

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: September 18, 1980

Forwarded to:

Honorable John S. Hassell, Jr.
Administrator
Federal Highway Administration
400 7th Street, S.W.
Washington, D.C. 20590

} SAFETY RECOMMENDATION(S)

H-80-50 and -51

About 12:45 a.m., on February 23, 1980, a two-door sedan was westbound on a two-lane section of U.S. Route 64, near Perry, Oklahoma. Traveling in the eastbound lane at an excessive rate of speed, the sedan crested a hill and collided head-on with an eastbound pickup truck. The sedan rebounded into the westbound lane and began to burn. The pickup truck was then struck by a following eastbound four-door sedan. Three of the five pickup truck occupants were ejected from the vehicle; all five suffered fatal injuries. The driver of the two-door sedan was killed. The two persons in the four-door sedan received minor injuries. 1/

U.S. Route 64 in the area of the accident site was a two-lane, rural, unlighted highway with a straight horizontal and a rolling vertical alignment. It is a Federal aid-primary route functionally classified as a minor artery between Interstate 35 and U.S. Route 177. It has an average daily traffic count of approximately 2,500 vehicles. According to the Oklahoma Department of Transportation (OKDOT), the 11-mile section of the road from Perry to U.S. 177 had an accident rate of 80.4 accidents per 100 million vehicle miles, as compared to the Statewide rate of 121. Thus, the section would not be considered a high-accident location. Of the 41 accidents which occurred over the past 5 years (1974 to 1979), only 2.0 percent were wrong-side-of-road, head-on collisions. However, the potential for catastrophic accidents exists as is evidenced by this accident.

The accident occurred on the crest of a 400-foot vertical curve (hill crest). The design plans indicated that the eastbound grades for the hill were +4.71 percent and -3.54 percent. At the point of impact, the roadway was 24 feet wide, with 8-foot-wide sod shoulders. The pavement was marked in 1977 with a dashed yellow centerline and white edgelines. The point of impact was about 55 feet west of the end of a no-passing zone for westbound traffic and 26 feet west of the hillcrest.

The 3.7-mile section of U.S. 64 (1.8 miles west and 1.9 miles east of the accident site) included 28 vertical curves, of which 13 were crest curves with design speeds of less than 55 mph. These 13 crest vertical curves had gradient differences ranging from 1.00 percent to 8.25 percent, and lengths ranging from 100 to 400 feet. Using the accident site which had a gradient difference of 8.25 percent, to justify a design speed of 55 mph, the no-passing, stopping sight-distance should have been 460 feet. This would have required a

1/ For more detailed information, read "Highway Accident Report--Head-on Collision of Sedan and Pickup Truck, U.S. Route 64, near Perry, Oklahoma, February 23, 1980" (NTSB-HAR-80-4).

crest curve of at least 1,000 feet. According to the design standards of the American Association of State Highway and Transportation Officials (AASHTO) Policy on Geometric Design of Rural Highways, 1965, the 400-foot hillcrest had a design speed of about 38 mph.

The OKDOT design plans for this section of U.S. 64 were completed in 1927, and it is assumed that the road was constructed soon thereafter. In 1977, the pavement was overlaid with asphalt. The road surface was in good condition and appeared to have a good skid resistance (an estimated coefficient of friction of 0.6).

The Ponca City Airport flight service station, 29 miles due north of the accident site, reported that on February 23, 1980, at 12:58 a.m., it was partially cloudy; the surface visibility was 4 miles with fog. However, the driver of the four-door sedan stated that she was not aware of any haze or fog as she approached the accident site. The average humidity between 11 a.m. on February 22 and 1 a.m. on February 23 was 84.3 percent.

About midnight on February 25, 3 days after the accident, the Safety Board's investigative team, with the aid of the OKDOT Division Four Traffic Engineer, conducted tests for headlight-glow, visibility, and sight-distance levels for vehicles approaching the hill crest at the accident site. Vehicles similar to those involved in the accident were used to assure proper eyeheight and vehicle headlamp positions. The tests were conducted with the headlamps at both high and low beams. It was noted that as each vehicle approached the crest of the hill, no headlamp glow was observed until immediately before the direct light source came into view. When the vehicles were first visible to each driver, the vehicles were about 340 feet apart.

It is impossible to duplicate the environmental conditions at the time of the accident and at the time of the field tests. At the time of the test, the reported humidity was 65 percent and there was no discernible headlight glow visible to the investigators. While the higher humidity at the time of the accident, which averaged 84.5 percent, would not insure that there would have been headlight glow visible to either or both drivers, the atmospheric conditions would have been more conducive to produce visible headlight glow.

