DEPARTMENT OF TRANSPORTATION
ENGINEERING SERVICE CENTER
Transportation Laboratory
P. O. Box 19128
Sacramento, California 95819

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

CAUTION: Prior to handling test materials, performing equipment setups, and / or conducting this method, testers are required to read **"SAFETY AND HEALTH"** in Section H of this method. It is the responsibility of the user of this method to consult and use departmental safety and health practices and determine the applicability of regulatory limitations before any testing is performed.

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. APPARATUS

1. Skid testing unit

   A 2-ply tire (200 mm rim height, 95 mm rim width, 425 mm tire height and a maximum overall tire width from 100 to 120 mm) with 170 ± 15 kPa air pressure manufactured with a smooth tread, together with rim, axle, and driving pulley, is mounted to a rigid frame. 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 6 mm 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 kilometers per hour. 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 0.7-m 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.

C. MATERIALS

1. Glycerin

2. Water

3. Paint brush
   (approximately 50 mm wide)

4. Wooden spacer
   (6 mm thick, 0.6 m long and 25 mm wide)

5. A stiff fiber broom

D. 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 6 mm 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 0.5 m ahead of the contact point) with glycerin, 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 90 km / h.

10. Release starting switch.

11. Drop the test tire to the pavement surface the instant the tachometer shows 80 km / h. 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 7.5-m intervals, unless any test measurement is less than the specified minimum. If less than the specified minimum, make five test measurements at 0.6-m 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 0.6 m nor farther than 1.2 m, 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 non-compliance.

E. 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 7.5 m intervals in a test location.

Test Location	Test Measurement	% Grade	Corrected Test Measurement*
0+00.0	0.37	+2	0.39
0+07.5	0.38	+1	0.39
0+15.0	0.40	+1	0.41
0+22.5	0.39	+1	0.40
0+30.0	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.

F. 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. Glycerin 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 AC placement before testing.

6. Temperatures less than 4.5˚C will cause glycerin to become viscous and yield lower values. For full accuracy, coefficient of friction values must be obtained at temperatures greater than 4.5˚C.

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 glycerin.

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

G. 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

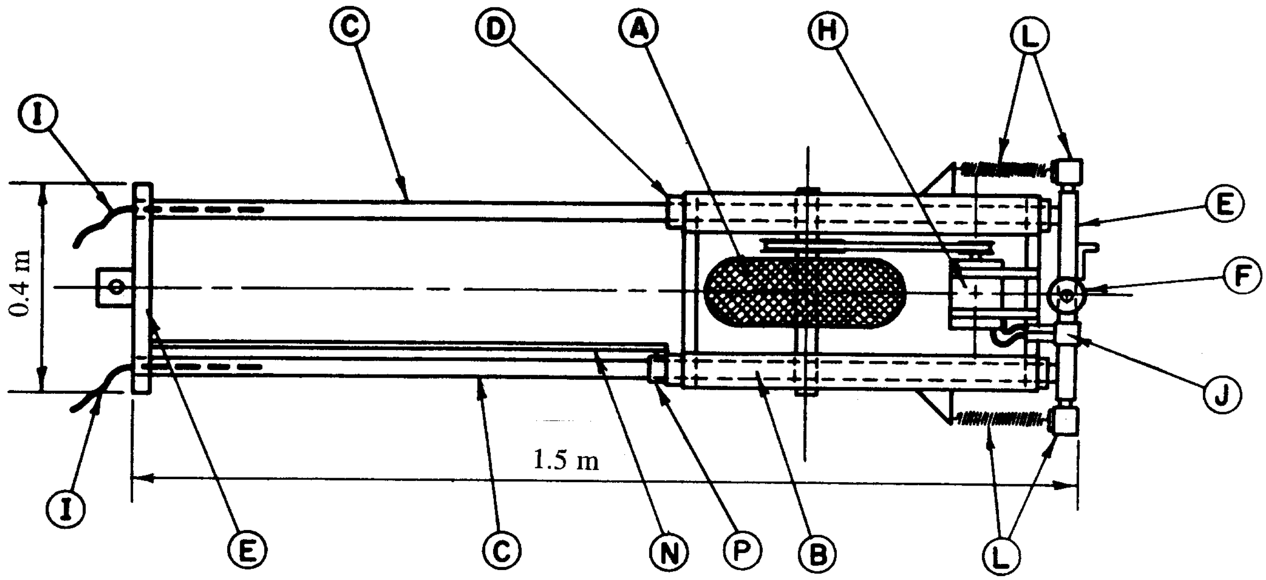
8. Form TL-3111 shall be used to report all test results. See Figure 10.

