STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY

DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SERVICES
Transportation Laboratory
5900 Folsom Blvd.
Sacramento, California 95819-4612

METHOD OF TEST FOR SURFACE SKID RESISTANCE WITH THE CALIFORNIA PORTABLE SKID TEST

A. SCOPE

The apparatus and procedure for obtaining coefficient of friction values of bituminous and portland cement concrete pavements and bridge decks using a portable skid tester are described in this test method.

B. REFERENCES

California Test 114 — Calibration of the California Portable Skid Tester

C. APPARATUS

1. Skid testing unit

   An ASTM Test Tire E1551 with 25 (± 2) psi air pressure. The tire is brought to the required test speed by a motor. A carriage moves on two parallel guides. Friction is reduced to a low uniform value with three roller bearings fitted at 120° points to bear against the guide rod at each corner of the carriage. Two guide rods are rigidly connected to the end frame bars. The front end of the guide bar frame assembly is firmly fastened to a bumper hitch to restrain forward movement. The bumper hitch provides for swinging the skid tester to the right or left after positioning the vehicle. The rear end of the frame assembly is raised by an adjustable knob to hold the tire ¼ in. above the surface to be tested. This device is constructed so that the tire may be dropped instantaneously to the test surface by tripping the release arm. A tachometer indicates the speed of the tire in miles per hour (mph). The springs are calibrated by procedures outlined in California Test 114. See Figures 1, 2 and 3.

2. A trailer hitch is used to fasten the skid testing unit to the test vehicle.

3. A 28 in. long metal carpenter's level, fitted at one end with a movable gage rod, is required. This device is calibrated to determine surface grades, in percent.

D. MATERIALS

1. Glycerine

2. Water

3. Paint brush (approximately 2 in. wide)

4. Wooden spacer ($^1/_4$ in. thick, 2 ft long and 1 in. wide)

5. A stiff fiber broom

E. TEST PROCEDURE

1. Clean loose material from the test surface using the stiff fiber broom.

2. Determine the grade of the test surface.

   a. Place the metal level on the test surface parallel to direction of traffic with the adjustable end down grade.
   b. Adjust the level until the bubble is centered.
   c. The grade is read directly on the calibrated sliding bar. See Figure 4. Record this slope to nearest 0.5 %.

3. Remove the skid testing unit from the vehicle, attach it to the bumper hitch, and connect the power cables as shown in Figure 5.

4. Position the skid tester with the test tire over the pavement surface to be tested. The test tire should be parallel to the direction of traffic.

5. Place the wooden spacer under the test tire and turn the adjustment knob to obtain a distance of ¼ in. from the test surface to the bottom of the test tire. Remove the wooden spacer.

6. Wet the full circumference of the test tire and the test surface (from the initial tire contact point to approximately one foot ahead of the contact point) with glycerine, using the paint brush.

7. Release the rebound shock absorber. This device is located in front of the switch, and below the motor.

8. Set the sliding gage indicator against the carriage end.

9. Depress the starting switch and bring the test tire speed to approximately 55 mph.

10. Release starting switch.

11. Drop the test tire to the pavement surface the instant the tachometer shows 50 mph. This is performed by engaging the lever arm.

12. Read the gage at the rear edge of indicator and record the test measurement. Obtain a coefficient of friction value for the smoothest appearing surface or surfaces on the project.

    For a pavement surface, obtain five test measurements and report the average as the coefficient of friction. Make the tests in a longitudinal direction at 25 ft intervals, unless any test measurement is less than the specified

minimum. If less than the specified minimum, make five test measurements at 2 ft intervals within or including the smoothest appearing area.

For a bridge deck, obtain the coefficient of friction value by averaging three test measurements. Space each test location for this average no nearer than 2 ft nor farther than 4 ft, from any other test location. The spacing may be lateral or longitudinal, but perform the test measurement in a longitudinal direction.

For coefficient of friction values less than the specified minimum, use a combination of visual observations and individual test measurements to define the area of noncompliance.

F. CALCULATIONS

1. Make pavement corrections due to slope changes using Figures 6 and 7.

2. Average the corrected readings for each test location.

Example: The following readings were taken at 25 ft intervals in a test location.

Test Location	Test Measurement	% Grade	Corrected Test Measurement*
1+00	0.37	+2	0.39
1+25	0.38	+1	0.39
1+50	0.40	+1	0.41
1+75	0.39	+1	0.40
2+00	0.41	+1	0.42
Average Coefficient of Friction =			0.40

*Corrected values for upgrade measurements were taken from chart in Figure 6.

Examples of coefficient of friction values for different pavement textures are presented in the Appendix.

G. PRECAUTIONS

1. The rear support rod must be cleaned by washing frequently with water and a detergent to prevent sticking. A coating of light oil should be applied.

2. Sliding gage indicator must be kept clean so that it will slide very freely, and adjusted so that it will not shift upon carriage recoil impact.

3. Glycerine remaining on the surface after the test should be flushed off with water.

4. A minimum of seven days should lapse after PCC placement before testing.

5. A minimum of one day should lapse after HMA placement before testing.

6. Temperatures less than 40°F will cause glycerine to become viscous and yield lower values. For full accuracy, coefficient of friction values must be obtained at temperatures greater than 40°F.

7. At the conclusion of a testing period, thoroughly wash the entire tester with water and carefully dry all parts with a cloth to minimize the corrosive properties of glycerine.

