Research Notes

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A New Method for Posting Advisory Speeds

The *2009 Manual on Uniform Traffic Control Devices (MUTCD)* contains ball-bank criteria, the most widely used method to determine advisory speeds. The *MUTCD* also establishes that, in general, advisory speeds shall be determined by engineering studies. The use of accelerometers and computational side friction factors are among such accepted kinds of studies.

However, research has repeatedly shown that there are concerns associated with the consistency of the ball-bank indicator. A recent Oregon Department of Transportation research project, ***Safety Evaluation of Curve Warning Speed Signs***, which was completed by researchers at Oregon State University (OSU), proposed a computational alternative to the ball-bank indicator known as the OSU Method. This method can be expected to improve both the consistency and safety performance of posted advisory speeds. This method's underlying principle is that the recommended advisory speed should be such that it minimizes the expected number of crashes. The basis of quantifying expected crashes is a mathematical model that emerges from a statistical analysis of a sample representative of rural highways in Oregon.

Since completion of the ODOT research project, the OSU researchers have completed additional work on this subject. This included an extended comparison of the OSU and current posting methods using the complete original sample of 210 curves. This analysis found that both the OSU and MUTCD methods are expected to perform better than currently posted advisory speeds in Oregon. Additionally, the OSU researchers performed a validation analysis using a new random sample of 44 unidirectional curves at state-maintained highways from five counties within ODOT Region 2. This validation found that the safety effect of advisory speeds is indeed statistically meaningful, thus strengthening the evidence in favour of the potential benefit of a posting method based on safety performance such as the OSU Method.

The OSU Method requires the radius and superelevation be known. Practitioners can estimate these parameters from design plans, aerial photography, and design codes. However, there are instances in which determining the actual values of radius and superelevation may require a field visit. In such cases, the use of the ball-bank indicator may still offer logistical advantages.

The researchers took on an additional task to devise a method that combined the logistical advantages of using the ball-bank indicator with the consistency and safety performance of the OSU Method. The resulting Hybrid OSU Method comprises two basic steps: (1) using the ball-bank indicator on at least four independent runs around the candidate horizontal curve to obtain dynamic-equivalent estimates of the radius and superelevation; and (2) using these dynamic-equivalent estimates to determine the recommended advisory speed, as of the crash-minimizing principle originally proposed for the OSU method.

The research team developed and calibrated, the Hybrid OSU Method at 91 unidirectional horizontal curves on state-maintained rural highways; and validated the results at 90 curves on county-maintained rural highways in Oregon. The results of this effort indicate that, in spite of relying on the ball-bank indicator, the advisory speeds from this new method are more consistent than their counterparts from the traditional ball-

bank thresholds though are less consistent than the computational OSU method. Finally, the validation part of this new effort confirmed the same trend in terms of expected safety: the OSU Method is expected to yield safer advisory speeds than the Hybrid OSU method, whose advisory speeds are in turn expectedly safer than currently posted advisory speeds.

Despite the growing body of evidence that supports the science behind the OSU and the Hybrid OSU methods, their implementation could prove onerous without the use of computational tools, such as spreadsheets or applications for portable devices. For that reason, the researchers developed a spreadsheet application including the implementation of both posting methods. This is available, along with the research report, on the website listed below.

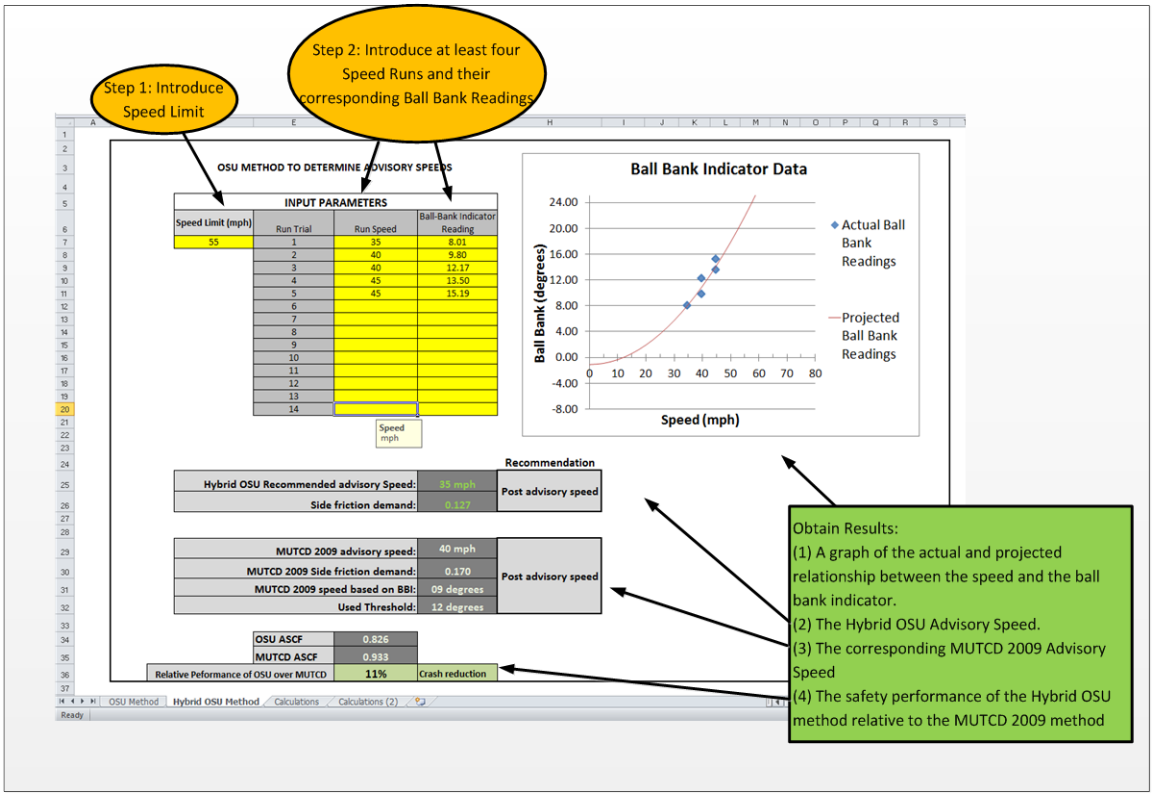

Figure: Spreadsheet for Use of the Hybrid Method to Determine Advisory Speeds

Oregon Department of Transportation
Research Section
200 Hawthorne Ave. SE, Suite B-240
Salem, OR 97301-5192
Telephone: 503-986-2700
FAX: 503-986-2844

To read the research report and to obtain the computational tools go to:
http://www.oregon.gov/ODOT/TD/TP_RES/docs/Reports/2011/WarningSpeedSignsSPR685.pdf

This Research Note was written by Raul Avelar, Oregon State University. For more information about this research, contact Raul via e-mail at eduardo.avelar@gmail.com.