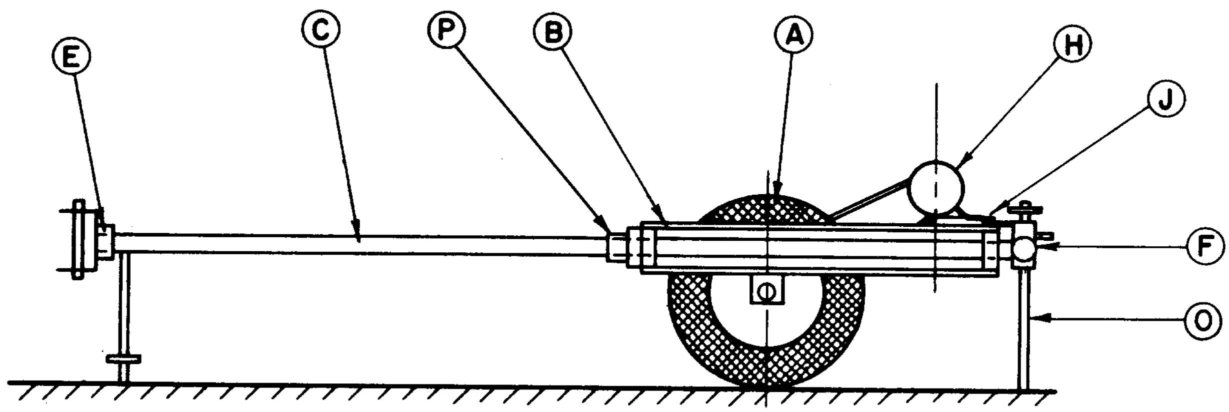
H. SAFETY AND HEALTH

Prior to handling, testing or disposing of any waste materials, testers are required to read: Part A (Section 5.0), Part B (Sections: 5.0, 6.0 and 10.0) and Part C (Section 1.0) of Caltrans Laboratory Safety Manual. Users of this method do so at their own risk.

REFERENCE:
California Test 114

End of Text (California Test 342 contains 12 pages)