8. Use care when removing and reinserting the test apparatus in the transport vehicle. See Figures 8 and 9.

H. REPORTING OF RESULTS

The report shall include the following data:

1. The name of the tester and the date when test measurements were recorded

2. The contract number

3. The year when the pavement surface was placed

4. The location of the test measurements

5. The surface grade for each test site

6. The initial and corrected test measurements and the average coefficient of friction value for each test location

7. Average air temperature during testing

8. See Figure 10 for test results format.

I. HEALTH AND SAFETY

It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Prior to handling, testing or disposing of any materials, testers must be knowledgeable about safe laboratory practices, hazards and exposure, chemical procurement and storage, and personal protective apparel and equipment.

Caltrans Laboratory Safety Manual is available at:

http://www.dot.ca.gov/hq/esc/ctms/pdf/lab_safety_manual.pdf

End of Text
(California Test 342 contains 14 pages)

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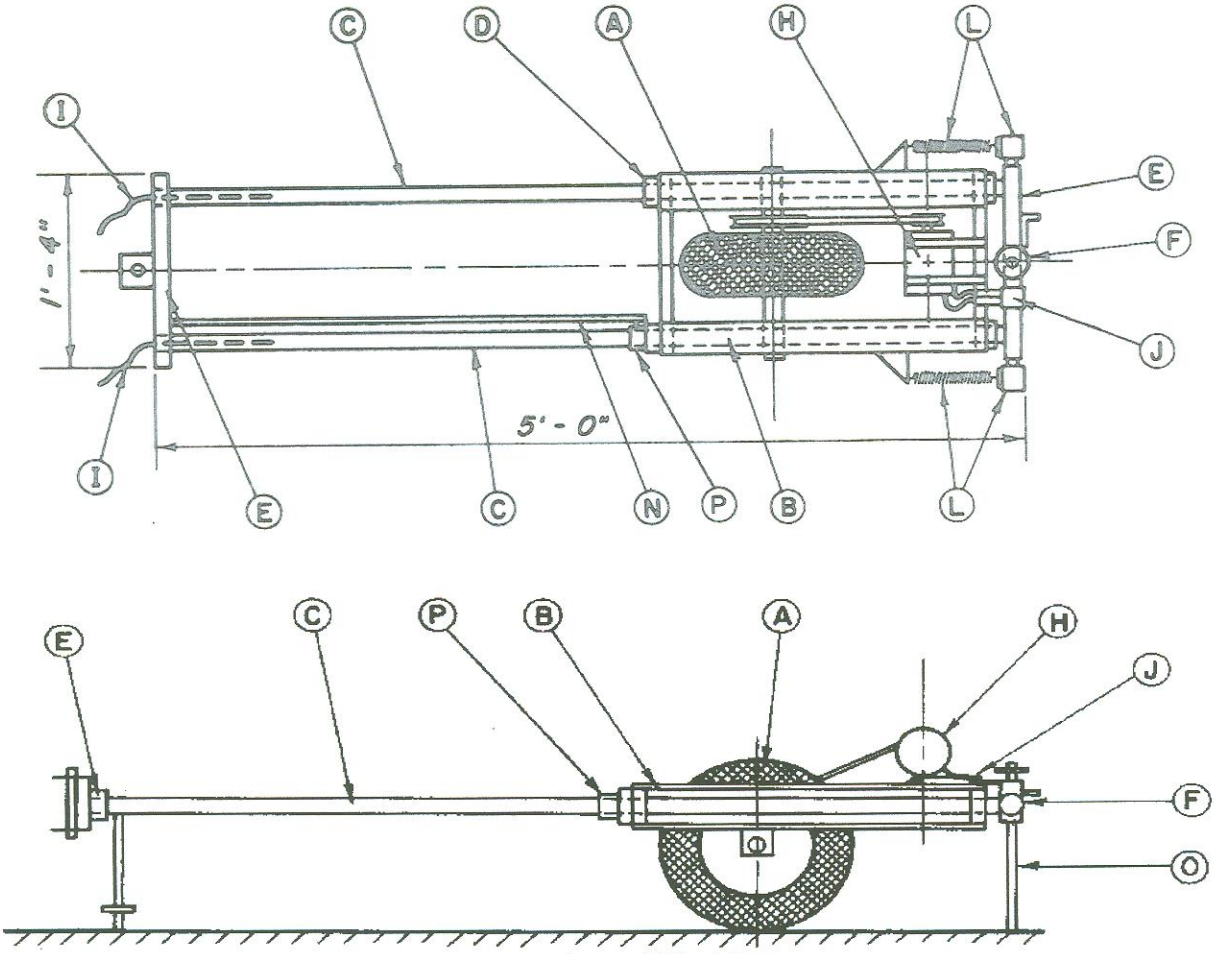

LETTER REFERENCE	DESCRIPTION
A	TEST TIRE
B	CARRIAGE COLLAR
C	CARRIAGE GUIDE RODS
D	BEARING ASSEMBLY
E	END FRAME BARS
F	ADJUSTMENT KNOB
G	RELEASE ARM
H	MOTOR
I	POWER CABLES
J	STARTING SWITCH
K	TACHOMETER
L	CALIBRATED SPRINGS
M	TIRE CIRCUMFERENCE
N	GAGE
O	REAR SUPPORT ROD
P	SLIDING GAGE INDICATOR

