

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: May 1, 1978

Forwarded to:

Honorable William M. Cox
Administrator
Federal Highway Administration
400 Seventh Street, S.W.
Washington, D.C. 20590

} SAFETY RECOMMENDATION(S)

H-78-19

About 4:20 p.m., on July 14, 1977, a 1972 Ford sedan southbound on U.S. Route 69 about 19.4 miles south of McAlester, Oklahoma, went out of control on wet pavement, crossed the centerline sideways, and collided with a northbound Midas Mini Motor Home. All six persons in the sedan were killed; the driver and right front passenger in the motor home were also killed and the six other passengers of the motor home were injured. 1/

The National Transportation Safety Board determines that the probable cause of this accident was a combination of the low skid resistance of the wet road surface and the lax operating maintenance by the owner of the Ford sedan which permitted the use of an unsafe tire and the imbalanced capability of the brake system. A factor contributing to the accident was the driver's unfamiliarity with the mechanical condition of the Ford sedan. Contributing to the severity of the injuries were the failure of the front seat occupants of the motor home to wear the available seatbelts and the failure of the door latch assembly.

U.S. 69 is a north/south primary highway connecting the northeast section of Oklahoma with the Dallas-Ft. Worth area of Texas. The segment of roadway at the accident site was constructed in the late 1950's. It is straight and level (with a grade of only +.40 percent), has two 12-foot driving lanes with 8-foot paved shoulders and a crown of 2 inches in 12 feet, and is bordered on each side with 4:1 slopes with grass. More than 5 miles of the road was overlaid recently with 1 inch of asphalt/concrete Oklahoma type-C mix. The "job mix formula" for the project--State-aid Project No. MC3(75)--called for 5 percent asphalt with 93 percent and 44 percent passing through the 3/8-inch and No. 8

1/ For more detailed information read "Highway Accident Report: Midas Mini Motor Home/Automobile Collision, U.S. Route 69, Near McAlester, Oklahoma, July 14, 1977" (NTSB-HAR-78-2).

sieves, respectively. The project was completed on June 29, 1977, and a final inspection was made on July 5, 1977. There were no deficiencies noted and the project was accepted by the State.

Comparison of the specifications of the Oklahoma type-C mix with the latest information from the Asphalt Institute and the American Association of State Highway and Transportation Officials (AASHTO) "Guidelines for Skid Resistant Pavement Design," (1976) indicates that the Oklahoma type-C mix is a dense graded mix with relatively little coarse texture. AASHTO's guide emphasizes that the coarse aggregates in a mix provide the major skid resistance at high speeds.

At the request of the Safety Board, the Oklahoma Department of Transportation conducted locked-wheel skid tests on the 5.18-mile resurfaced section of U.S. Route 69 with emphasis on the vicinity of the accident. The Oklahoma skid trailer conformed to the requirements of the American Society for Testing and Material Methods' "Method of Skid Resistance Measurements," (ASTM) E-274-77. The trailer had not been calibrated recently at a Federal Highway Administration (FHWA) test center.

The tests were conducted on July 18 and 28, 1977. All tests were made at 40 mph for the inside wheel paths of the accident vehicles. On July 18 the test skid numbers for the accident site were 28 in the northbound lane and 27 in the southbound lane. On July 28, 1977, the test skid numbers were 25 for the northbound and 24 for the southbound lanes.

In order to assure the comparability of the test skid numbers to FHWA guidelines for coefficient of friction, the FHWA, at the request of the Safety Board, retested the road surface for the area of the 5.18 miles of overlay and a half-mile stretch of old pavement surface immediately south of the overlay. The FHWA skid trailer also conformed to the requirements of the ASTM E-274-77 and had been calibrated in July 1976.

The FHWA skid tests were made on August 31, 1977. The pertinent results (see attachment) show that the entire length of the overlaid road surface produced skid numbers lower than the old road surface immediately south of the overlay. The overlay area mean skid number was 23.4 northbound and 18.4 southbound compared to the old surface mean skid number of 45.9 northbound. The mean skid numbers for the inside wheel paths at the accident site were significantly lower--18.2 for northbound traffic (motor home) and 11.6 for southbound traffic (sedan).

