



## Florida Department of Transportation

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STATE SAFETY OFFICE BULLETIN 10-01  
ROADWAY DESIGN BULLETIN 10-09

DATE: August 5, 2010

TO: District Design Engineers, District Traffic Operation Engineers, District Safety Engineers, Plans Preparation Manual Holders

FROM: David C. O'Hagan, PE, State Roadway Design Engineer  
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COPIES: Brian Blanchard, Robert Robertson, Marianne Trussell, Thomas Bane, Roosevelt Petithomme, Duane Brautigam, Chris Richter (FHWA)

SUBJECT: Benefit/Cost Analysis, Roadside Safety Analysis Program and Discount (Interest) Rate

### **Benefit/Cost Analysis Background:**

The use of the Crash Reduction Factor (CRF) has not consistently been followed throughout the state. Resources have varied from the University of Florida 1988 Accident Reduction Factors for Use in Calculating Benefit/Cost to the Federal Highway Administration (FHWA) Desktop Reference for Crash Reduction Factors.

### **Requirements:**

To ensure that the items are used consistently, the following guidance is provided for obtaining the CRF in the Benefit/Cost analysis process (in the order of preference):

1. Florida Department of Transportation State Safety Office (SSO) – Crash Reduction Analysis System Hub (CRASH) CRASH is a web-based database application developed to systematically maintain statewide safety improvement project data to facilitate the continual process of updating CRFs. An excel spreadsheet of the CRFs is maintained on the SSO SharePoint:  
<http://cosharepoint.dot.state.fl.us/sites/safety/Safety%20Engineering/references/default.aspx>

Without access to the SSO SharePoint, contact Joe Santos at [joseph.santos@dot.state.fl.us](mailto:joseph.santos@dot.state.fl.us)

CRF utilized should be based on crash type. If there are multiple crash types it is recommended to utilize the CRF associated with the "Total" column. If there were less than 5 projects for the improvement type to generate the CRF, the resulting CRF may not be appropriate for the analysis. Proceed to the FHWA Crash Modification Factors (CMF) Clearinghouse.

2. FHWA Crash Modification Factors (CMF) Clearinghouse  
<http://www.cmfclearinghouse.org/>

The Crash Modification Factors Clearinghouse houses a Web-based database of CMFs along with supporting documentation to help transportation engineers identify the most appropriate countermeasure for their safety needs. The FHWA Desktop Reference for Crash Reduction Factors publication is contained within the database.

The quality of the countermeasure is important (number of stars). The star rating is based on a scale (1 to 5), where a 5 indicates the highest or most reliable rating.

**Implementation:**

These changes are effective immediately on all Design Exception and Variation submittals, and will be addressed in the January 1, 2011 Plans Preparation Manual (PPM) update.

**Roadside Safety Analysis Program and Discount (Interest) Rate Background:**

- The January 1, 2007 PPM contained changes to the methods for calculating the benefit/cost analysis for Design Exceptions and Variations. ROADSIDE 5.0 was replaced with RSAP. This Design Bulletin provides the updated crash cost figures to be utilized in the RSAP program.
  
- The interest rate used in calculating the present value of expected yearly benefits and costs is known as the discount rate. The discount rate should be appropriate for current economic conditions, in percent. The value may be adjusted to accommodate economic factors which provide the real difference of interest charged and annual inflation or satisfy a Rule requirement. In conducting a benefit-cost analysis the appropriate capital recovery factor must be applied in the calculation when using the Historical Crash Method. In recent years the various offices within Roadway Design and the State Safety Office have utilized different rates when conducting benefit-cost analysis. This bulleting provides one rate for all offices to use.

**Requirements:**

In the Plans Preparation Manual, Volume 1, Section 23.5, replace item “y” with the following:

- y) For areas with crash histories or when a benefit to cost analysis is requested, provide a time value analysis between the benefit to society quantified in dollars and the costs to society quantified in dollars over the life of the exception. In general practice the benefit to society is quantified by the reduction in crash cost foreseeable because of the proposed design and the cost due to the implementation of that change such as construction and maintenance costs over the life of the project. The Discount (interest) rate to be utilized in benefit/cost analysis is 4%.

Two acceptable methods for calculating a benefit/cost analysis are:

**1. Roadside Safety Analysis Program (RSAP)**

This method complements the Roadside Design Guide dated June 2002. When hazards cannot be removed or relocated, designers need to determine if a safety device, such as a guardrail or a crash cushion, is warranted to protect motorists from the roadside obstacle. This method can be used to perform a benefit/cost analysis comparing a safety treatment with the existing or baseline conditions (i.e., the do-nothing option) and/or alternative safety treatments. Based on the input (offsets, traffic, slopes, crash history, traffic accident severity levels, etc.) of information available to the user, the program will offer results which can be used in comparing courses of action.

When utilizing RSAP for analysis, the accident severity level costs to be should be revised as follows:

Option 3: KABCO

<b>Crash Severity</b>	<b>Comprehensive Crash Cost</b>
Fatal (K)	\$6,380,000
Severe Injury (A)	\$521,768
Moderate Injury (B)	\$104,052
Minor Injury (C)	\$63,510
Property Damage Only (O)	\$6,500

*Source: Florida Department of Transportation Crash Analysis Reporting (C.A.R.) System*

**2. Historical Crash Method (HCM)**

This method can be used for sites with a crash history. It is basically the ratio (benefit/cost) of the estimated reduction in crash costs to the estimated increase in construction and maintenance cost. The annualized conversion will show whether the estimated expenditure of funds for the benefit will exceed the direct cost, thereby lending support as to whether the improvement should be done or not.

The HCM uses the following **Highway Safety Improvement Program Guideline (HSIPG)** cost per crash by facility type to estimate benefit to society while the cost to society is estimated by the cost of right of way, construction, and maintenance.

HSIPG COST/CRASH BY FACILITY TYPE						
FACILITY TYPE	DIVIDED			UNDIVIDED		
	URBAN	SUBURBAN	RURAL	URBAN	SUBURBAN	RURAL
2-3 Lanes	\$85,851	\$151,015	\$260,531	\$92,847	\$228,613	\$402,003
4-5 Lanes	\$83,359	\$181,265	\$366,422	\$83,359	\$193,774	\$94,171
6+ Lanes	\$107,658	\$130,385	\$478,263	n/a	n/a	n/a
Interstate	\$141,197	n/a	\$295,810	n/a	n/a	n/a
Turnpike	\$124,459	n/a	\$215,507	n/a	n/a	n/a

All State Roads Average Cost/Crash: \$142,472

\*The above values were derived from 2005, 2006, 2007, 2008, and 2009 traffic crash and injury severity data for crashes on state roads in Florida, using the formulation described in *FHWA Technical Advisory "Motor Vehicle Accident Costs", T 7570.1, dated June 30, 1988* and *FHWA Technical Advisory, T 7570.2, dated October 31, 1994* using updated fatality cost of \$5.8 million as recommended in the U.S. Department of Transportation *Office of Secretary Transportation memo, Treatment of the Economic Value of a Statistical Life in Department Analysis dated February 5, 2008* (<http://ostpxweb.dot.gov/policy/reports/080205.htm>).

**Implementation:**

These changes are effective immediately on all Design Exception and Variation submittals. Please note that AASHTO has recently published the first edition of the Highway Safety Manual (HSM) which provides additional safety analysis tools and provides additional information on the CMFs. The Department is working on an implementation plan to address the use of the HSM and further guidance will be included in a future update to the PPM.

**Contacts:**

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