FIGURE 1. Diagram of Skid Tester

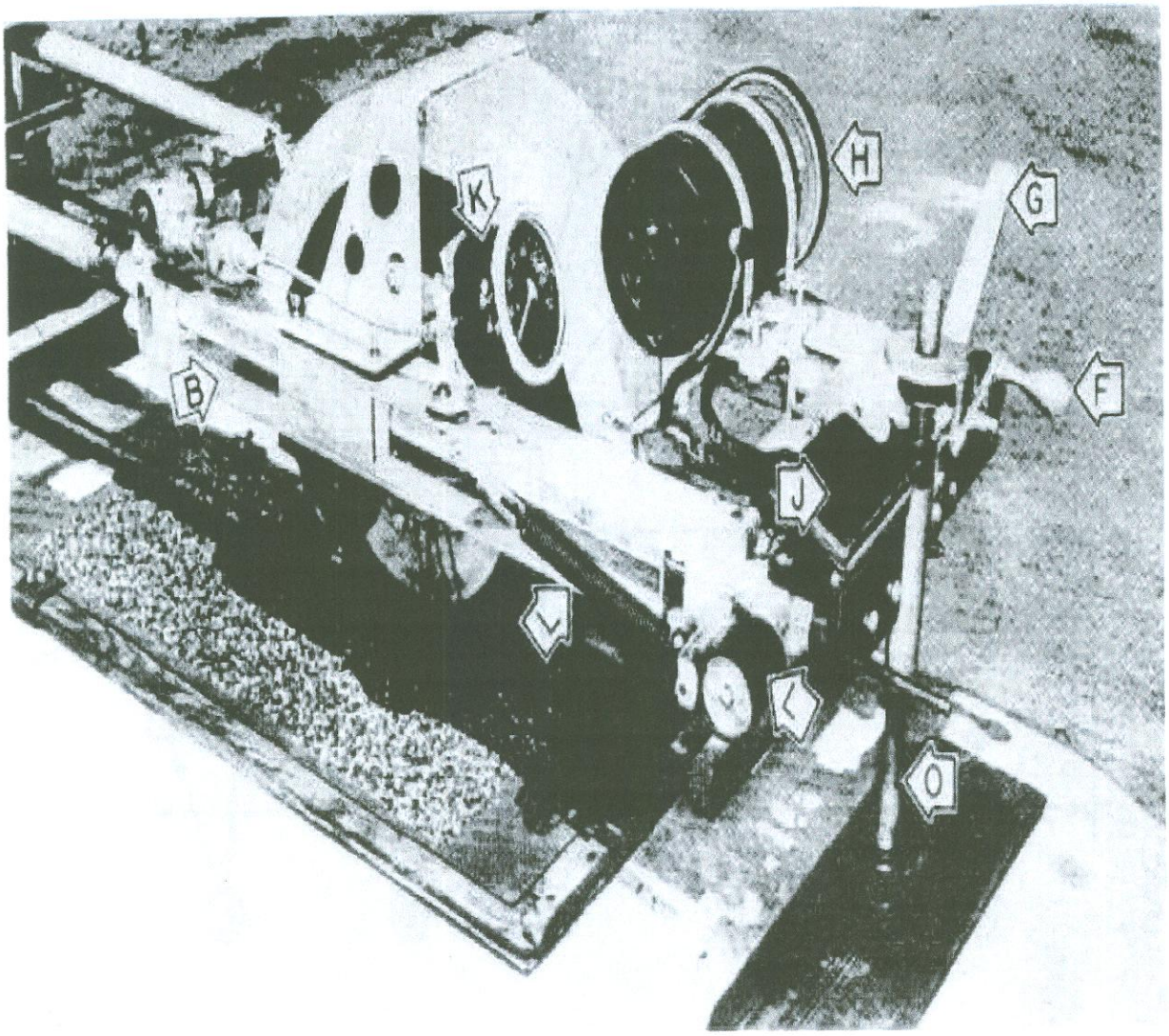

FIGURE 2. Side View of Skid Tester

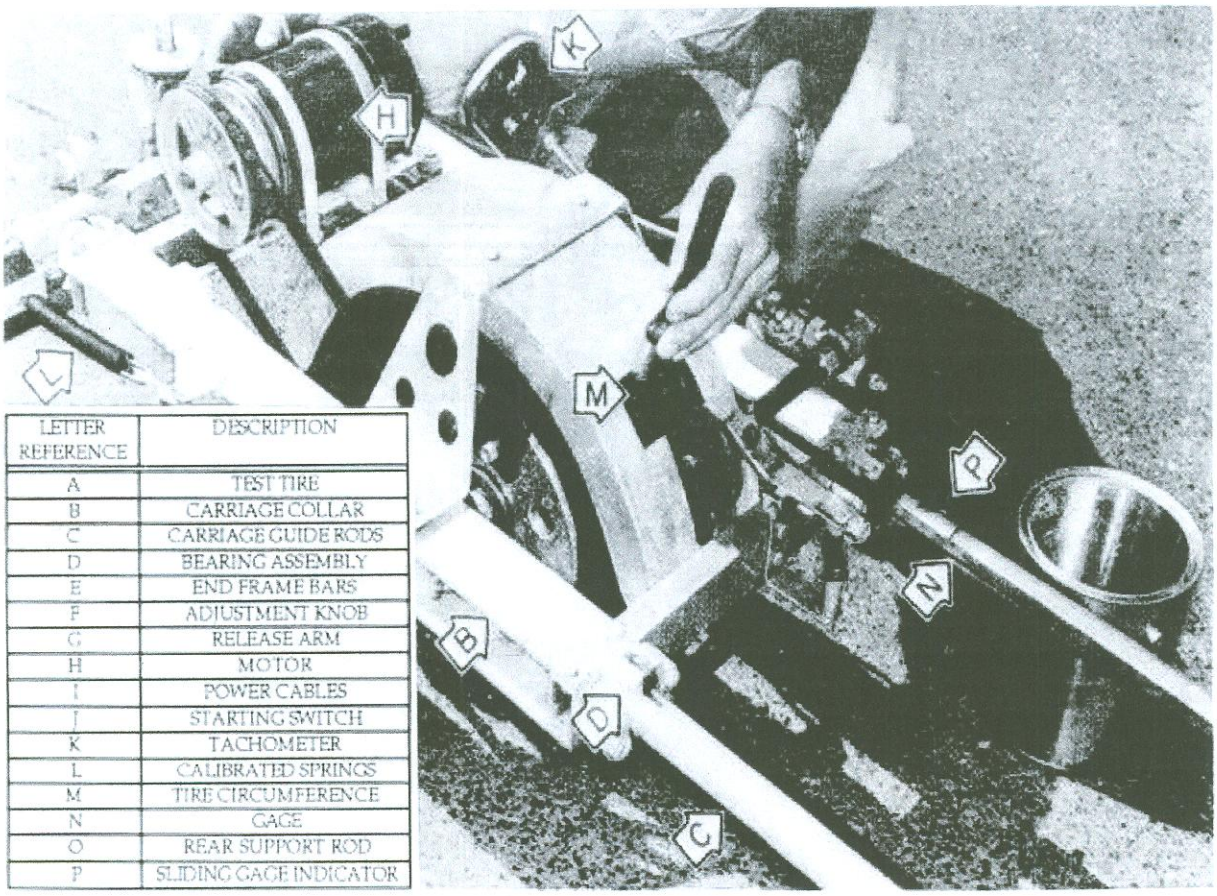

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FIGURE 3. Close-Up View of Skid Tester

