



Basic Horizontal Curve Safety Treatments

Course Number: CE-03-902

PDH: 3

Approved for: AK, AL, AR, DC, DE, FL, GA, IA, ID, IL, IN, KS, KY, LA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NH, NJ, NM, NV, NY, OH, OK, OR, PA, SC, SD, TN, TX, UT, VA, VT, WI, WV, and WY

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This document is the course text. You may review this material at your leisure before or after you purchase the course.

After the course has been purchased, review the technical material and then complete the quiz at your convenience.

A Certificate of Completion is available once you pass the exam (70% or greater).

If a passing grade is not obtained, you may take the quiz as many times as necessary until a passing grade is obtained).

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INTRODUCTION

The roadway horizontal alignment is a series of horizontal tangents (straight roadway sections), circular curves, and spiral transitions. It shows the proposed roadway location in relation to the existing terrain and adjacent land conditions. Together with the *vertical alignment* (grades and vertical curves) and *roadway cross-sections* (lanes, shoulders, curbs, medians, roadside slopes, ditches, sidewalks), the **horizontal alignment** (tangents and curves) helps to provide a three-dimensional roadway layout. The main objective of geometric roadway design is to integrate these elements to produce a compatible speed with the road's function and location.

Safety, operational quality, and project costs can be significantly influenced by coordinating the horizontal and vertical alignments. In today's environment, designers must do more than apply design standards and criteria to 'solve' a problem. They must understand how various roadway elements contribute to safety and facility operation, including the horizontal alignment. The fundamental objective of good geometric design will remain as it has always been – **to produce a roadway that is safe, efficient, reasonably economic and sensitive to conflicting concerns.**

AASHTO's **Strategic Highway Safety Plan** set a goal of reducing annual highway fatalities by 5000 to 7000. Various guides are available to identify methods for reducing injuries and fatalities in targeted areas – one such area is the issue of vehicle crashes at horizontal curves.

The average crash rate for horizontal curves in the U.S. is roughly three times that for other highway sections. **A Guide for Reducing Collisions on Horizontal Curves** reports that nearly 25% of U.S. traffic fatalities are killed in vehicle crashes at curves annually with:

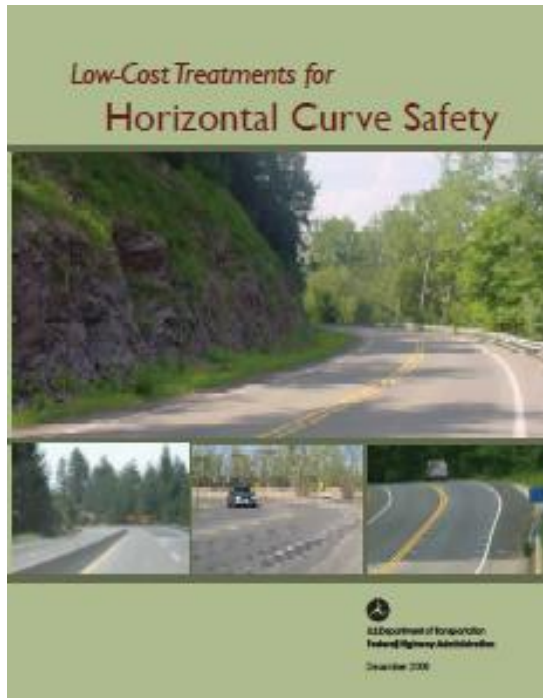
76% - single vehicles leaving the roadway

75% - rural roads

70% - two-lane secondary (local) road crashes

11% - head-on crashes.

Due to these statistics, the Federal Highway Administration (FHWA) identified Roadway Departure as one of its program emphasis areas and developed practical information publications for local agencies. The main reference for this course, **Low-Cost Treatments for Horizontal Curve Safety*** is a result of these Roadway Departure program goals.



http://safety.fhwa.dot.gov/roadway_dept/horcurves/fhwasa07002/fhwasa07002.pdf

* This reference may also be referred to as “LCTHCS” throughout this document and includes only those engineering treatments that are low cost strategies.