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

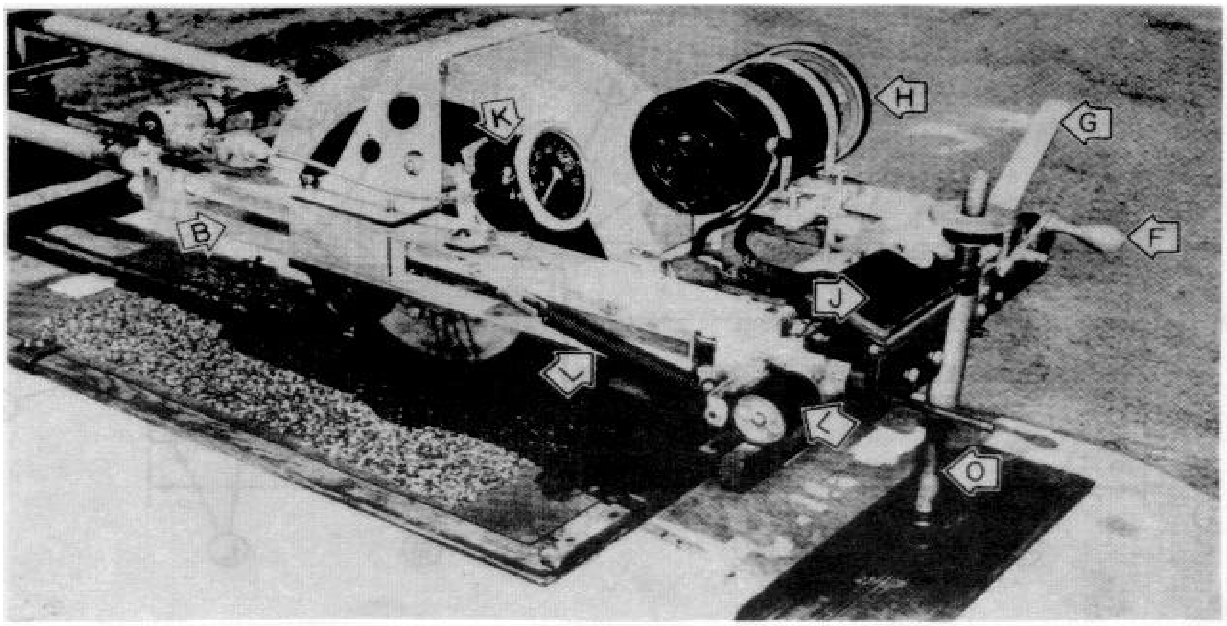


FIGURE 2 - SIDE VIEW OF SKID TESTER

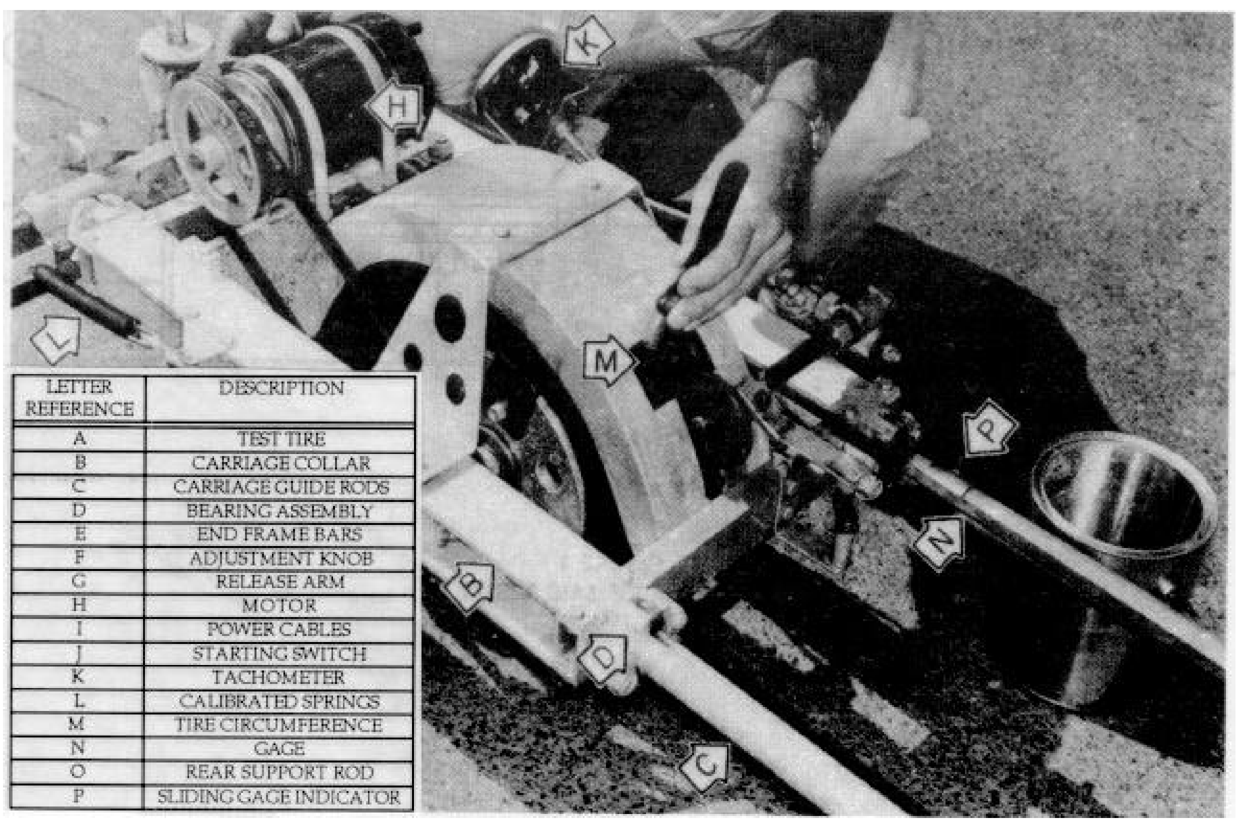


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FIGURE 3 - CLOSE-UP VIEW OF SKID TESTER