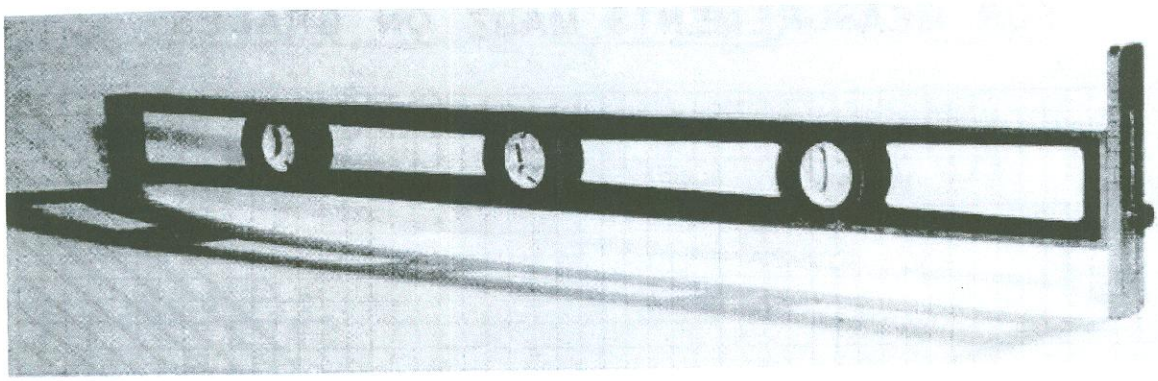


FIGURE 4. Level for Measuring Pavement Slope

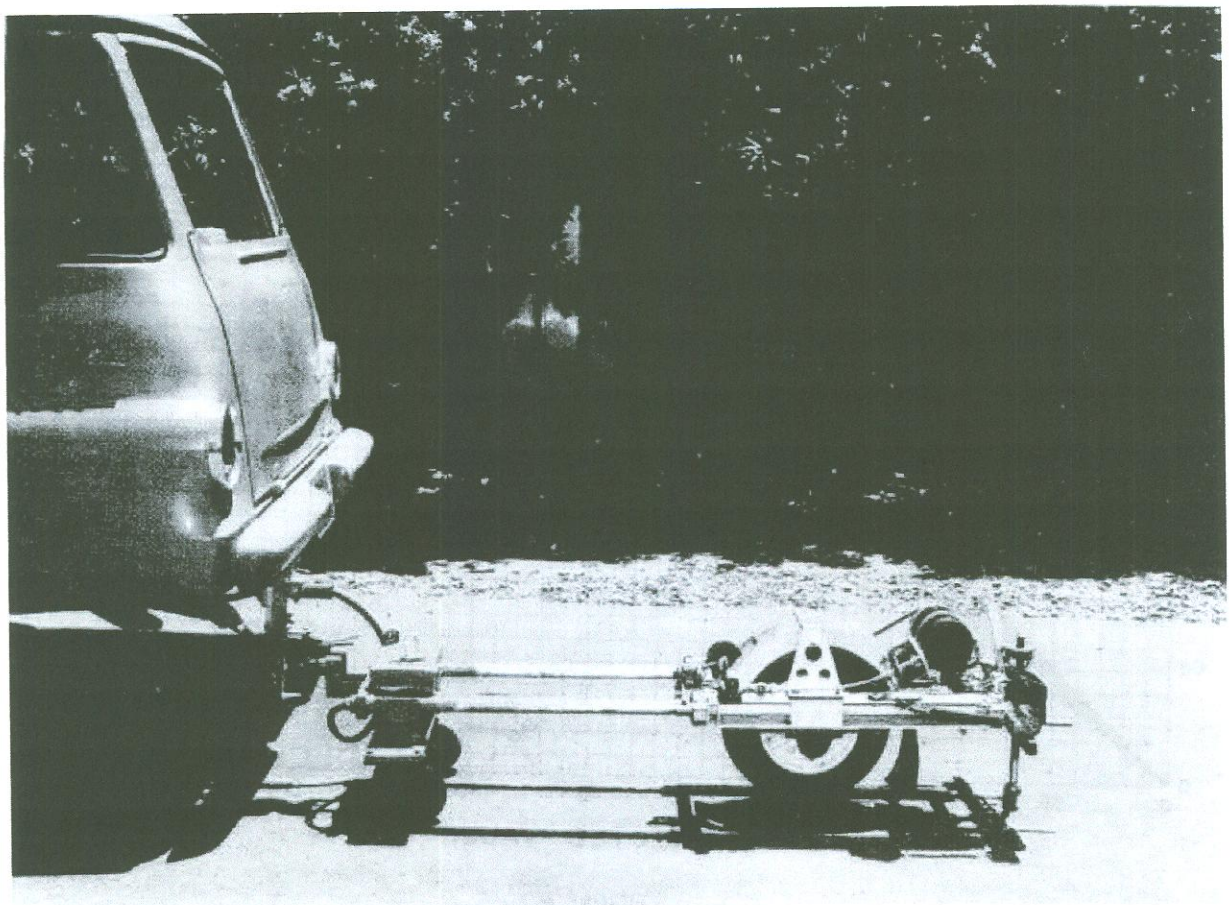


