4.1.9	Conduct enforcement to increase seat belt and helmet use	T	T	T
Appendix 17A.4.1.10	Implement network-wide engineering consistency	T	T	T
Appendix 17A.4.1.11	Conduct public education campaigns	T	T	T
Appendix 17A.4.1.12	Implement young drivers and graduated driver licensing programs	T	T	T

NOTE: ✓ = Indicates that a CMF is available for the treatment.
T = Indicates that a CMF is not available but a trend regarding the potential change in crashes or user behavior is known and presented in Appendix 17A.
— = Indicates that a CMF is not available and a trend is not known.

17.5.2. Road Use Culture Network Consideration Treatments with CMFs

17.5.2.1. Install Automated Speed Enforcement

Automated enforcement systems use video or photographic identification in conjunction with radar or lasers to detect speeding drivers. The systems automatically record vehicle registrations without needing police officers at the scene.

The crash effects of installing automated speed enforcement in urban or rural areas on all road types are shown in Table 17-5 (1,3,5,7,9,12). The base condition for this CMF (i.e., the condition in which the CMF = 1.00) is the absence of automated speed enforcement.