State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

Request for Quotation

RFQ NUMBER	PAGE
7780061	1

ADDRESS CORRESPONDENCE TO ATTENTION OF:
MICHAEL AUSTIN
304-558-2402

VENDOR
RFQ COPY
TYPE NAME/ADDRESS HERE

SHIP TO
DIVISION OF HIGHWAYS
MATERIALS, CONTROL, SOILS,
& TESTING
190 DRY BRANCH DRIVE
CHARLESTON, WV
25306 304-558-8984

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
03/25/2008				

BID OPENING DATE: 04/16/2008 BID OPENING TIME 01:30PM

LINE	QUANTITY	UOP	CAT NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
0001	1	EA		845-63		

CONTINOUS READING, FIXED SLIP TEST TRAILER

PER THE ATTACHED SPECIFICATIONS.

VENDOR PREFERENCE CERTIFICATE

CERTIFICATION AND APPLICATION* IS HEREBY MADE FOR PREFERENCE IN ACCORDANCE WITH WEST VIRGINIA CODE, 5A-3-37 (DOES NOT APPLY TO CONSTRUCTION CONTRACTS).

A. APPLICATION IS MADE FOR 2.5% PREFERENCE FOR THE REASON CHECKED:

( ) BIDDER IS AN INDIVIDUAL RESIDENT VENDOR AND HAS RESIDED CONTINUOUSLY IN WEST VIRGINIA FOR FOUR (4) YEARS IMMEDIATELY PRECEDING THE DATE OF THIS CERTIFICATION; OR

( ) BIDDER IS A PARTNERSHIP, ASSOCIATION OR CORPORATION RESIDENT VENDOR AND HAS MAINTAINED ITS HEADQUARTERS OR PRINCIPAL PLACE OF BUSINESS CONTINUOUSLY IN WEST VIRGINIA FOR FOUR (4) YEARS IMMEDIATELY PRECEDING THE DATE OF THIS CERTIFICATION; OR 80% OF THE OWNERSHIP INTEREST OF BIDDER IS HELD BY ANOTHER INDIVIDUAL, PARTNERSHIP, ASSOCIATION OR CORPORATION RESIDENT VENDO WHO HAS MAINTAINED ITS HEADQUARTERS OR PRINCIPAL PLACE OF BUSINESS CONTINUOUSLY IN WEST VIRGINIA FOR FOUR (4) YEARS IMMEDIATELY PRECEDING THE DATE OF THIS CERTIFICATION; OR

( ) BIDDER IS A CORPORATION NONRESIDENT VENDOR

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE	TELEPHONE	DATE

TITLE	FEIN	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

GENERAL TERMS & CONDITIONS
REQUEST FOR QUOTATION (RFQ) AND REQUEST FOR PROPOSAL (RFP)

1. Awards will be made in the best interest of the State of West Virginia.

2. The State may accept or reject in part, or in whole, any bid.

3. All quotations are governed by the ***West Virginia Code*** and the ***Legislative Rules*** of the Purchasing Division.

4. Prior to any award, the apparent successful vendor must be properly registered with the Purchasing Division and have paid the required $125.00 registration fee.

5. All services performed or goods delivered under State Purchase Orders/Contracts are to be continued for the term of the Purchase Order/Contract, contingent upon funds being appropriated by the Legislature or otherwise being made available. In the event funds are not appropriated or otherwise available for these services or goods, this Purchase Order/Contract becomes void and of no effect after June 30.

6. Payment may only be made after the delivery and acceptance of goods or services.

7. Interest may be paid for late payment in accordance with the ***West Virginia Code.***

8. Vendor preference will be granted upon written request in accordance with the ***West Virginia Code.***

9. The State of West Virginia is exempt from federal and state taxes and will not pay or reimburse such taxes.

10. The Director of Purchasing may cancel any Purchase Order/Contract upon 30 days written notice to the seller.

11. The laws of the State of West Virginia and the ***Legislative Rules*** of the Purchasing Division shall govern all rights and duties under the Contract, including without limitation the validity of this Purchase Order/Contract.

12. Any reference to automatic renewal is hereby deleted. The Contract may be renewed only upon mutual written agreement of the parties.

13. **BANKRUPTCY:** In the event the vendor/contractor files for bankruptcy protection, this Contract may be deemed null and void, and terminated without further order.

14. **HIPAA Business Associate Addendum -** The West Viginia State Government HIPAA Business Associate Addendum (BAA), approved by the Attorney General, and available online at the Purchasing Division's web site **(http://www.state.wv.us/admin/purchase/vrc/hipaa.htm)** is hereby made part of the agreement. Provided that, the Agency meets the definition of a Covered Entity (45 CFR §160.103) and will be disclosing Protected Health Information (45 CFR §160.103) to the vendor.