FIGURE 5. Apparatus in Test Position

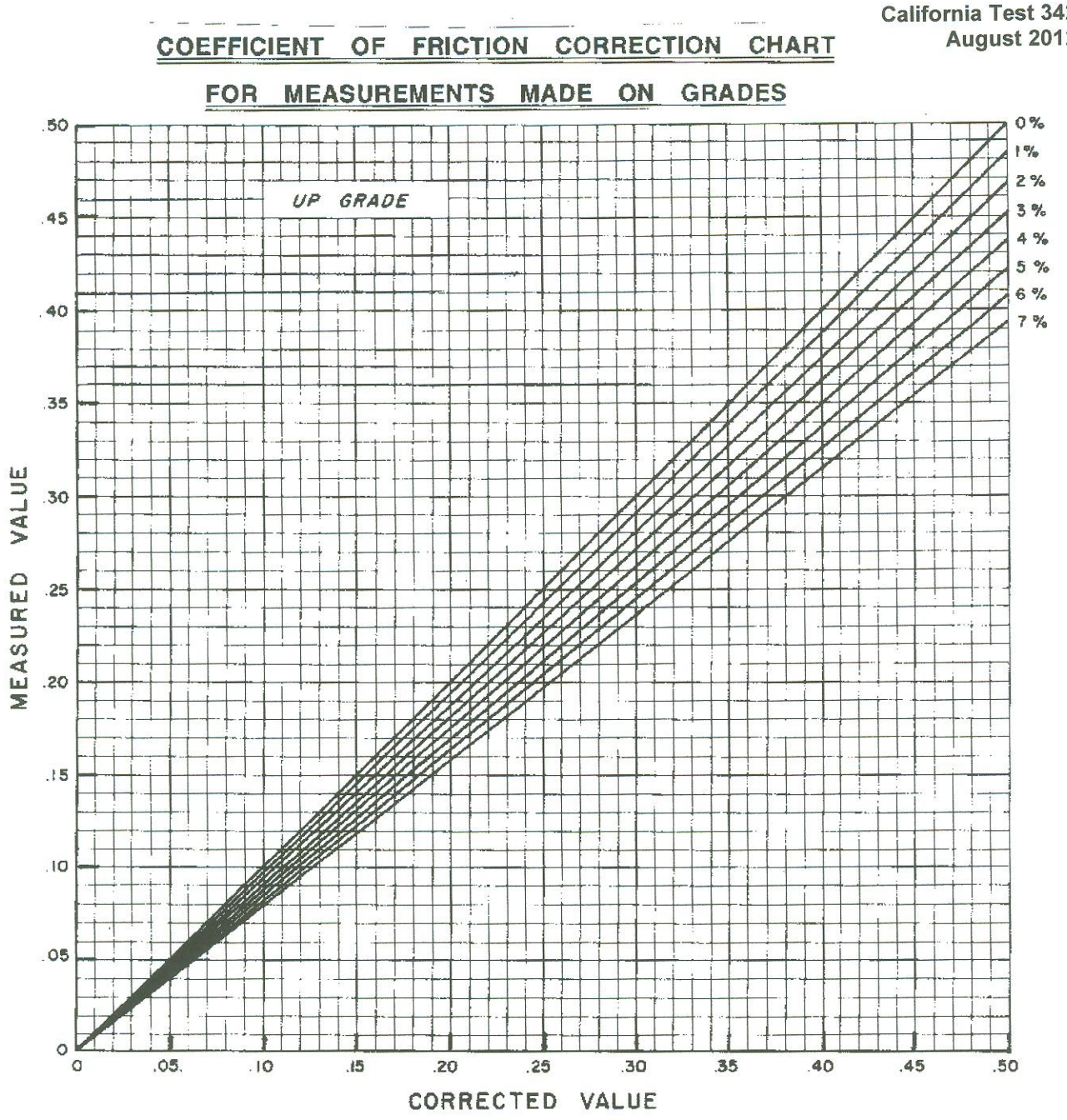


FIGURE 6. Grade Correction Chart (Up Grade)

