U.S. Department
of Transportation

Federal Aviation Administration

Advisory Circular

Subject: Change 1 to MEASUREMENT, CONSTRUCTION, AND MAINTENANCE OF SKID-RESISTANT AIRPORT PAVEMENT SURFACES

Date: 04/16/04 **Initiated by:** AAS-100

AC No: 150/5320-12C **Change:** 1

1. PURPOSE. This change updates information regarding FAA qualified Continuous Friction Measuring Equipment.

2. PRINCIPAL CHANGES. The following editorial changes have been made:

a. Table 3-2. Friction Level Classification For Runway Pavement Surfaces revised to change name from K.J. Law Runway Friction Tester to Dynatest Consulting, Inc., Runway Friction Tester.

b. Appendix 4. FAA-Approved CFME revised to change name from K.J. Law Engineers, Inc., to Dynatest Consulting, Inc., which includes their address.

c. Appendix 4. Changes have been made to reflect updated information for manufacturers.

PAGE CONTROL CHART

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CFME furnished with self-wetting systems should be calibrated periodically to assure that the water flow rate is correct and that the amount of water produced for the required water depth is consistent and applied evenly in front of the friction measuring wheel(s) for all test speeds.

Section 3. Conducting Friction Evaluations with CFME

3-14. PRELIMINARY STEPS. Friction measurement operations should be preceded by a thorough visual inspection of the pavement to identify deficiencies as outlined in paragraph 3-4. Careful and complete notes should be taken not only of the CFME data but of the visual inspection as well. The airport operator should assure that appropriate communications equipment and frequencies are provided on all vehicles used in conducting friction surveys and that all personnel are fully cognizant of airport safety procedures. Personnel operating the equipment should be fully trained and current in all procedures. The CFME should be checked for accurate calibration and the vehicle checked for adequate braking ability.

3-15. LOCATION OF FRICTION SURVEYS ON THE RUNWAY. The airport operator, when conducting friction surveys on runways at 40 mph (65 km/h), should begin recording the data 500 feet (152 m) from the threshold end to allow for adequate acceleration distance. The friction survey should be terminated approximately 500 feet (152 m) from the opposite end of the runway to allow for adequate distance to safely decelerate the vehicle. When conducting friction surveys at 60 mph (95 km/h), the airport operator should start recording the survey 1,000 feet (305 km) from the threshold end and terminate the survey approximately 1,000 feet from the opposite end of the runway. Where travel beyond the end of the runway could result in equipment damage or personal injury, additional runway length should be allowed for stopping. The lateral location on the runway for performing the test is based on the type of aircraft operating on the runway. Unless surface conditions are noticeably different on either side of the runway centerline, a test on one side of the centerline in the same direction the aircraft lands should be sufficient. However, when both runway ends are to be evaluated, vehicle runs can be made to record data on the return trip (both ways).

The lateral location on the runway for performing friction surveys is based on the type and/or mix of aircraft operating on the runway:

a. Runways Serving Only Narrow Body Aircraft. Friction surveys should be conducted 10 feet (3 m) to the right of the runway centerline

b. Runways Serving Narrow Body and Wide Body Aircraft. Friction surveys should be conducted 10 and 20 feet (3 and 6 m) to the right of the runway centerline to determine the worst case condition. If the worst case condition is found to be consistently limited to one track, future surveys may be limited to this track. Care should be exercised, however, to account for any future and/or seasonal changes in aircraft mix.

3-16. VEHICLE SPEED FOR CONDUCTING SURVEYS. All of the approved CFME in Appendix 4 can be used at either 40 mph (65 km/h) or 60 mph (95 km/h). The lower speed determines the overall macrotexture/contaminant/drainage condition of the pavement surface. The higher speed provides an indication of the condition of the surface's microtexture. A complete survey should include tests at both speeds.

3-17. USE OF CFME SELF-WETTING SYSTEM. Since wet pavement always yields the lowest friction measurements, CFME should routinely be used on wet pavement which gives the "worst case" condition. CFME is equipped with a self-wetting system to simulate rain wet pavement surface conditions and provide the operator with a continuous record of friction values along the length of the runway. The attached nozzle(s) are designed to provide a uniform water depth of 1 mm (0.04 inch) in front of the friction measuring tire(s). This wetted surface produces friction values that are most meaningful in determining whether or not corrective action is required.

