PROGRESS REPORT No. 1 ON THE SKID RESISTANCE STUDY EXPERIMENTAL TEST SECTION U.S. 421 SOUTH OF KIRKLIN

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No. 35

by

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PROGRESS REPORT NO. 1 OF THE
SKID RESISTANCE STUDY ON
THE EXPERIMENTAL TEST SECTION OF U. S. 421
SOUTH OF KIRKLIN

TO: K. B. Woods, Director
Joint Highway Research Project

September 26, 1956

FROM: H. L. Michael, Assistant Direcotr

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Attached is a report entitled, Progress Report No. 1 of the Skid Resistance Study on the Experimental Test Section of U. S. 421 South of Kirklin," by John W. Shupe. This report summarizes some special skid tests conducted on four different sections of highway near Kirklin, Indiana. Certain variable conditions are present in these surfaces.

Dense graded bituminous coated aggregate had the poorest skid resistance while open graded bituminous coated aggregate had the best skid resistance. Two sections using AH Type B asphaltic concrete had similar skid characteristics slightly better than the dense graded mix.

Respectfully submitted,

Harold L. Michael

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by
John W. Shupe

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INTRODUCTION

This report summarizes the results of the first series of skid tests performed by the Joint Highway Research Project on an experimental test project on U. S. Highway No. 421. This project is located in Boone County, beginning at the junction of U. S. 421 and State Route No. 47 and continuing northward to Kirklin.

IDENTIFICATION OF TEST SECTIONS

For the purposes of this report the sections are numbered consecutively from south to north, beginning at the junction of State Route No. 47. Each test section is approximately one mile long.

Section I: (AH-type B using ATB-5) A hot asphaltic concrete surface containing Trinidad blend asphalt.

Section II: (AH-type B using AP-5) A standard hot asphaltic concrete surface.

Section III: (BCA-dense) A dense-graded bituminous coated aggregate cold mix.

Section IV: (BCA-open) An open-graded bituminous coated aggregate cold mix.

Method of Test

The tests were performed using the skid equipment developed in 1954 by the Joint Highway Research Project to conduct a comprehensive skid resistance study of pavement surface types. A standard 2-door 1955 Ford, fitted with this skid equipment, was used in making the tests.

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PROCEDURE

For all skidding tests the test vehicle was brought up to a speed of 30 mph, the wheels were locked and the distance required to skid to a stop was determined. Each of the four test sections were tested both wet and dry in each direction with two skids for each condition, giving a total of 32 skids.

Since it was impossible to begin each skid at exactly 30 mph, it was necessary to adjust the measured skidding distances to give an equivalent 30 mph skid. This was accomplished from an application of the physical relationship, $S = \frac{V^2}{30f}$; where "S" is the total stopping distance in feet, "V" the original speed in mph, and "f" the average coefficient of friction between the highway surface and the skidding tire.

Although the coefficient of friction for most surface types will increase as the speed becomes less, within the range of speeds at which the tests were begun, 29.5 to 31.75 mph, the change in "f" would be negligible. Therefore, the stopping distance would vary as the square of the velocity and the following expression was used for correction purposes:

S corrected = S measured x $(\frac{30}{V})^2$, where "V" is the original velocity at which the wheels were locked.

SUMMARY OF RESULTS

The following figures represent the averages of four skids, namely, two tests at each location and in both directions of traffic. The total test data are tabulated on the last page of this report.

TOTAL STOPPING DISTANCE IN FEET AT 30 MPH

SECTION	DRY	WET
I	60.4	92.4
II	61.0	93.9
III	62.6	98.4
IV	63.0	78.9

DISCUSSION OF RESULTS

As is generally the case in studies of this nature, the results of the dry skid tests were not particularly significant. It would appear from the data that the dense-graded surfaces are capable of developing a slightly greater frictional resistance. This would seem reasonable since the open-graded surfaces would have less area in contact with the sliding tire, and for the dry tests the amount of force developed is largely dependent upon the total area in contact. However, the difference between the averages of the shortest and longest dry skid tests was only about 4%, and when such items as the possibility of human error and the fact that the test sections may have been on a slight grade are considered, this 4% difference does not seem significant.

In the wet condition, however, a greater variation in skidding resistance was noted for the four surface types with the stopping distance for the poorest section exceeding that of the best by over 25%. Within the range of accuracy of these tests the two hot mix asphalt concrete surfaces gave nearly identical results, while the dense-graded bituminous coated aggregate surface gave stopping distances about 6% greater than these two.

The surface which deviated markedly from the other three was the

open-graded bituminous coated aggregate surface. For wet testing the pavement was liberally sprinkled by a water-tank truck and on most of the section the water puddled and gave the appearance of saturating the surface. On this open-textured surface, however, it was impossible to keep the surface entirely saturated and the projecting aggregate particles were merely damp, not wet. This might explain, in part, why the total stopping distances on this section were 15 to 20 feet shorter than on the other three surface types. The condition at which the surface was tested, however, would be representative of this surface when wet, with the possible exception of during a heavy rain.

TEST DATA

Test Section Location: US 421 from junction with State Route No. 47, north to Kirklin.

Driver: W. B. Luttrell

Recorder: J. W. Shupe

Test Date: August 30, 1956

Air Temperature: 70 to 76°

Test Section Identification*:

Section I: AH-type B using ATB-5

Section II: AH-type B using AP-5

Section III: BCA-dense

Section IV: BCA-open

*Notation consistent with Indiana Highway Commission Specifications.

TOTAL STOPPING DISTANCE IN FEET FROM 30 TO 0 MPH

			Dry Tests			Wet Tests		
Section	Direction	Run	Speed	Stopping Distance	Corrected Distance	Speed	Stopping Distance	Corrected Distance
I	N	1	30.00	60.5	60.5	30.25	93.5	91.8
		2	30.00	59.5	59.5	30.00	92.0	92.0
I	S	1	29.75	61.0	62.0	29.50	92.0	95.3
		2	30.25	60.5	59.5	30.25	92.0	90.3
	Average				60.4			92.4
II	N	1	30.00	61.0	61.0	30.00	91.5	91.5
		2	30.00	60.5	60.5	30.00	93.0	93.0
II	S	1	29.75	60.5	61.5	30.00	97.2	97.2
		2	29.75	60.0	61.0	31.75	105.0	93.8
	Average				61.0			93.9
III	N	1	30.00	63.5	63.5	30.00	102.0	102.0
		2	29.75	63.0	64.0	30.00	102.5	102.5
III	S	1	30.00	61.5	61.5	30.75	100.0	95.3
		2	29.75	60.5	61.5	31.00	100.0	93.6
	Average				62.6			98.4
IV	N	1	29.75	62.0	63.0	30.75	83.0	79.1
		2	29.75	64.0	65.0	30.75	83.5	79.6
IV	S	1	30.00	63.0	63.0	30.5	83.0	80.2
		2	29.75	60.0	61.0	30.0	76.5	76.5
	Average				63.0			78.9