COEFFICIENT OF FRICTION CORRECTION CHART

FOR MEASUREMENTS MADE ON GRADES

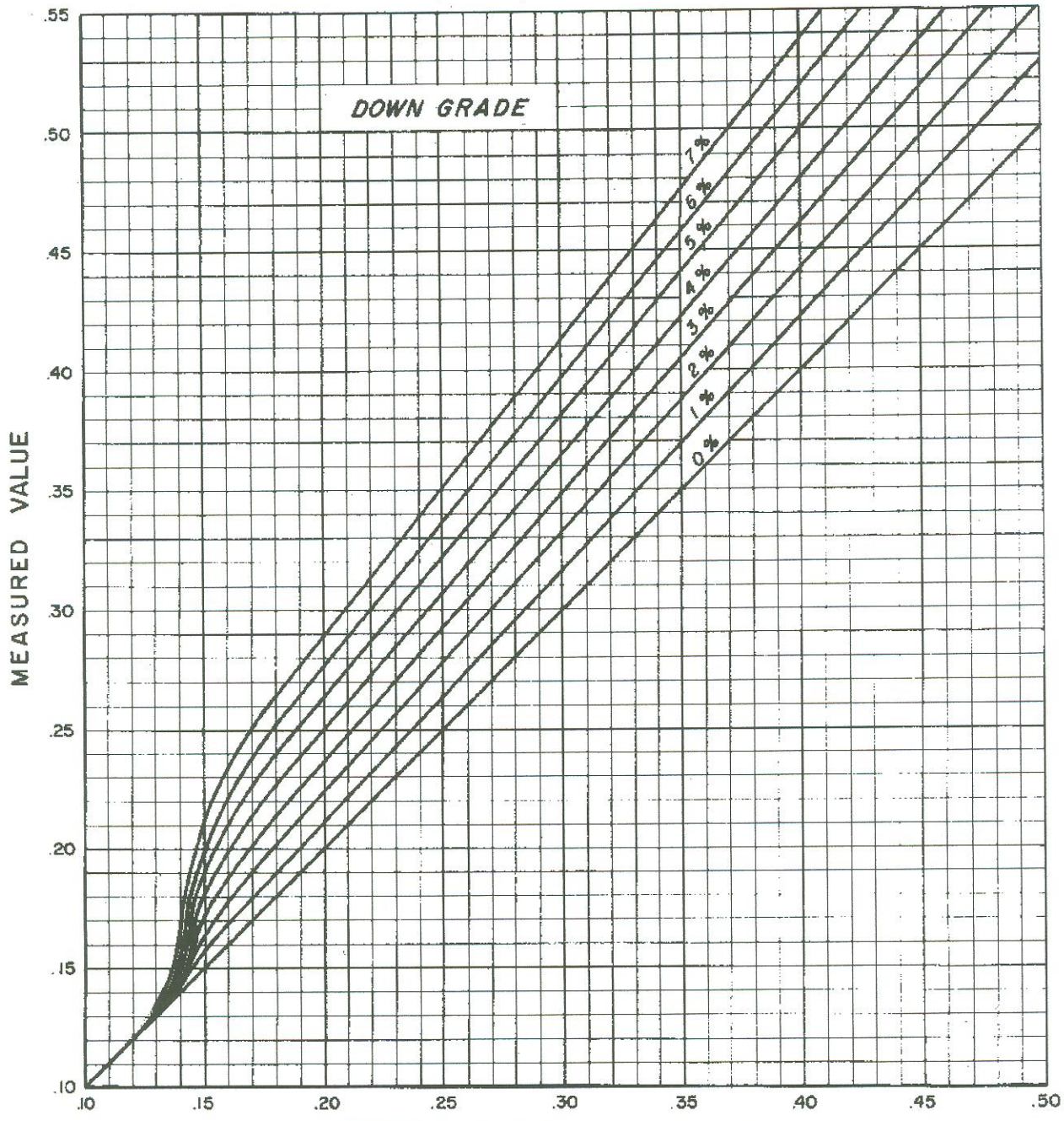


FIGURE 7. Grade Correction Chart (Down Grade)

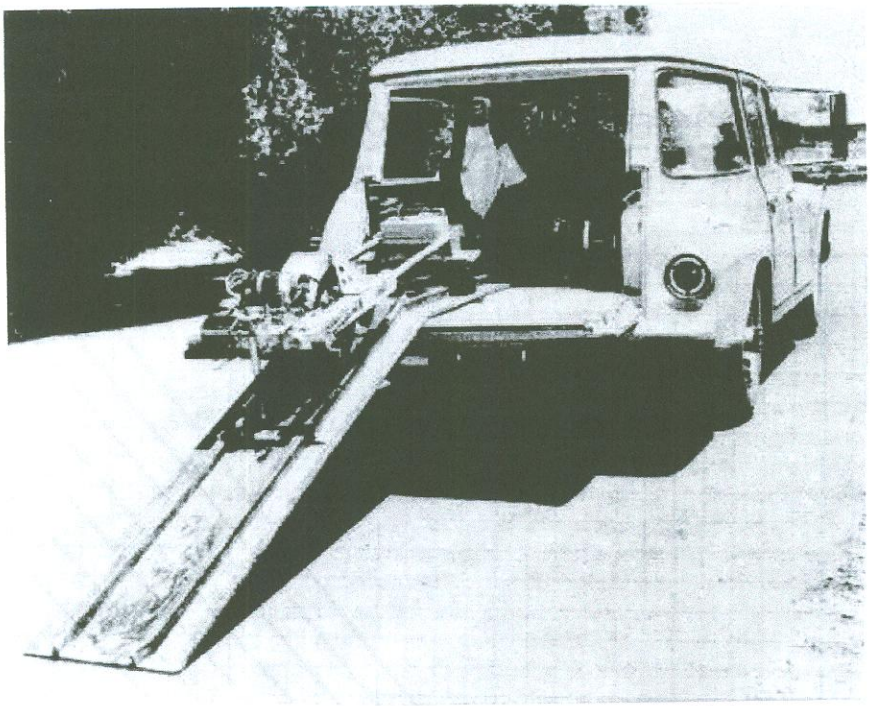


FIGURE 8. Apparatus Being Placed in Vehicle (NOTE: Cable and Winch for Moving Skid Tester)

