



# SPR RESEARCH PROGRAM SECOND-STAGE PROBLEM STATEMENT FY 2008-09

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## I. PROBLEM NUMBER

TS-09-10

## II. PROBLEM TITLE

Safety Evaluation of Curve Warning Advisory Speed Signs

## III. RESEARCH PROBLEM STATEMENT

The use of curve warning advisory speed signs at sharp horizontal curve locations is standard throughout the United States. The safety benefits of advisory speed signs are assumed by the engineering community, but there is really no clear research demonstrating the safety evaluation of these signs and their relationship to crashes or changes to safe driver performance at these locations

Recently, researchers at Oregon State University completed an advisory speed evaluation of a random sample of 210 state highway horizontal curve locations on rural highways in Oregon. The purpose of this study was to determine the level of compliance with current advisory speed standards and the implications of changing posting criteria to match proposed revisions to the MUTCD signing guidelines (which are less conservative than those in use in Oregon). The study revealed that there are many current advisory speed signs that do not adhere to Oregon posting criteria. The research team suggested it may be appropriate to gradually upgrade signs based on some to-be-determined safety threshold that would be based, in part, on a determination if there has been a history of safety problems at locations that are not currently in compliance with posting criteria.

The conventional method of using a ball-bank device to determine recommendations for curve speeds is time consuming and may not produce consistent results. Uniform application of curve warning advisory speed signs is important for establishing driver expectancy.

## IV. RESEARCH OBJECTIVES

The goal of this proposed research is to ensure that advisory speeds are adequately posted in the state of Oregon, with particular emphasis on higher speed rural horizontal curve locations. This can be accomplished by evaluating the safety record for rural road horizontal curve locations in Oregon and contrast this record with advisory speed sign compliance. This research effort will also include an evaluation of potential advisory speed posting assessment procedures that can be performed prior to or instead of the current ball-bank field evaluation. These alternative procedures may ultimately provide more consistent and cost effective advisory speed posting techniques.

## V. WORK TASKS, COST ESTIMATE AND DURATION

Successful completion of this proposed research effort will include the following tasks:

1. **Literature Review:** The literature review will identify advisory speed literature that has been published since the literature review for the previous research effort was completed. It will identify any safety research regarding advisory speed posting including alternative posting procedures for advisory speeds. An interim report will be prepared. **Estimated cost:** \$10,000
2. **Data Collection and Assessment:** The data collection effort will be limited to acquiring prevailing speed information at a subset of the 210 curve locations used in the previous study. This sub-set of sites will include a variety of companion horizontal curve radii so that the direct influence of road geometry can be included in the assessment. This data will be analyzed to determine if the recommended advisory speed is consistent with observed speeds and, if not, how it differs. This information will then be used when assessing relative safety for posting techniques compared to crash history and expected operating conditions. **Estimated cost:** \$55,000
3. **Evaluation of Crash Data at Study Locations:** The research team will use historic crash data at the study curve locations to determine recent crash history (within the most recent five years) and how this information corresponds to advisory speed posting procedures. Included in this review will be approach and departure segments of road as

well as consideration of isolated curves compared to combination curve locations. An interim report will be prepared. **Estimated cost:** \$15,000

4. **Assess Alternative (In-Office) Speed Posting Evaluation Methods:** The conventional method of using a ball-bank device and driving along the curve multiple times at 5 mph increments is time consuming and may not always result in the same recommendations since the results depend on the test driver and equipment stability. This means that consistent posting of advisory signs is an issue. The research team will assess methods for evaluating curves by the use of aerial photos, operating speed information, and site information to determine if a less costly, more consistent procedure may be appropriate for determining proposed advisory speeds. An interim report will be prepared. **Estimated cost:** \$10,000
  5. **Recommendations:** The evaluations in tasks 3 and 4 will be combined to determine appropriate recommendations to be considered by Oregon decision makers in how to proceed with assuring consistent and appropriate advisory speed posting methods. In particular, the research team will recommend what site conditions pose the greatest risk if advisory speeds are not addressed and how ODOT could incrementally modify advisory speed signage effectively. **Estimated cost:** \$10,000
  6. **Reports:** The research team will prepare draft and final reports compiling the results presented in interim reports as well as final recommendations. **Estimated cost:** \$10,000
  7. **Project Coordination and Management:** ODOT staff time to coordinate TAC meetings, manage project, and prepare final report for publication. **Estimated cost:** \$5,000
- The project cost estimate is **\$115,000** with an **18-month** schedule.

## VI. IMPLEMENTATION

It is expected that updated advisory speed posting procedures including new methods for consistently evaluating speed posting evaluation methods will result from this research. The research team will make presentations to the appropriate officials as deemed necessary by ODOT and the TAC in order to disseminate this information to the appropriate representatives of ODOT or other agencies. Ultimately, the research results may be included in modified state-wide advisory speed posting procedures.

## VII. POTENTIAL BENEFITS

If this research is not performed, ODOT will have potentially unsafe conditions at improperly signed horizontal curve locations. Proposed changes to the MUTCD recommend a modified threshold for advisory speeds that varies significantly from the current Oregon threshold. Decision makers in Oregon must determine if they want to adopt new MUTCD thresholds or retain Oregon thresholds. In the event current Oregon thresholds are retained, the recent advisory speed study demonstrated that many of the current advisory speed signs do not meet Oregon criteria. The decision to invest in replacing these signs must also be considered. This research will aid Oregon decision makers by determining specific safety implications of current posted advisory speeds and the implications of either modifying the posting threshold or enforcing the current threshold. This proposed research will also help identify priorities for sign upgrades by determining the safety implications of the various compliance levels.

Additionally, since current advisory speed warning sign posting procedures require expensive site visits and field testing to determine the appropriate speed to post, the research team will determine if a more cost effective “office” technique for identifying advisory sign requirements may be feasible through the use of aerial photos or design plans.

## VIII. SUBMITTED BY

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