3-18. FRICTION SURVEYS DURING RAINFALL. One limitation in using the self-wetting system on a friction measuring device is that it cannot by itself indicate the potential for hydroplaning. Some runways have depressed areas which pond during periods of moderate to heavy rainfall. These areas may exceed considerably the water depth used by the self-wetting system of the friction measuring device. Therefore, it

is recommended that the airport owner periodically conduct visual checks of the runway surface during rainfall, noting the location, average water depth, and approximate dimensions of the ponded areas. If the average water depth exceeds 1/8 inch (3 mm) over a longitudinal distance of 500 feet (152 m), the depressed area should be corrected to the standard transverse slope. If possible, the airport owner should conduct periodic friction surveys during rainfall through the ponded areas.

3-19. FRICTION LEVEL CLASSIFICATION. Mu numbers (friction values) measured by CFME can be used as guidelines for evaluating the surface friction deterioration of runway pavements and for identifying appropriate corrective actions required for safe aircraft operations. Table 3-2 depicts the friction values for three classification levels for FAA qualified CFME operated at 40 and 60 mph (65 and 95 km/h) test speeds. This table was developed from qualification and correlation tests conducted at NASA's Wallops Flight Facility in 1989.

TABLE 3-2. FRICTION LEVEL CLASSIFICATION FOR RUNWAY PAVEMENT SURFACES

	40 mph			60 mph		
	Minimum	Maintenance Planning	New Design/ Construction	Minimum	Maintenance Planning	New Design/ Construction
Mu Meter	.42	.52	.72	.26	.38	.66
Dynatest Consulting, Inc. Runway Friction Tester	.50	.60	.82	.41	.54	.72
Airport Equipment Co. Skiddometer	.50	.60	.82	.34	.47	.74
Airport Surface Friction Tester	.50	.60	.82	.34	.47	.74
Airport Technology USA Safegate Friction Tester	.50	.60	.82	.34	.47	.74
Findlay, Irvine, Ltd. Griptester Friction Meter	.43	.53	.74	.24	.36	.64
Tatra Friction Tester	.48	.57	.76	.42	.52	.67
Norsemeter RUNAR (operated at fixed 16% slip)	.45	.52	.69	.32	.42	.63

3-20. EVALUATION AND MAINTENANCE GUIDELINES. The following evaluation and maintenance guidelines are recommended based on the friction levels classified in Table 3-2. These guidelines take into account that poor friction conditions for short distances on the runway do not pose a safety problem to aircraft, but long stretches of slippery pavement are of serious concern and require prompt remedial action.

a. Friction Deterioration Below the Maintenance Planning Friction Level (500 ft). When the average Mu value on the wet runway pavement surface is less than the Maintenance Planning Friction Level but above the Minimum Friction Level in Table 3-2 for a distance of 500 feet (152 m), and the adjacent 500 foot (152 m) segments are at or above the Maintenance Planning Friction Level, no corrective action is required. These readings indicate that the pavement friction is deteriorating but the situation is still within an acceptable overall condition. The airport operator should monitor the situation closely by conducting periodic friction surveys to establish the rate and extent of the friction deterioration.

APPENDIX 4. FAA-APPROVED CFME

AIRPORT SURFACE FRICTION TESTER INDUSTRIES AB Metallgatan 7 271 39 Ystad, Sweden SWEDEN	**AIRPORT SURFACE FRICTION TESTER** +46 0 411 651 00 FAX +46 0 411 190 12 sales@ asft.se
AIRPORT TECHNOLOGY USA	**SAFEGATE FRICTION TESTER**
NO LONGER AVAILABLE	
DYNATEST CONSULTING, INC., **(FORMERLY K.J. LAW ENGINEERS, INC.)** 13952 US Highway 301 South Starke, FL 32091	**RUNWAY FRICTION TESTER (M6800)** (904) 964-3777 FAX (904) 964-3749
FINDLAY, IRVINE, LTD. 42-44 Bog Road, Penicuik Midlothian EH 26 9 BU SCOTLAND	**GRIPTESTER FRICTION TESTER** +44 1968 672111 FAX +44 1968 671237 www.findlayirvine.com
INTERTECH ENGINEERING	**TATRA FRICTION TESTER**
NO LONGER AVAILABLE	
NEUBERT AERO CORP. 4105 West DeLeon Street Tampa, FL 33609	**MARK 4 MU METER** (404) 252-0600 FAX (727) 789-2015 www.airportnac.com
NORSEMETER P.O. Box 125 Bogstadvien 0323 0310 NORWAY	**RUNAR RUNWAY ANALYSER AND RECORDER** +47 23 20 1270 FAX + 47 23 20 1271
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