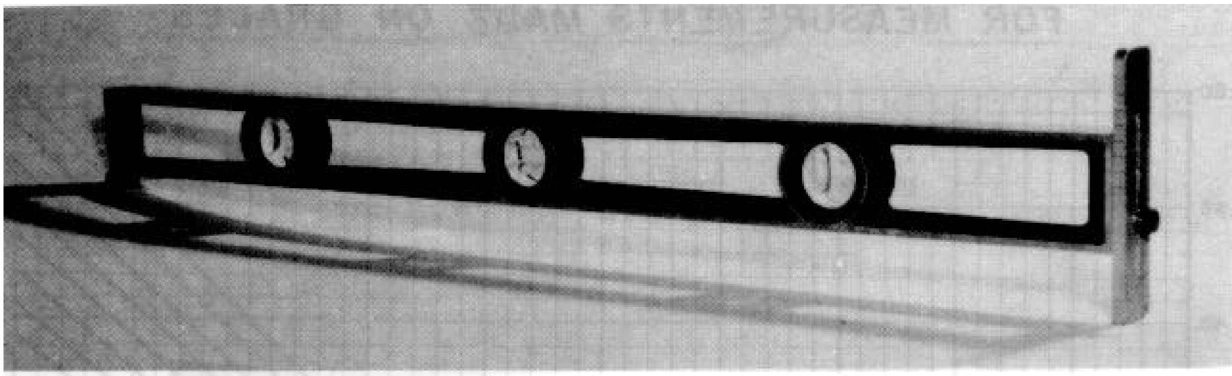


FIGURE 4 - LEVEL FOR MEASURING PAVEMENT SLOPE

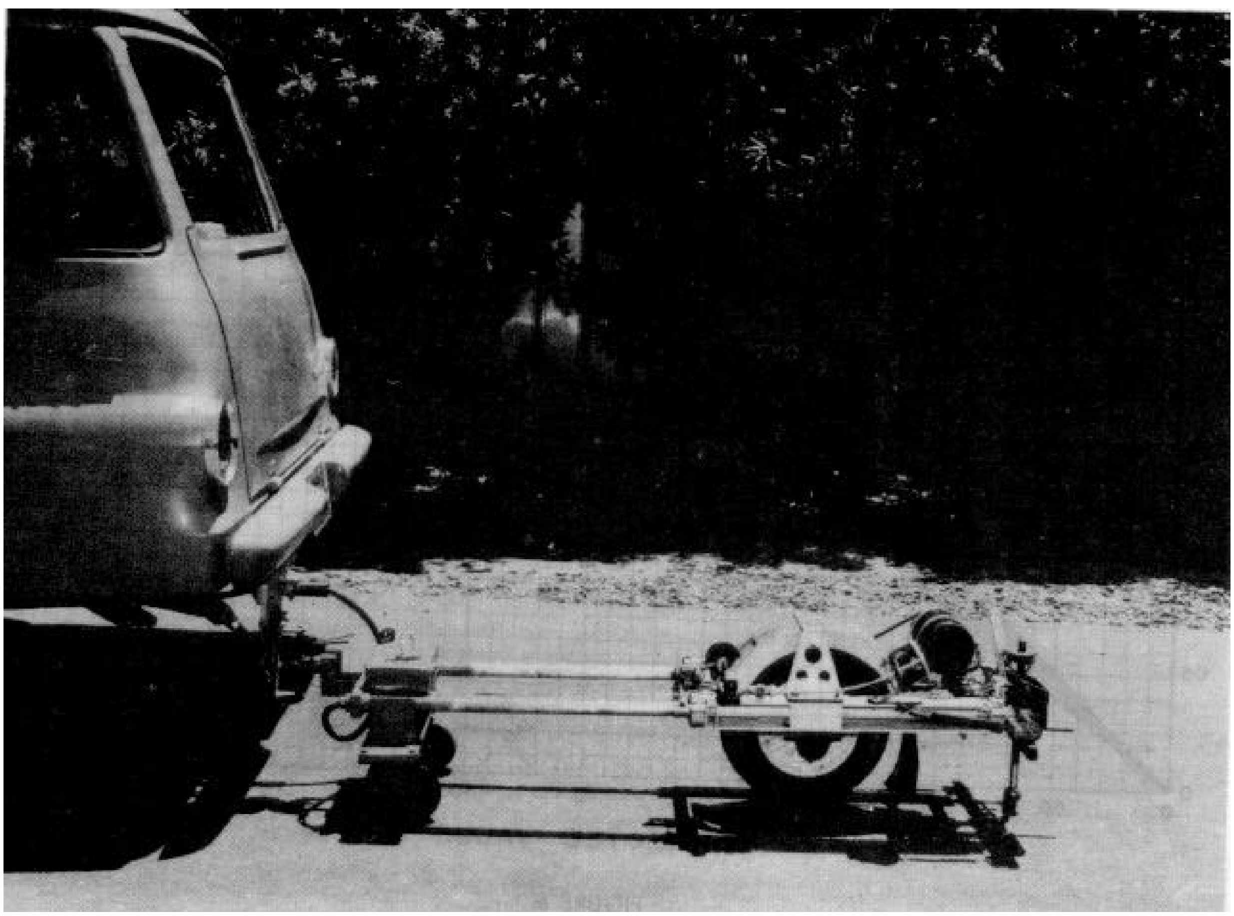