INSTRUCTIONS TO BIDDERS

1. Use the quotation forms provided by the Purchasing Division.

2. **SPECIFICATIONS:** Items offered must be in compliance with the specifications. Any deviation from the specifications must be clearly indicated by the bidder. Alternates offered by the bidder as **EQUAL** to the specifications must be clearly defined. A bidder offering an alternate should attach complete specifications and literature to the bid. The Purchasing Division may waive minor deviations to specifications.

3. Complete all sections of the quotation form.

4. Unit prices shall prevail in cases of discrepancy.

5. All quotations are considered F.O.B. destination unless alternate shipping terms are clearly identified in the quotation.

6. **BID SUBMISSION:** All quotations must be delivered by the bidder to the office listed below prior to the date and time of the bid opening. Failure of the bidder to deliver the quotations on time will result in bid disqualifications.

SIGNED BID TO:

Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

Request for Quotation

RFQ NUMBER	PAGE
7780061	2

ADDRESS CORRESPONDENCE TO ATTENTION OF:
MICHAEL AUSTIN
304-558-2402

VENDOR
RFQ COPY
TYPE NAME/ADDRESS HERE

SHIP TO
DIVISION OF HIGHWAYS
MATERIALS, CONTROL, SOILS,
& TESTING
190 DRY BRANCH DRIVE
CHARLESTON, WV
25306 304-558-8984

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
03/25/2008				

BID OPENING DATE: 04/16/2008 BID OPENING TIME 01:30PM

LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT

WHICH HAS AN AFFILIATE OR SUBSIDIARY WHICH EMPLOYS A MINIMUM OF ONE HUNDRED STATE RESIDENTS AND WHICH HAS MAINTAINED ITS HEAQUARTERS OR PRINCIPAL PLACE OF BUSINESS WITHIN WEST VIRGINIA CONTINUOUSLY FOR THE FOUR (4) YEARS IMMEDIATELY PRECEDING THE DATE OF THIS CERTIFICATION.

B. APPLICATION IS MADE FOR 2.5% PREFERENCE FOR THE REASON CHECKED:

( ) BIDDER IS A RESIDENT VENDOR WHO CERTIFIES THAT, DURING THE LIFE OF THE CONTRACT, ON AVERAGE AT LEAST 75% OF THE EMPLOYEES WORKING ON THE PROJECT BEING BID ARE RESIDENTS OF WEST VIRGINIA WHO HAVE RESIDED IN THE STATE CONTINUOUSLY FOR THE TWO YEARS IMMEDIATELY PRECEDING SUBMISSION OF THIS BID;
OR
( ) BIDDER IS A NONRESIDENT VENDOR EMPLOYING A MINIMUM OF ONE HUNDRED STATE RESIDENTS OR IS A NONRESIDENT VENDOR WITH AN AFFILIATE OR SUBSIDIARY WHICH MAINTAINS ITS HEADQUARTERS OR PRINCIPAL PLACE OF BUSINESS WITHIN WEST VIRGINIA EMPLOYING A MINIMUM OF ONE HUNDRED STATE RESIDENTS WHO CERTIFIES THAT, DURING THE LIFE OF THE CONTRACT, ON AVERAGE AT LEAST 75% OF THE EMPLOYEES OR BIDDERS' AFFILIATE'S OR SUBSIDIARY'S EMPLOYEES ARE RESIDENTS OF WEST VIRGINIA WHO HAVE RESIDED IN THE STATE CONTINUOUSLY FOR THE TWO YEARS IMMEDIATELY PRECEDING SUBMISSION OF THIS BID.

BIDDER UNDERSTANDS IF THE SECRETARY OF TAX & REVENUE DETERMINES THAT A BIDDER RECEIVING PREFERENCE HAS FAILED TO CONTINUE TO MEET THE REQUIREMENTS FOR SUCH PREFERENCE, THE SECRETARY MAY ORDER THE DIRECTOR OF PURCHASING TO: (A) RESCIND THE CONTRACT OR PURCHASE ORDER ISSUED; OR (B) ASSESS A PENALTY AGAINST SUCH BIDDER IN AN AMOUNT NOT TO EXCEED 5% OF THE BID AMOUNT

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE	TELEPHONE	DATE

TITLE	FEIN	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

Request for Quotation

RFQ NUMBER	PAGE
7780061	3

ADDRESS CORRESPONDENCE TO ATTENTION OF:
MICHAEL AUSTIN
304-558-2402

VENDOR
RFQ COPY
TYPE NAME/ADDRESS HERE

SHIP TO
DIVISION OF HIGHWAYS
MATERIALS, CONTROL, SOILS,
& TESTING
190 DRY BRANCH DRIVE
CHARLESTON, WV
25306 304-558-8984

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
03/25/2008				

BID OPENING DATE: 04/16/2008 BID OPENING TIME 01:30PM

LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT

AND THAT SUCH PENALTY WILL BE PAID TO THE CONTRACTING AGENCY OR DEDUCTED FROM ANY UNPAID BALANCE ON THE CONTRACT OR PURCHASE ORDER.

