

Table of Contents for HSM Supplement

CHAPTER 18—Predictive Method for Freeways

18.1. INTRODUCTION	18-1
18.2. OVERVIEW OF THE PREDICTIVE METHOD	18-1
18.3. FREEWAYS—DEFINITIONS AND PREDICTIVE MODELS.....	18-2
18.3.1. Definition of Freeway Facility and Site Types	18-2
18.3.2. Predictive Model for Freeway Segments	18-4
18.3.3. Predictive Model for Freeway Speed-Change Lanes	18-6
18.4. PREDICTIVE METHOD FOR FREEWAYS	18-7
18.4.1. Step-by-Step Description of the Predictive Method	18-7
18.4.2. Data Needed to Apply the Predictive Method	18-14
18.5. ROADWAY SEGMENTS AND SPEED-CHANGE LANES	18-21
18.5.1. Definition of Freeway Segment and Speed-Change Lane.....	18-21
18.5.2 Segmentation Process	18-22
18.5.3. Crash Assignment to Sites.....	18-23
18.6. SAFETY PERFORMANCE FUNCTIONS	18-24
18.6.1. Safety Performance Functions for Freeway Segments	18-24
18.6.2. Safety Performance Functions for Speed-Change Lanes.....	18-29
18.7. CRASH MODIFICATION FACTORS	18-34
18.7.1. Crash Modification Factors for Freeway Segments.....	18-35
18.7.2. Crash Modification Factors for Speed-Change Lanes	18-45
18.7.3. Supplemental Calculations to Apply Crash Modification Factors	18-50
18.8. SEVERITY DISTRIBUTION FUNCTIONS.....	18-53
18.9. CALIBRATION OF THE SPFS AND SDFS TO LOCAL CONDITIONS	18-56
18.10. LIMITATIONS OF PREDICTIVE METHOD.....	18-56

18.11. APPLICATION OF PREDICTIVE METHOD	18-57
18.11.1. Freeways with Barrier-Separated Managed Lanes	18-57
18.11.2. Freeways with Toll Facilities	18-57
18.12. SUMMARY	18-57
18.13. SAMPLE PROBLEMS	18-58
18.13.1. Sample Problem 1	18-58
18.13.2. Sample Problem 2	18-69
18.13.3. Sample Problem 3	18-82
18.13.4. Sample Problem 4	18-90
18.13.5. Sample Problem 5	18-98
18.13.6. Sample Problem 6	18-104
18.14. REFERENCES.....	18-110
APPENDIX 18A—WORKSHEETS FOR PREDICTIVE METHOD FOR FREEWAYS	18-111

CHAPTER 19—Predictive Method for Ramps

19.1. INTRODUCTION	19-1
19.2. OVERVIEW OF THE PREDICTIVE METHOD	19-1
19.3. RAMPS—DEFINITIONS AND PREDICTIVE MODELS.....	19-2
19.3.1. Definition of Ramp Site Types.....	19-3
19.3.2. Predictive Model for Ramp Segments	19-7
19.3.3. Predictive Model for Ramp Terminals.....	19-9
19.4. PREDICTIVE METHOD FOR RAMPS AND RAMP TERMINALS	19-10
19.4.1. Step-by-Step Description of the Predictive Method	19-10
19.4.2. Data Needed to Apply the Predictive Method	19-17
19.5. RAMP SEGMENTS AND RAMP TERMINALS	19-25
19.5.1. Definition of Ramp Segment and Ramp Terminal.....	19-25
19.5.2 Segmentation Process.....	19-26
19.5.3. Crash Assignment to Sites.....	19-27
19.6. SAFETY PERFORMANCE FUNCTIONS	19-27
19.6.1. Safety Performance Functions for Ramp Segments	19-28
19.6.2. Safety Performance Functions for Ramp Terminals.....	19-35