FIGURE 5 - APPARATUS IN TEST POSITION

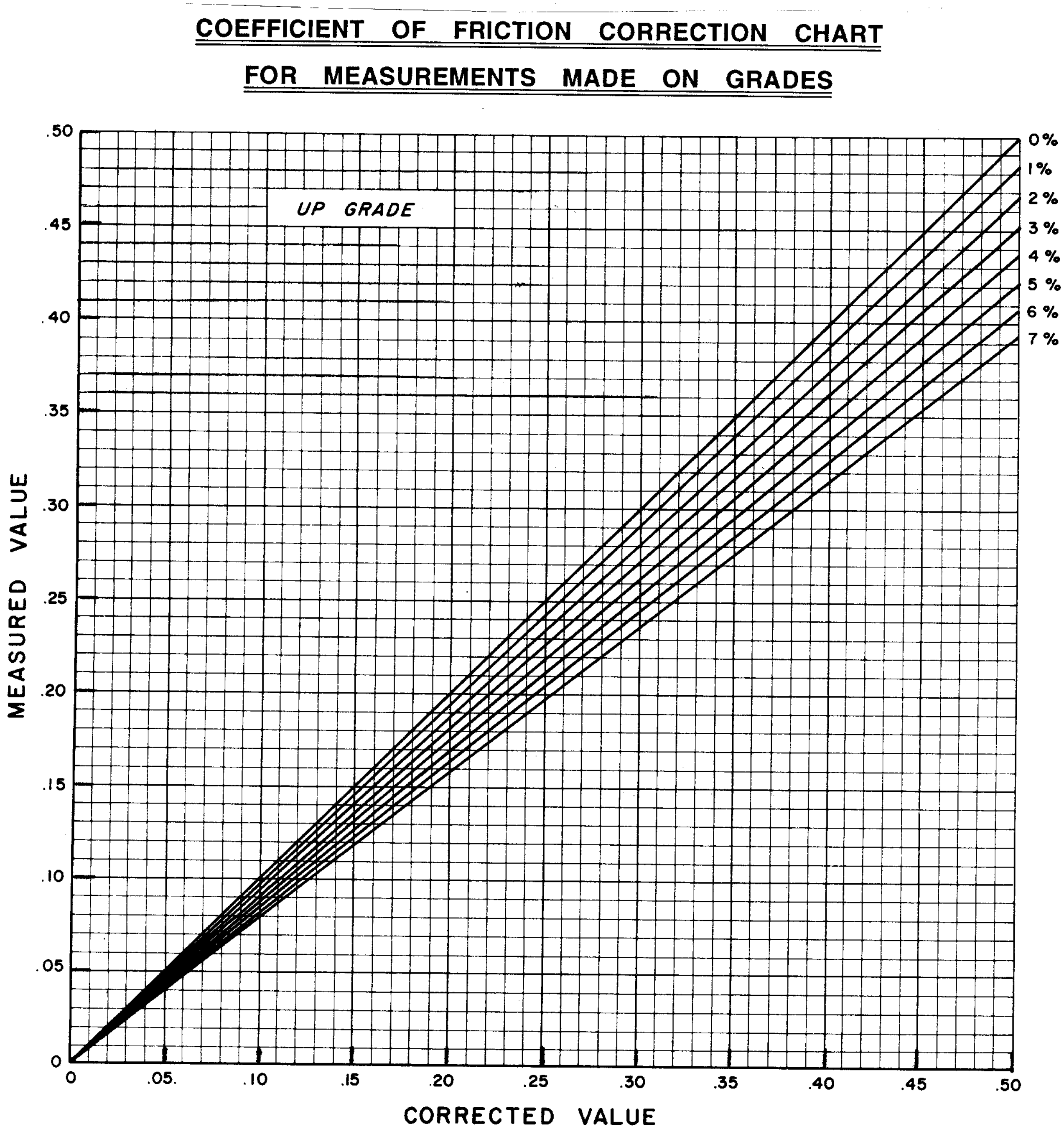


FIGURE 6 - GRADE CORRECTION CHART (UP GRADE)