BY SUBMISSION OF THIS CERTIFICATE, BIDDER AGREES TO DISCLOSE ANY REASONABLY REQUESTED INFORMATION TO THE PURCHASING DIVISION AND AUTHORIZES THE DEPARTMENT OF TAX AND REVENUE TO DISCLOSE TO THE DIRECTOR OF PURCHASING APPROPRIATE INFORMATION VERIFYING THAT BIDDER HAS PAID THE REQUIRED BUSINESS TAXES, PROVIDED THAT SUCH INFORMATION DOES NOT CONTAIN THE AMOUNTS OF TAXES PAID NOR ANY OTHER INFORMATION DEEMED BY THE TAX COMMISSIONER TO BE CONFIDENTIAL.

UNDER PENALTY OF LAW FOR FALSE SWEARING (WEST VIRGINIA CODE 61-5-3), BIDDER HEREBY CERTIFIES THAT THIS CERTIFICATE IS TRUE AND ACCURATE IN ALL RESPECTS; AND THAT IF A CONTRACT IS ISSUED TO BIDDER AND IF ANYTHING CONTAINED WITHIN THIS CERTIFICATE CHANGES DURING THE TERM OF THE CONTRACT, BIDDER WILL NOTIFY THE PURCHASING DIVISION IN WRITING IMMEDIATELY.

BIDDER: ----------

DATE: ----------

SIGNED: ----------

TITLE: ----------

* CHECK ANY COMBINATION OF PREFERENCE CONSIDERATION(S) IN EITHER "A" OR "B", OR BOTH "A" AND "B" WHICH YOU

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE	TELEPHONE	DATE

TITLE	FEIN	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

Request for Quotation

RFQ NUMBER	PAGE
7780061	4

ADDRESS CORRESPONDENCE TO ATTENTION OF:
MICHAEL AUSTIN
304-558-2402

VENDOR
RFQ COPY
TYPE NAME/ADDRESS HERE

SHIP TO
DIVISION OF HIGHWAYS
MATERIALS, CONTROL, SOILS,
& TESTING
190 DRY BRANCH DRIVE
CHARLESTON, WV
25306 304-558-8984

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
03/25/2008				

BID OPENING DATE: 04/16/2008 BID OPENING TIME 01:30PM

LINE	QUANTITY	UOP	CAT. NO	ITEM NUMBER	UNIT PRICE	AMOUNT

ARE ENTITLED TO RECEIVE. YOU MAY REQUEST UP TO THE MAXIMUM 5% PREFERENCE FOR BOTH "A" AND "B".
(REV. 12/00)

NOTICE

A SIGNED BID MUST BE SUBMITTED TO:

DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
BUILDING 15
2019 WASHINGTON STREET, EAST
CHARLESTON, WV 25305-0130

THE BID SHOULD CONTAIN THIS INFORMATION ON THE FACE OF THE ENVELOPE OR THE BID MAY NOT BE CONSIDERED:

SEALED BID

BUYER: 33

RFQ. NO.: 7780061

BID OPENING DATE: 04/16/2008

BID OPENING TIME: 1:30 PM

PLEASE PROVIDE A FAX NUMBER IN CASE IT IS NECESSARY TO CONTACT YOU REGARDING YOUR BID:

CONTACT PERSON (PLEASE PRINT CLEARLY):

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE	TELEPHONE	DATE

TITLE	FEIN	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

Request for Quotation

RFQ NUMBER	PAGE
7780061	5

ADDRESS CORRESPONDENCE TO ATTENTION OF:
MICHAEL AUSTIN
304-558-2402

VENDOR
RFQ COPY
TYPE NAME/ADDRESS HERE

SHIP TO
DIVISION OF HIGHWAYS
MATERIALS, CONTROL, SOILS,
& TESTING
190 DRY BRANCH DRIVE
CHARLESTON, WV
25306 304-558-8984

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
03/25/2008				

BID OPENING DATE: 04/16/2008 BID OPENING TIME 01:30PM

LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT

****** THIS IS THE END OF RFQ 7780061 ****** TOTAL:

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE	TELEPHONE	DATE

TITLE	FEIN	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

Continuous Reading, Fixed Slip Test Trailer.