19.7. CRASH MODIFICATION FACTORS	19-45
19.7.1. Crash Modification Factors for Ramp Segments	19-46
19.7.2. Crash Modification Factors for Ramp Terminals	19-54
19.7.3. Supplemental Calculations to Apply Crash Modification Factors	19-65
19.8. SEVERITY DISTRIBUTION FUNCTIONS	19-72
19.8.1. Severity Distribution Functions for Ramp Segments	19-73
19.8.2. Severity Distribution Functions for Ramp Terminals	19-74
19.9. CALIBRATION OF THE SPFS AND SDFS TO LOCAL CONDITIONS	19-76
19.10. INTERIM PREDICTIVE METHOD FOR ALL-WAY STOP CONTROL	19-77
19.11. LIMITATIONS OF PREDICTIVE METHOD	19-78
19.12. APPLICATION OF PREDICTIVE METHOD	19-79
19.13. SUMMARY	19-79
19.14. SAMPLE PROBLEMS	19-80
19.14.1. Sample Problem 1	19-80
19.14.2. Sample Problem 2	19-91
19.14.3. Sample Problem 3	19-101
19.14.4. Sample Problem 4	19-114
19.14.5. Sample Problem 5	19-125
19.14.6. Sample Problem 6	19-134
19.15. REFERENCES	19-143
APPENDIX 19A—WORKSHEETS FOR PREDICTIVE METHOD FOR RAMPS	19-144

APPENDIX B—Specialized Procedures Common to Chapters 18 and 19

B.1. CALIBRATION OF THE CHAPTER 18 AND 19 PREDICTIVE MODELS	B-1
B.1.1. CALIBRATION OF PREDICTIVE MODELS	B-2
B.1.1.1. Step 1—Identify the predictive models to be calibrated.	B-2
B.1.1.2. Step 2—Select sites for calibration of the predictive model.	B-3
B.1.1.3. Step 3—Obtain data for each set of calibration sites for the calibration period.	B-4
B.1.1.4. Step 4—Apply the applicable predictive method to estimate the predicted average crash frequency for each site during the calibration period as a whole.	B-8
B.1.1.5. Step 5—Compute calibration factors for use in the predictive models.	B-8

B.1.2. DEVELOPMENT OF JURISDICTION-SPECIFIC SAFETY PERFORMANCE FUNCTIONS (SPFS) FOR USE IN THE PREDICTIVE METHOD	B-8
B.1.3. REPLACEMENT OF SELECTED DEFAULT VALUES IN THE PREDICTIVE METHODS.....	B-9
B.1.3.1. Replacement of Default Values for Freeways	B-10
B.1.3.2. Replacement of Default Values for Ramps	B-11
B.1.4. CALIBRATION OF SEVERITY DISTRIBUTION FUNCTIONS	B-12
B.1.4.1. Step 1 Identify the site types for which the SDFs are to be calibrated.....	B-12
B.1.4.2. Step 2—Select sites for calibration of the SDF.....	B-12
B.1.4.3. Step 3—Obtain data for each set of calibration sites for the calibration period.	B-13
B.1.4.4. Step 4—Apply the applicable predictive method to estimate the predicted average crash frequency by severity for each site during the calibration period.	B-13
B.1.4.5. Step 5—Compute the calibration factors for use in the SDFs.....	B-13
B.2. THE EMPIRICAL BAYES METHOD	B-14
B.2.1. Determine whether the EB Method is Applicable.....	B-15
B.2.2. Determine whether Observed Crash Data are Available for the Project and, if so, Obtain those Data.....	B-16
B.2.2.1. Projects with One Site	B-16
B.2.2.2. Projects with Two or More Sites	B-18
B.2.3. Assign Crashes to Individual Sites for Use in the EB Method	B-19
B.2.4. Apply the Site-Specific EB Method	B-20
B.2.5. Apply the Project-Level EB Method.....	B-22
B.2.6. Estimate the Expected Average Crash Frequency for a Future Time Period	B-26
B.2.7. EB Method for Segments with an Odd Number of Lanes.....	B-28
B.3. REFERENCES	B-30