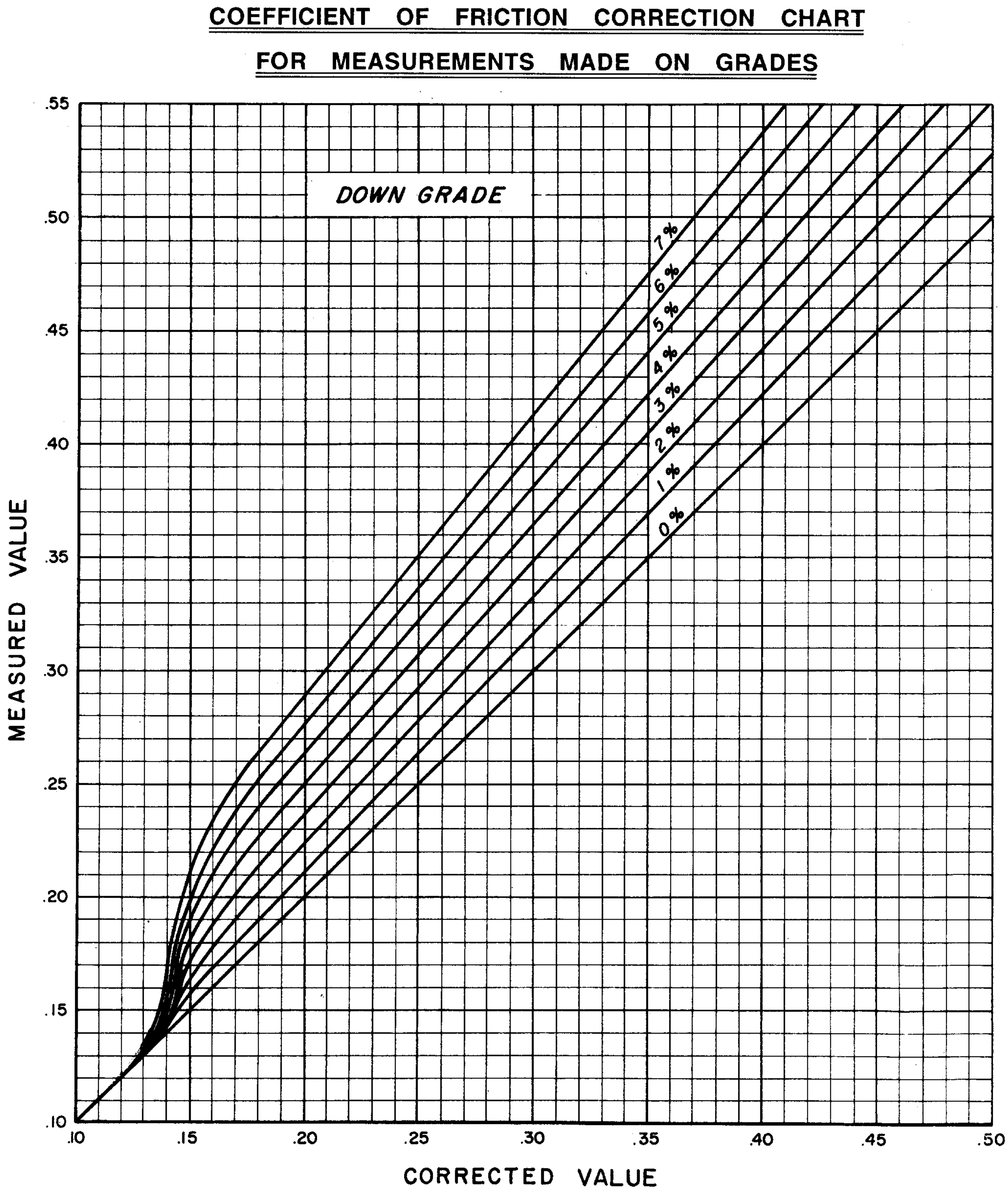


FIGURE 7 - GRADE CORRECTION CHART (DOWN GRADE)

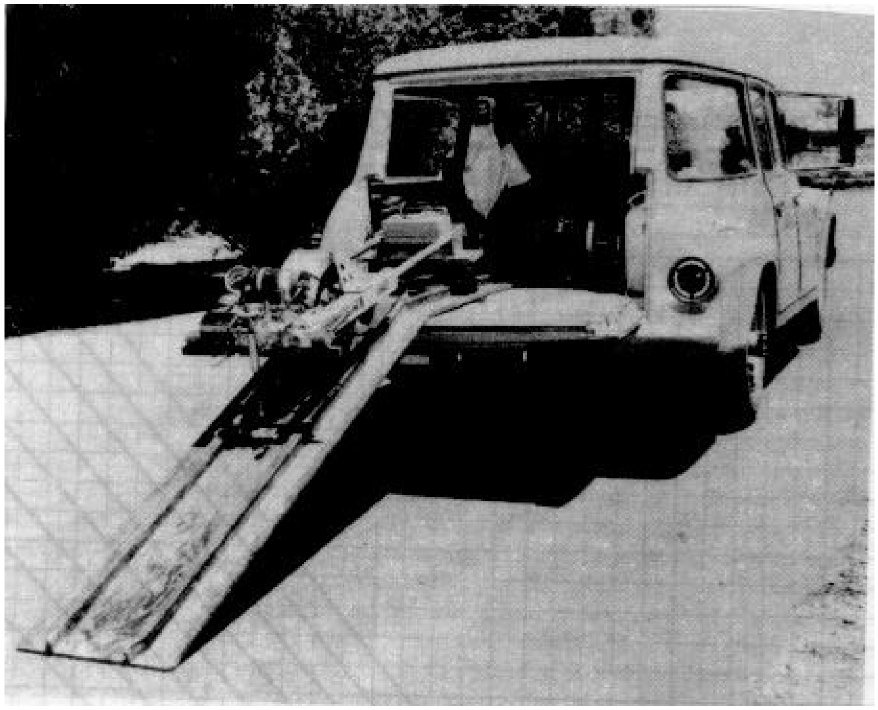


FIGURE 8 - APPARATUS BEING PLACED IN VEHICLE
(NOTE: CABLE AND WINCH FOR MOVING SKID TESTER)

