



TRAFFIC AND SAFETY MANUAL

Chapter 7 – Traffic Engineering Studies 7B – Curve Speed Study

Curve Speed Study

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General

The purpose of a Curve Speed Study is to determine the maximum comfortable speed on a horizontal curve for use in determining whether there is need to communicate this information to the approaching motorists with Turn, Curve or Advisory Speed signing. The maximum comfortable speed may also be a conservative indication of the safe speed. The study is performed by driving the curve at 5 mph increments and observing the reading on a ball bank indicator mounted in the vehicle. The ball bank indicator is a steel ball encased with liquid in a curved sealed glass tube and mounted in a metal frame. The tube is bent on the arc of a circle and graduated from zero to 25 degrees, both to the right and left of the zero point. When the vehicle is driven at a steady speed on a curve the vehicle body roll and centrifugal force on the ball cause it to move out to a stable position, which is dependent on the superelevation of the curve.

Criteria For Signing

The Turn warning sign or Reverse Turn warning sign with Advisory Speed Plaque is used if the advisory speed as determined by a curve speed study is 30 MPH or less and is equal to or less than the speed limit.

The Curve or Reverse Curve sign with Advisory Speed Plaque is used if the advisory speed as determined by a curve speed study is greater than 30 MPH and equal to or less than the speed limit. The Curve or Reverse Curve sign is not needed for curves of 4 degrees of curvature or less. Curve or Reverse Curve signs are needed for curves of 8 degrees of curvature or greater.

The need for a Curve or Reverse Curve sign for curves between 4 and 8 degrees of curvature is determined by a curve speed study. If the ball bank study results in a number of 5 or more on the ball bank indicator at the posted speed limit, use of a Curve or Reverse Curve sign is indicated.

Curves should be signed for the same advisory speed for both directions of travel at the lower speed determined by the curve speed study.

Preparation

There are several steps that need to be taken prior to performing the study:

- The ball bank indicator should be mounted in a passenger vehicle that is in a stationary, level position on zero gradient with tires evenly inflated.
- The ball bank indicator should be mounted plumb, level and perpendicular to the vehicle's long dimension, so that it reads zero degrees when the vehicle is level.
- The vehicle must ride in its normal position without being altered by excess weight, poor suspension system, etc.

- The vehicle speedometer must be accurately calibrated or a vehicle mounted distance-measuring instrument used for observing speed.
- All occupants that will be in the vehicle when the observations are made should be in the same positions in the vehicle when the instrument is mounted or checked.
- The ball bank indicator should be mounted directly in front of the observer insofar as possible.

Procedure

It is advisable to have two people involved with measuring the speed of curves. One drives the vehicle and observes the speed being driven while the other observes the ball bank indicator and records the results of the tests. With practice, and with the ball bank indicator properly mounted, one person can perform the tests but it may take longer due to having more unusable tests.

The driver must appraise the curve and make sure that the first test run is made at a conservative speed for the sake of safety. Each test run must be made precisely on course and at the intended increment of 5 mph speed, so that the ball does not move as the result of an off-course movement or a variation in speed. The ball should move steadily outward as the vehicle enters the curve and steadily inward as the vehicle exits the curve. The number to be recorded is the maximum observed for each test run. The curve should be driven several times, increasing the speed in increments of 5 mph until test runs at or below the speed limit exceed the following limits:

- 14 degrees for speeds of 20 mph and lower
- 12 degrees for speeds of 25 and 30 mph
- 10 degrees for speeds of 35 mph or higher

The advisory speed to be posted is the highest speed that did not exceed the limits listed above as verified by two identical ball bank readings. Each direction of travel should be studied separately even though the curve will be posted for both directions of travel at the lower speed determined by the study.

Documentation

For many studies, the findings, conclusions and recommendations must be clearly conveyed to those who are responsible for acting on the results. This is done through the use of a memo, letter or more formal report. Some study presentations include the use of forms, tables or graphs depicting the data collected.

The documentation for a curve speed study should include when, where and by whom the study was conducted, and that it was done in conformance with established guidelines. It should include the location of the curves, direction of travel, speeds driven, ball bank readings and any indicated changes to the horizontal alignment signing in the area.

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