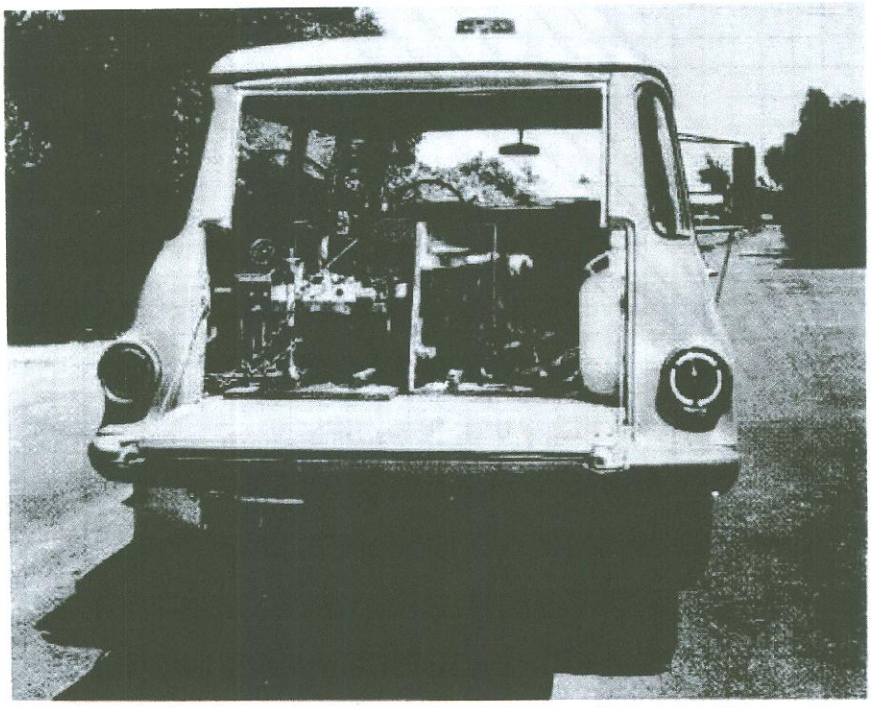


FIGURE 9. Appartus in Position for Transporting

REPORT OF PAVEMENT SKID TESTS

California Department of Transportation
Division of Engineering Services
Materials Engineering and Testing Services
Office of Roadway Materials Testing
5900 Folsom Boulevard, Sacramento, California 95819

Work Requested By: Requester
Requestor's Telephone Number: Ph #
Dist.-Co.-Rte.-PM/PM : 03-Yol-505-PM 23.5/26.5
Project No.: Project #/Phase (EFIS)
Direction & No. of Lanes: Dir (EB,WB,NB,SB) - # of lanes
Type of Surface(s): (PCC, Polyester Concrete, etc.)

Weather: condition
Test Method: CT 342
Request No.: PD06_03#02
Tested By: tester/tester
Date(s) of Test(s): 03/06/09 - 03/07/09
Date(s) Surface(s) Placed: 02/02/09 - 02/05/09

Air Temperature: Deg°F
Fed Aided?: Yes / No
Equipment: PST # 1/2

Position: In the direction of travel, measurements are taken perpendicularly from the left/right edge of the pavement.
Project Stationing: The project stationing is used as the location reference.

RWT=Right Wheel Track
LWT=Left Wheel Track
NB=Northbound Direction of Travel
SB=Southbound Direction of Travel
EB=Eastbound Direction of Travel
WB=Westbound Direction of Travel

Test No.	Location			Percent Grade	Test Measurement			Remarks and Date Surfacing Placed
	Project Stationing (Feet)	Direction & Lane #	Position (Feet)		Measured	Corrected	Average *	
1	125+00	NB LN 1 LWT	5.0	0	0.37	0.37		
	125+25	NB LN 1 LWT	5.0	0	0.35	0.35		
	125+50	NB LN 1 LWT	5.0	0	0.36	0.36		
	125+75	NB LN 1 LWT	5.0	0	0.38	0.38		
	126+00	NB LN 1 LWT	5.0	0	0.37	0.37	0.37	Placed 02/02/09
2								
3								
4								
					Average:		0.37	

Tire Pressure: Pressure psi
Tire Pressure Specs: 25 psi +/- 2 psi
Calibration: Calibration Plate #
Calib. Plate #2 Specs: 0.42/0.30 +/- 0.02