The Strategic Highway Safety Plan identified a set of strategies for reducing highway crash fatalities at horizontal curves. These included: **Goal 15 - *Keeping Vehicles on the Roadway***; and **Goal 16 - *Minimizing the Consequences of Leaving the Road***.



These strategies share one of the following for improving horizontal curve safety

1. **Reduce the likelihood of a vehicle leaving its lane and either crossing the roadway centerline or leaving the roadway at a horizontal curve**

and

2. **Minimize the adverse consequences of leaving the roadway at a horizontal curve.**

Several crash emphasis areas evolved: *head-on crashes, curve-related crashes, crashes with trees in hazardous locations, and run-off-road (ROR) crashes.*



COURSE CONTENTS

This course summarizes practical information on where, when, or how to apply safety treatments for horizontal curves or winding sections. These treatments are relatively low cost versus geometric design improvements (degree of curve, shoulders, superelevation, curve length, cross-section, etc.). Information for each treatment will generally include:

Description

Application guidelines – installation practices

Design elements and materials

Effectiveness – safety improvements

Cost

Estimates for treatment effectiveness in reducing crashes are included if available. Actual observed effectiveness values of a treatment may vary depending on its location.

Topics covered in this course include:

Basic Treatments – Devices found in the MUTCD

Centerline markings

Edge lines

Horizontal alignment signs

Advisory Speed Plaque

One-Direction Large Arrow Sign

Combination Horizontal Alignment/Advisory Speed Sign

Curve Speed Sign

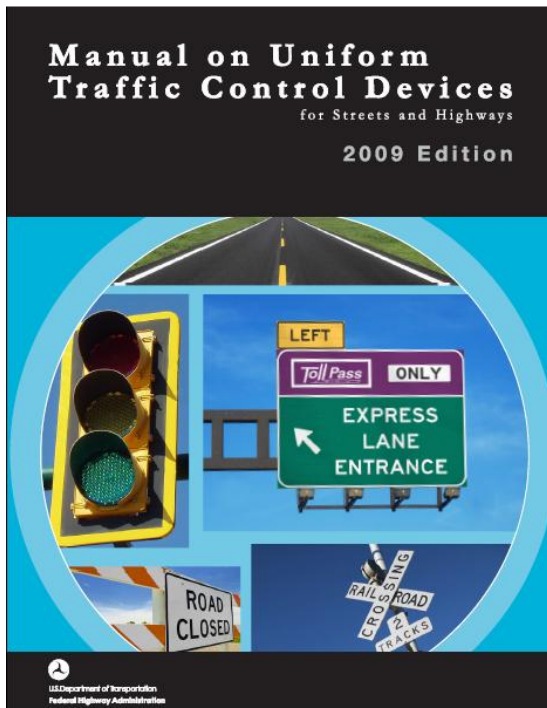
Chevrons

Delineators

The purpose of this course is to encourage readers to use this information to evaluate problems and implement appropriate treatments for problem curve locations. These treatments should help reduce roadway departure crashes, injuries, and fatalities.

MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD)

By law (23 CFR 655, Subpart F), the **Manual on Uniform Traffic Control Devices (MUTCD)** defines the standards for all traffic control devices in order to regulate, warn, and guide drivers safely on U.S. roadways and streets. **It is the definitive authority for traffic signs and pavement markings.** The MUTCD defines conditions about what, where, and how a device is to be placed or installed. Nationwide consistency is the goal of the MUTCD.



The MUTCD is published by the Federal Highway Administration (FHWA) to promote safety and efficiency on our public roads by establishing uniform standards for traffic control devices. It defines the nationwide standards for the installation and maintenance of the devices on all streets and highways.

The MUTCD allows us to drive anywhere in the U.S. using the same basic traffic control devices. Drivers who see a particular pavement marking or traffic sign should expect it to mean the same thing and be prepared to take the same action regardless of location.

All States are required to adopt either the MUTCD or a State MUTCD that conforms to the Federal version of the MUTCD. In some cases, States have adopted the national MUTCD with an added State Supplement.



Purchase this course to
see the remainder of
the technical materials.