FIGURE 9 - APPARATUS IN POSITION FOR TRANSPORTING

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
ENGINEERING SERVICE CENTER

TRANSPORTATION LABORATORY
REPORT OF SKID TESTS

DISTRIBUTION
- _ TRANSLAB
- _ RESIDENT ENGINEER
- _ DISTRICT MATERIALS ENGINEER
- _ OFFICE OF STRUCTURES

District, County, Route, P.M. ____________________

Contract Number ____________________ Number of Lanes ____________

Federal Number ____________________ Bridge Width ____________

Contract Limits ____________________

Tested By ____________ Test Date ________ Bridge No. ____________

Lane: ____________ Average Air Temperature ____________

Position: In the direction of flow, position denotes feet to the right of the left edge of pavement or the inside face of the right wheel from the left bridge rail.

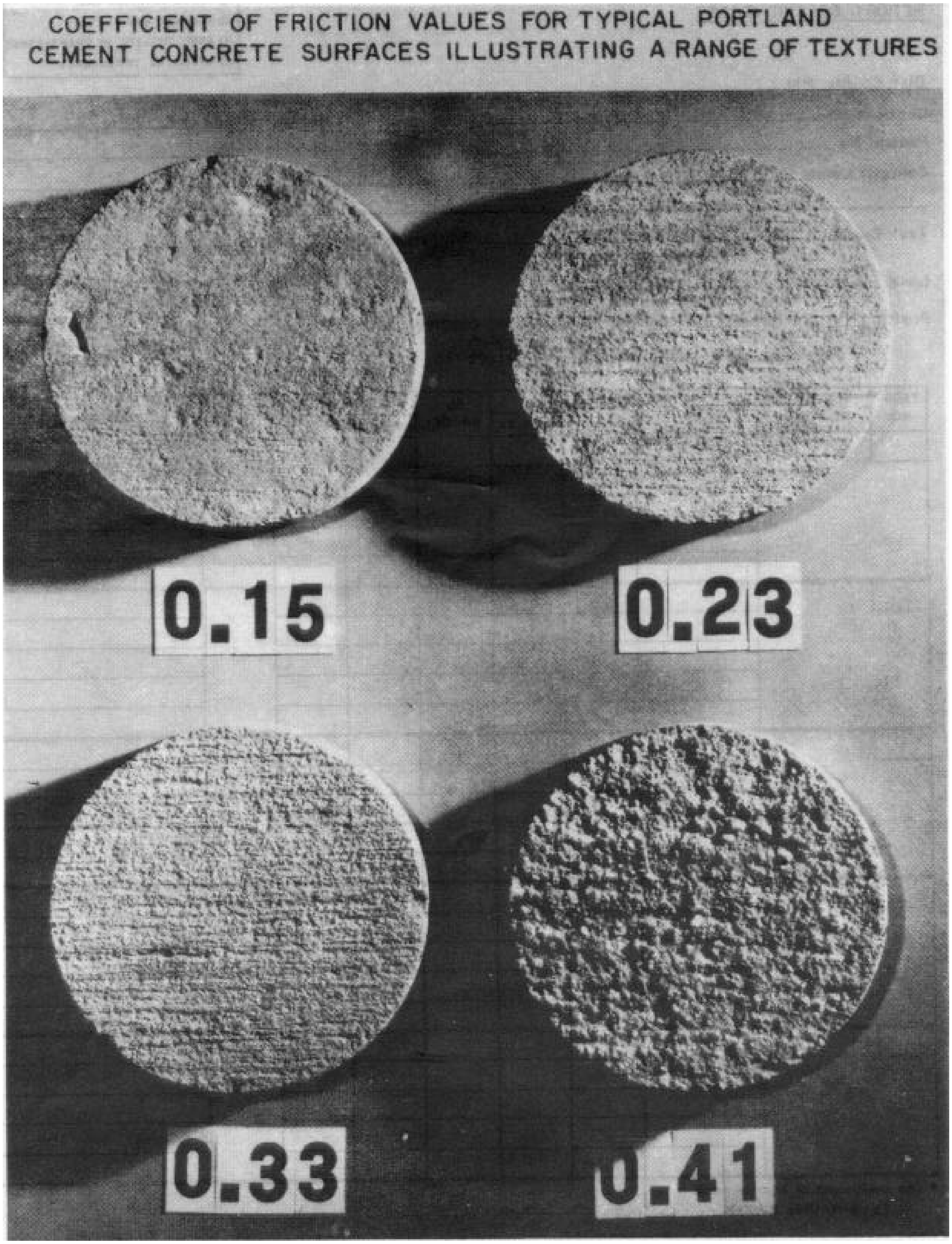
TEST NO.	DATE PLACED	LOCATION			PERCENT GRADE	TEST MEASUREMENT			REMARKS
		KILOMETER POST	LANE	POSITION		MEASURED	CORRECTED	AVERAGE *	
1									
2									
3									
4									
5									