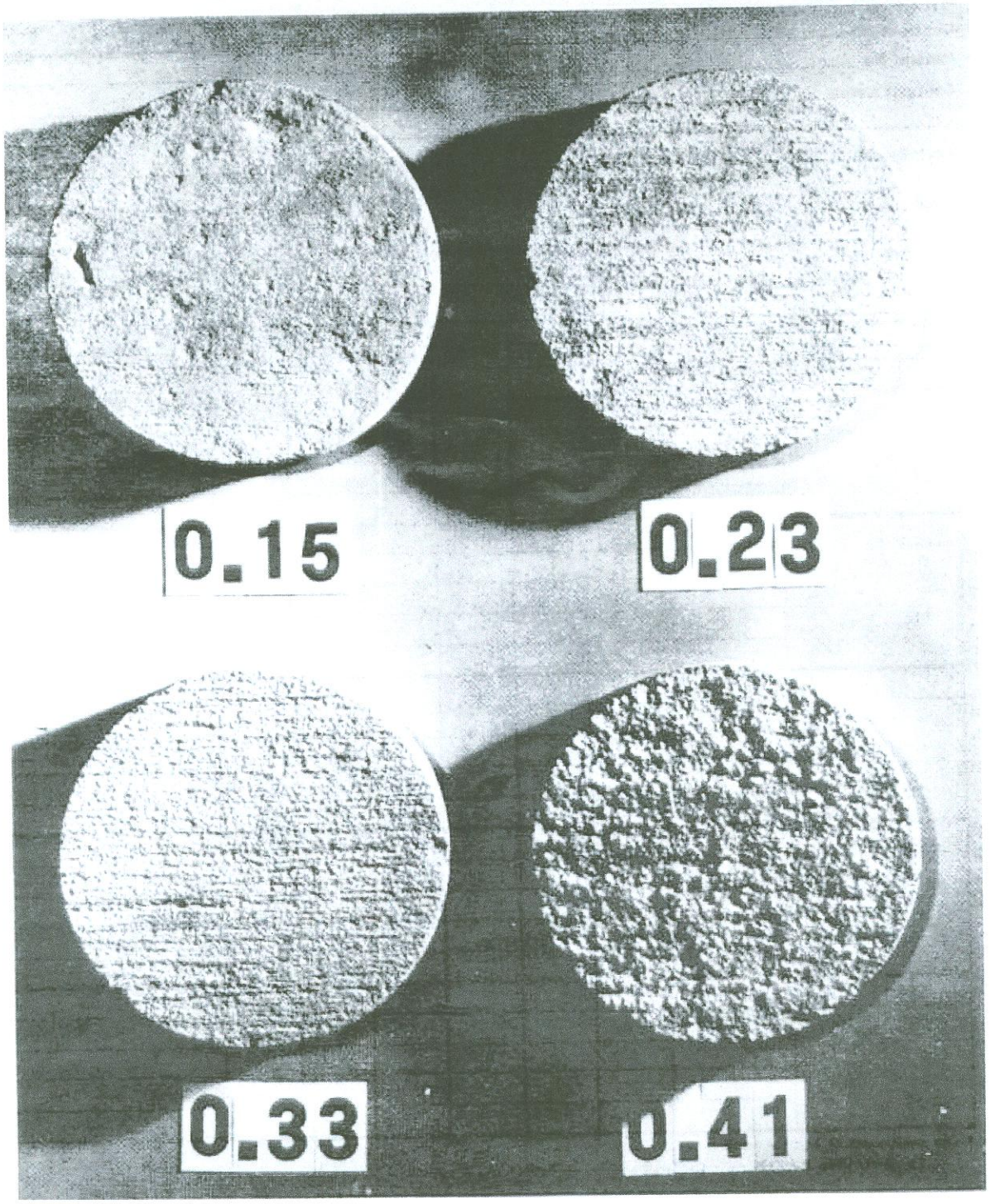
* The coefficient of friction value as measured by California Test 342

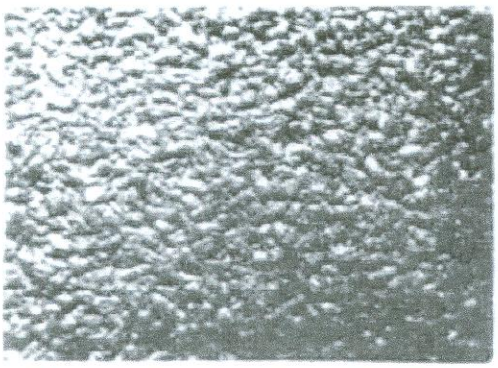
Reported By: reporter
Checked By: checker
Pavement Testing Branch
(916) 227-5847

FIGURE 10. Report Form

APPENDIX

COEFFICIENT OF FRICTION VALUES FOR TYPICAL PORTLAND CEMENT CONCRETE SURFACES ILLUSTRATING A RANGE OF TEXTURES

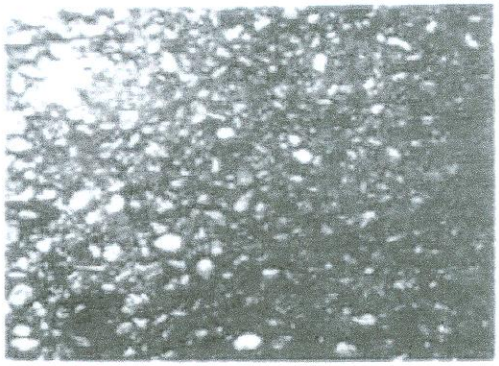




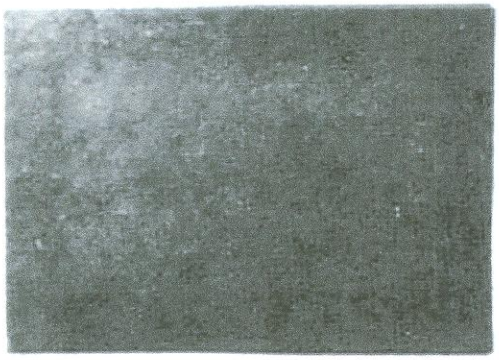
TYPICAL OPEN GRADED
0.39

TYPICAL DENSE GRADED
0.37

MEDIUM AGGREGATE
CHIP SEAL
0.43



CHIP SEAL WITH SOME
CHIPS IMBEDDED OR MISSING
0.37



EXCESSIVE FOG SEAL
OVER DGAC
0.15

BLEEDING OR FLUSHING
DGAC
0.13

COEFFICIENT OF FRICTION VALUES FOR
VARIOUS ASPHALT CONCRETE SURFACES