CRASH MODIFICATION FACTORS IN PRACTICE

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Real-world Application of Crash Modification Factors

*"**The CMFs in Practice series is an excellent tool** to show how crash modification factors **help rationalize risk** and **build better projects**. The series addresses important situations such as design exceptions, which are essential for **allowing flexibility in design**."*

- John E. Wright, P.E., Director, Highway Design and Technical Support
Indiana Department of Transportation

Nationwide, transportation professionals are using Crash Modification Factors (CMFs) to estimate how the design of a roadway element or implementation of a countermeasure can affect crashes. In the new Federal Highway Administration's CMFs in Practice series, road safety experts explore the many ways in which CMFs are being used, and demonstrate the value of this information in making educated decisions in the project development process.

Five separate guides document the use of CMFs in the following activities:

- Roadway Safety Management
- Road Safety Audits
- Development and Analysis of Alternatives
- Design Decisions and Exceptions
- Value Engineering

Each guide in the series includes a step-by-step demonstration of how CMFs can be applied in a specific activity, a case study to show real-world application of CMFs, discussion of potential challenges in applying CMFs, and opportunities to overcome those challenges.

ROADWAY SAFETY MANAGEMENT

When used in the roadway safety management process, CMFs can help teams select countermeasures and prioritize projects through an economic evaluation. A case study follows the Strategically Targeted Affordable Roadway Solutions program in Virginia, aimed at improving critical safety and congestion hot spots throughout the state. Study teams identify potential safety and operational issues, along with a list of potential countermeasures. CMFs are then applied to help justify and prioritize suggestions. Results are used by decision-makers to identify cost-effective strategies, eventually leading to more safety-focused projects.

ROAD SAFETY AUDITS

CMFs can be applied in the Road Safety Audit (RSA) process to quantify the safety effects of treatments and justify RSA team's suggestions to the project owner. A case study shows how CMFs were applied by the Michigan Department of Transportation in a RSA. In their report, the RSA team provided CMFs for several of their suggested countermeasures, an estimate of the annual crash reduction based on the CMFs, an estimate of the costs for each countermeasure, and a benefit-cost analysis. Results of the analysis can be used when applying for funding.

Crash modification factors (CMFs) support a number of safety-related activities in the project development process. The CMFs in Practice series includes five separate guides that identify opportunities to consider and quantify safety in specific activities, including roadway safety management processes, road safety audits, design decisions and exceptions, development and analysis of alternatives, and value engineering. The purpose of the CMFs in Practice series is to illustrate the value of CMFs in these five activities and demonstrate practical application of CMFs.

U.S. Department of Transportation
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DESIGN DECISIONS AND EXCEPTIONS

CMFs can be applied to quantify the safety impacts of individual design elements and evaluate the overall impact of design exceptions on the safety performance of a facility. One case study illustrates how CMFs were applied by the California Department of Transportation to estimate the safety impacts of proposed engineering improvements after 24 collisions occurred over a three-year period on a section of US 199. While some of the proposed changes do not meet California design standard, the use of CMFs demonstrated that a substantial reduction in crashes could be achieved compared to the existing conditions. Another case study illustrates how CMFs were applied in conjunction with safety performance functions (SPFs) by the Missouri Department of Transportation to quantify the safety performance of various design elements. SPFs were used to predict crashes for baseline conditions and CMFs were applied to adjust the baseline predicted crashes to reflect the conditions of interest. Results were used to select values for design elements that enhance safety.

DEVELOPMENT AND ANALYSIS OF ALTERNATIVES

CMFs can be applied in the analysis of alternatives to quantify the safety performance of alternative designs. In the first case study, to accommodate growing development in the Castle Rock, Colorado, area, the Colorado Department of Transportation considered two intersection designs as part of a new interchange on I-5. CMFs were employed to estimate the long-term safety performance of the two alternatives. The estimated safety performance of each alternative was compared with the operational performance, project costs, environmental impacts and other factors to identify a balanced design and the most desirable alternative. Another case study illustrates how CMFs were used in conjunction with SPFs by the Arizona Department of Transportation in the development and analysis of alternatives. SPFs were used to predict crashes for base conditions and CMFs were applied to adjust the baseline predicted crashes to reflect the conditions of interest. The results were used to identify an optimal shoulder width for the corridor based on cost-effectiveness.

VALUE ENGINEERING

CMFs can be applied in the Value Engineering process to explicitly consider and quantify safety impacts of opportunities identified by the study team. A case study illustrates how CMFs were applied in conjunction with SPFs by the Missouri Department of Transportation to quantify the safety impacts of opportunities related to the cross-section and roadside design. SPFs were used to predict crashes for baseline conditions and CMFs were applied to estimate crashes for the opportunities of interest. The results were used to compare the safety performance of the original design with alternatives that incorporated the value engineering team's suggestions.

*"The **application of CMFs** is an effective follow-up measure for **prioritizing safety improvement projects** for roadways that have been identified as areas with a **high crash reduction potential** by safety performance function models. With limited resources available to fund these projects, these tools are necessary to **establish transparency and accountability**."*

- David Swenka, P.E., Traffic Engineer
Colorado Department of Transportation

For More Information:

For more information about CMFs or the CMFs in Practice series, contact Karen Scurry, FHWA Office of Safety, karen.scurry@dot.gov, 609-637-4207.

Visit us on the web at:
http://safety.fhwa.dot.gov/tools/crf/resources/cmfs/

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