The four-door sedan driver indicated that the pickup truck was traveling approximately 50 mph. Calculations indicated the speed of the two-door sedan was about 85 mph. At the relative closing speed of 135 mph (199 feet per second), both drivers only had 1.7 seconds to see the other vehicle before the collision.

At the Safety Board's request, the OKDOT prepared a cost estimate for "flattening the accident curve." The following is an excerpt from the March 11, 1980, letter from the OKDOT Chief Traffic Engineer to the Board:

"In order to get adequate sight distance of 1,000 feet or more, the roadway would have to be rebuilt from around station 405+50 to station 433+00, a distance of approximately 2,850 feet. The estimate to make this improvement at today's contract prices is \$843,000.

"The sufficiency rating on this section of roadway is 68. I am enclosing excerpts from our 1978 Needs Study and Sufficiency Rating Report that explains the method of calculating the sufficiency rating. Our construction program is based on our needs study."

According to OKDOT's sufficiency rating system, a rating of 0-69 is an "inadequate" road, 70-79 is "tolerable," and 80-100 is "adequate." When traffic volume and highway accidents are considered, the rating is 67. Thirty-nine percent of Oklahoma's rural roads are rated as "inadequate" by this system.

Much of the State of Oklahoma consists of many miles of highway built to standards in use before 1965. Although the posted speed limit was 55 mph, 64 percent or 7 of the 13 crest curves near and including the accident site had theoretical design speeds of less than 55 mph.

The State has a systematic program for improving these inadequately rated roads as resources become available. However, the accident hill crest is in competition with 39 percent of Oklahoma's 11,714 miles of highway (not including Interstate highways) for these resources.

As more low profile small cars with reduced eyeheight use the roads, the problem of limited sight distance on hill crests will worsen. The situation could cause more accidents similar to this one. One approach to this incompatible situation of low design speeds versus higher posted speeds would be to warn drivers using this road of the possible hazard due to limited sight distances. One procedure is the posting of warning signs accompanied by an advisory plate bearing the safe design speed. The Manual on Uniform Traffic Control Devices (MUTCD) suggests a "Limited Sight Distance" (W14-4) sign and provides guidance for its use. The 30- by 30-inch diamond-shaped sign, with a supplemental Advisory Speed Sign (W13-1), is intended for use on hills where adequate safe stopping sight distance is not available. Authorized signs are listed in the MUTCD after a technical review by the National Central Devices and with the concurrence of the Federal Highway Administration (FHWA). There may or may not be an operational evaluation of the new sign before it is included in the MUTCD. The sign was included in the 1978 version of the MUTCD, based on a 1976 request submitted by the AASHTO, and it was not evaluated by the FHWA. Considering the nonspecific nature of its message and the large number of signs required due to the variable design speeds, the use of this combination sign may not be beneficial.

Although it would be impractical to flatten this hill crest, as a result of this accident, the State should consider reducing the speed limit for this section of the road to the mean safe speed, as indicated by the highway design, until sufficient resources are available to correct the hazard.

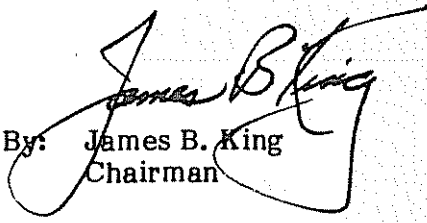
The problem of incompatibility of operating speeds, current vehicle design eyeheight, and limited sight distance exists on many roads designed to pre-1965 standards and is not unique to Oklahoma. The FHWA should continue its study and evaluation of the problem of limited sight distance situations and develop guidelines to assist the States in taking corrective action to make travel speeds and highway geometry compatible.

Therefore, the National Transportation Safety Board recommends that the Federal Highway Administration:

Evaluate the effectiveness of the "Limited Sight Distance" sign (W14-4-MUTCD) and report its findings to the Board. (Class II, Priority Action) (H-80-50)

If the Limited Sight Distance (W14-4-MUTCD) sign is found to be ineffective, then devise an effective method of warning motorists of the incompatibility of operating speeds, current vehicle design eyeheight, and limited sight distance situations that exist on roads designed to pre-1965 standards. (Class II, Priority Action) (H-80-51)

KING, Chairman, McADAMS, BURSLEY, and GOLDMAN, Members, concurred in these recommendations. DRIVER, Vice Chairman, did not participate.


By: James B. King
Chairman