Both dry and wet skid tests were made using the left-front tire and then the left-rear tire of the sedan on the FHWA skid trailer. The left-front tire's average of five skid tests was 26.5 (wet). The left-rear tire had an average of 11.6 (wet) after two tests.

The FHWA also conducted a modified sandpatch test and an outflow meter test on the actual accident site. The sandpatch tests were made to determine texture depth. This test uses a measured quantity of fine sand that is leveled off above the pavement in a prescribed manner. The tests determined that the southbound inside-wheel path had a texture depth of 0.004 inch. Currently there are no Federal regulations requiring minimum texture depths.

In the inside-wheel path of the southbound lane, drainage times in three locations measured 286 seconds, 267 seconds, and 609 seconds. In parallel locations at the edge of the road surface the timings were: 11.12 seconds, 11.10 seconds, and 11.12 seconds. As with the sandpatch tests, there are no Federal regulations or guidelines relating to use or results of the outflow meter.

Because the skid resistance of a pavement generally deteriorates with use, checking skid resistance is done periodically at problem locations and on a sampling basis at other locations. The criteria proposed for including a location in the periodic schedule include: (a) high accident experience, (b) indications of excessive skidding, (c) potentially hazardous locations, (d) locations where traffic volumes are heavy, (e) locations where the pavement is constructed with materials known to polish rapidly, and (f) locations where the pavement is in poor condition.

The guidelines and criteria established by the standard do not provide any procedures or controls that would assure that newly constructed or overlaid road surfaces are safe for use by the motoring public. The first awareness the State has of an unsafe road surface is the occurrence of an abnormal number of accidents or excessive skidding.

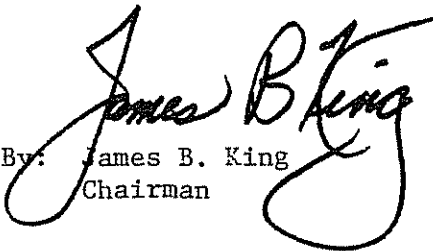
An ideal procedure would require State and local highway departments to conduct skid resistance evaluations of all newly constructed or resurfaced roadways before they are opened to the public. An immediate evaluation of skid resistance performance should be another step in the quality control to assure that the road surface and texture is in compliance with specifications and safety practices.

In addition to the skid trailer there are other procedures for testing surface texture that are not as sophisticated. The sandpatch and outflow meter tests being developed by the FHWA to corroborate the skid tests in this accident investigation are simple tests and the necessary testing equipment are relatively inexpensive. They would provide a degree of assurance that in the spots tested, the road surface was porous enough to let the surface water run off, and in that respect, whether the road was safe for travel.

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

Develop expeditiously procedures to determine the skid resistant characteristics of newly constructed and resurfaced roadways before they are opened to the public. (Class II, Priority Action) (H-78-19)

KING, Chairman, McADAMS, HOGUE, and DRIVER, Members, concurred in the above recommendation.


By: James B. King
Chairman

Attachment

<u>Location</u>	<u>Number of tests*</u>	<u>Starting point</u>	<u>Mean test speed</u>	<u>Mean skid number</u>
Inner travel path of northbound lane	17	.01 to 5.18	39.5	23.4
	4(old surface)	5.18 to 5.72	39.3	45.9
Inner travel path of southbound lane	15	.26 to 4.90	39.8	18.4
Inner travel path of northbound lane at accident site	5	1.82	39.6	18.2
Inner travel path of southbound lane at accident site	5	1.74 to 1.76	40.8	11.6
	5**	1.76 to 1.77	39.8	26.5
	2***	1.74 to 1.76	41.0	11.6
	2(dry)	1.76	40.5	66.7
	2(dry)**	1.78	38.7	64.2
2(dry)***	1.78	40.2	66.1	
Center of northbound lane at accident site	3	1.68 to 1.95	39.7	28.2
Center of southbound lane at accident site	3	1.58 to 1.81	40.6	29.9

* All tests were made on wet pavement with ASTM test tire, except where noted.

** Tests made with the left-front tire (inflated to 24 psi) from the automobile involved in the accident.

*** Tests made with the left-rear tire (inflated to 24 psi) from the automobile involved in the accident.

