Project Summary

Texas Department of Transportation

0-5439: Identifying and Testing Effective Advisory Speed Setting Procedures

Background

Warning signs are intended to improve curve safety by alerting the driver to a change in geometry that may not be apparent or expected. These signs notify drivers of the change through the use of one or more of the curve warning signs identified in the *Manual on Uniform Traffic Control Devices* (*MUTCD*). Drivers may also be notified of the need to reduce their speeds through the use of an advisory speed plaque.

Several research projects conducted in the last 20 years have consistently shown that drivers are not complying with the advisory speed plaque. Several researchers have suggested that current practice in the U.S. for setting advisory speeds is contributing to this lack of compliance and a poor safety record. They advocate the need for a procedure that can be used to:

- identify when a curve warning sign and advisory speed plaque are needed, and
- select an advisory speed that is consistent with driver expectation.

The objectives of research project 0-5439 were to develop guidelines for determining when advisory speeds are needed to maintain safe operation, develop criteria for identifying appropriate advisory speeds, and develop a cost-effective engineering study method for determining the advisory speed for a given curve. The research project focused on horizontal curves that exist on rural highways in Texas. However, the research findings may be useful for establishing advisory speeds for urban streets.

What the Researchers Did

The project objectives were achieved through a series of research tasks. These tasks included:

- evaluating the crash history of sharper curves in Texas and quantifying the curve safety problem,
- evaluating car and truck driver curve speed choice as may be influenced by various factors,
- developing recommended guidelines and procedures for setting advisory speeds in conjunction with other warning signs and devices that enhance pavement edge delineation, and
- evaluating the effects of the recommended guidelines through field testing.

The research was based on a 2-year program of field investigation, data analysis, and guideline development. The research findings were used to develop a handbook to assist Texas Department of Transportation engineers with signing for rural highway curves.

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What They Found

An important objective in horizontal curve signing is having a consistent, or uniform, display of advisory speed on curves of similar geometry, character, and road surface condition. A uniformly applied advisory speed will be more likely to command the respect of drivers and achieve the desired safety benefits.

Most engineers believe that advisory speeds are usually too low by 5 to 10 mph. In fact, advisory speed signing appears to be largely ineffective if the goal is for drivers to actually travel at the posted advisory speed.

The traditional method of setting advisory speed is based on the ball-bank indicator. However, research indicates that the variability in ball-bank indicator readings taken on any given curve is relatively large. This variability makes it likely that advisory speeds will vary by 5 mph, and sometimes 10 mph, among curves of similar geometry and road surface condition.

Research also indicates that the tangent speed has a significant influence on driver curve speed choice; however, this influence is not reflected in the ball-bank criteria currently used to establish the advisory speed.

It is not uncommon for drivers on rural highways to exceed the regulatory speed limit. The amount by which the speed limit is exceeded varies with the speed limit and tends to be largest for lower speed limits. The implications of this trend are important when using guidelines for horizontal curve signing that have some basis in speed. Any guideline that is based on an assumed equality between the 85th percentile speed and the speed limit is not likely to yield the desired result.

An alternative method for establishing the advisory speed was developed in this project. It is referred to as the "compass method" because it uses a compass and distance measuring instrument to measure curve geometry. The compass method was found to be more capable of establishing consistent advisory speeds than the ball-bank indicator method.

What This Means

The main product of this research project is a *Horizontal Curve Signing Handbook*. This document provides technical guidance for engineers and technicians responsible for designing the traffic control device layout for horizontal curves. The handbook provides guidance for identifying curves that can substantially benefit from warning signs and supplemental pavement edge delineation. It also describes a method for accurately, consistently, and cost-effectively identifying the advisory speed. The guidelines and procedures described in the handbook are intended to promote the uniform application of curve warning signs in Texas, as well as advisory speeds that are consistent with driver expectancy. Statewide implementation of the procedures in the handbook is expected to restore driver respect for curve warning signs and improve curve safety.

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