

SAFETY ANALYSIS TOOLS FOR DESIGN EXCEPTIONS AND VARIATIONS (MAY 2013)

13 Controlling Design Elements	2-lane Undivided			4-lane Undivided			4-lane Divided			Urban & Suburban Arterials			Freeways			Speed-Change Lanes			Ramps			All Facilities		Reference ID for State Safety Office CRFs or CRF Recommended Range
	Highway Safety Manual		FHWA Clearinghouse CMFs	Highway Safety Manual		FHWA Clearinghouse CMFs	Highway Safety Manual		FHWA Clearinghouse CMFs	Highway Safety Manual		FHWA Clearinghouse CMFs	Highway Safety Manual		FHWA Clearinghouse CMFs	Highway Safety Manual		FHWA Clearinghouse CMFs	Highway Safety Manual	FHWA Clearinghouse CMFs	Roadside Safety Analysis Program (RSAP)	Historical Crash Method (HCM)		
	Part C	Part D		Part C	Part D		Part C	Part D		Part C	Part D		Part C	Part D		Part C	Part D						Part C	
Design Speed			5-Star (5)			5-Star (5)			5-Star (5)		✓	3-Star (6) 4-Star (1) 5-Star (6)			5-Star (5)							✓	45, 116	
Lane Width	✓	✓	3-Star (4) 4-Star (6) 5-Star (12) Unrated (7)	✓	✓	3-Star (4) 4-Star (6) 5-Star (10) Unrated (5)	✓	✓	3-Star (4) 4-Star (6) 5-Star (8) Unrated (5)	✓	✓	3-Star (3) 4-Star (8) 5-Star (17) Unrated (5)	✓	✓	3-Star (5) 4-Star (1) 5-Star (1)	✓	✓					✓	18-22, 30-34, 43, 90, 95, 106, 118, 120-122, 126	
Shoulder Width	✓	✓	3-Star (4) 4-Star (6) 5-Star (15) Unrated (7)	✓	✓	3-Star (4) 4-Star (6) 5-Star (10) Unrated (5)	✓	✓	3-Star (4) 4-Star (6) 5-Star (8) Unrated (5)		✓	3-Star (3) 4-Star (8) 5-Star (20) Unrated (5)	✓	✓	3-Star (5) 4-Star (1) 5-Star (1)	✓	✓				✓	✓	18-22, 30-34, 43, 91, 92, 95, 106, 117, 118, 120-123, 126	
Bridge Width																						✓	94	
Horizontal Alignment	✓	✓										5-Star (3)	✓			✓						✓	84, 96	
Superelevation	✓	✓																				✓	85, 95, 96	
Vertical Alignment		✓	3-Star (1) Unrated (1)																			✓		
Grade	✓	✓	3-Star (1) Unrated (1)																			✓	95	
Stopping Sight Distance																						✓	104	
Cross Slope																						✓	Recommended CRF Range 0.30 - 0.33	
Vertical Clearance																						✓		
Horizontal Clearance (lateral offset to obstruction)	✓	✓	3-Star (4) 4-Star (2) 5-Star (7) Unrated (32)		✓	3-Star (3) 4-Star (2) 5-Star (3)		✓	3-Star (3) 4-Star (6) 5-Star (4)		✓	3-Star (3) 4-Star (2) 5-Star (1)		✓	3-Star (3) 4-Star (2) 5-Star (1)		✓				✓	✓	23-29, 35-38, 78-83, 101, 107, 114, 125, 127	
Structural Capacity	Provide Load Rating Calculations and Maintenance Office Recommendation for Inventory Ratings less than 1.0. See FDOT Structures Design Guide Sections 1.7, 3.15.14, 4.6.10, & 7.1.1 and FDOT Bridge Load Rating Manual (http://www.dot.state.fl.us/statemaintenanceoffice/LRManual82012.pdf)																					105		

- NOTES:**
- The interactive version of this spreadsheet will be coming soon.
 - 1-Star (#) - Numbers in parenthesis indicate number of available FHWA Clearinghouse CMFs with its corresponding Star Rating as of May 2013. This table will be updated on an as-needed basis using the latest FHWA Clearinghouse CMFs which are updated quarterly.
 - CMF - measures the percentage of change in number of crashes as a result of implementing one or more countermeasures; typically are applied in HSM Predictive Analyses.
 - CRF - measures the percent reduction in number of crashes as a result of implementing one or more countermeasures; typically are applied in Historical Crash Method Analyses.
 - CMF & CRF - multiplicative factors that can help identify the safety impacts of implementing one or more countermeasures. Mathematically related: $CMF = 1 - (CRF / 100)$.
 - FDOT State Safety Office CRFs with less than 3 Projects are not recommended for use. In any analysis, no more than 3 Cumulative CMFs/CRFs should be used. Non cumulative CRFs or CRFs shall not be used together. (e.g. a stop sign and a traffic signal)
 - FHWA CRFs can be used with the Historical Crash Method.
 - References used to produce this table include:

Reference	Website
Highway Safety Manual	www.highwaysafetymanual.org
FHWA Clearinghouse	www.clearinghouse.org
FDOT State Safety Office CRFs	www.dot.state.fl.us/rddesign/QA/Tools/CRF.pdf
FDOT Roadway Design Office	www.dot.state.fl.us/rddesign/default.shtm
FHWA Desktop Reference for Crash Reduction Factors	safety.fhwa.dot.gov/tools/crf/resources/fhwasa08011