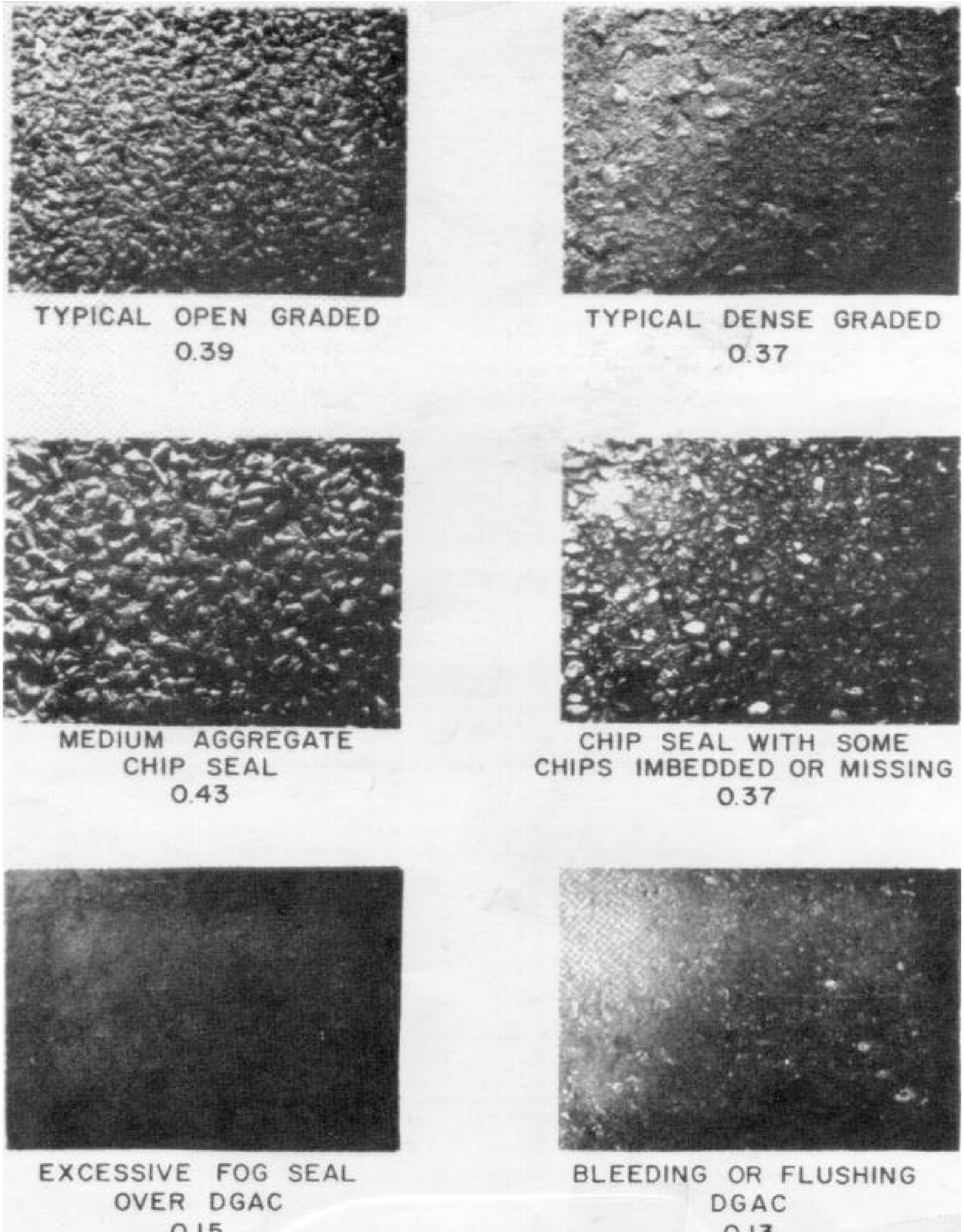
* The coefficient of friction value

FORM TL-3111 (Revised 8/95)

FIGURE 10 - REPORT FORM

APPENDIX


COEFFICIENT OF FRICTION VALUES FOR TYPICAL PORTLAND CEMENT CONCRETE SURFACES ILLUSTRATING A RANGE OF TEXTURES
0.15
0.23
0.33
0.41



COEFFICIENT OF FRICTION VALUES FOR
VARIOUS ASPHALT CONCRETE SURFACES