1. Shall be equipped with either a force transducer to provide direct measurement of the braking force, or a torque transducer to measure the torque on the test wheel or both. A load force transducer shall be included if the average load force cannot be shown to be within 1 % of the static wheel load over the reporting length.

1.1 Braking force transducer, if included, shall measure the force with minimal inertial effects. The effects of cross-axle loading shall be less than 1 % of the applied load and shall experience less than 1 degree angular rotation with respect to its longitudinal measuring plane at the expected maximum loading. It is preferable that the output is directly proportional to force with hysteresis less than 1 % of the applied load up to the maximum applied load.

1.2 Torque transducer, if included, shall provide output directly proportional to torque with hysteresis less than 1 % of the applied load and nonlinearity up to the maximum applied load of less than 1 % of the applied load. Torque measurements include all wheel/tire effects. These effects shall be compensated for at all test speeds.

1.3 If a load force transducer is included, it will meet the requirements of section 1.1. If not included, the load force will be assumed constant and the dynamic wheel load must be shown to be within ± 2 % of the actual dynamic wheel load.

2. Shall include a mechanism or mechanisms to measure the test speed and distance traveled.

2.1 Distance shall be measured with a resolution of 0.1 % and an accuracy of ± 0.5 % and shall be continuously recorded.

2.2 Speed shall be measured with a resolution of 1 mph and an accuracy of ± 0.5 mph. These measurements should be continuously recorded.

3. Shall include a method for measuring the rate of water flow and preferably recording the flow rate continuously.

4. All necessary water tanks, pumps and connections needed to supply water to the trailer will be included.

5. The water flow rate shall be regulated within ± 10 %, and the discharge shall be protected from effects of side winds.

6. The test tire shall meet the requirements of ASTM E 1844.

7. A computer system with appropriate software and necessary connections will be included to allow the operator to view data as it is captured and allow future processing of information. Windows XP or Vista will be required as the operating system.

Designation: E 2340 – 06

Standard Test Method for Measuring the Skid Resistance of Pavements and Other Trafficked Surfaces Using a Continuous Reading, Fixed-Slip Technique[1]

This standard is issued under the fixed designation E 2340; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the measurement of the skid resistance of a pavement or other trafficked surface using the continuous reading, fixed-slip technique.

1.2 This test method covers braked wheel measurements obtained with less than 100 % slip. It does not cover side force measurements.

1.3 This test method provides a record of the skid resistance along the whole length of one track of the test surface and enables averages to be obtained for specified test segments.

1.4 This test method is used to measure skid resistance on a wide variety of surfaces in a wide variety of circumstances. Consequently, there are many different designs of continuous reading, fixed-slip measuring equipment (CFME) and as many different test procedures governing their use.

1.5 This test method does not attempt to detail these different equipments and procedures but does set out the essential common principles.

1.6 CFMEs function by creating and measuring a frictional force between a test tire operating at a selected slip and the test surface. Different types of CFME do not necessarily create the same frictional force between their particular test tire and a common test surface and do not necessarily use the same method to measure this frictional force.

1.7 CFME measurements are obtained at a selected steady test speed. This speed may vary according to the application.

1.8 The test surface may be contaminated or clean and dry. If it is clean and dry, a measured amount of water is normally deposited on the surface just in front of the test wheel.

1.9 The measuring apparatus may be built into a vehicle, built into a trailer that is towed by a vehicle, or built into a device that is manually pushed.

1.10 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.11 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Safety precautionary information is contained in Section 7.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

E 178 Practice for Dealing With Outlying Observations

E 501 Specification for Rib Tire for Pavement Skid-Resistance Tests

E 524 Specification for Smooth Tire for Pavement Skid-Resistance Tests

E 867 Terminology Relating to Vehicle-Pavement Systems

E 1551 Specification for Special Purpose, Smooth–Tread Tire, Operated on Fixed Braking Slip Continuous Friction Measuring Equipment

E 1844 Specification for A Size 10 × 4–5 Smooth-Tread Friction Test Tire

F 408 Test Method for Tires for Wet Traction in Straight-Ahead Braking, Using a Towed Trailer

F 457 Test Method for Speed and Distance Calibration of Fifth Wheel Equipped With Either Analog or Digital Instrumentation

3. Terminology

3.1 For definitions of terms used in this test method, refer to Terminology E 867.

3.2 *Definitions:*

3.2.1 *braking force, n*—dynamic instantaneous frictional force acting on the test wheel.

3.2.2 *braking force coefficient (BFC), n*—appropriately filtered mean of a number of instantuneous friction readings over a defined distance.

[1] This test method is under the jurisdiction of ASTM Committee E17 on Vehicle - Pavement Systems and is the direct responsibility of Subcommittee E17.21 on Field Methods for Measuring Tire Pavement Friction.

Current edition approved Dec. 1, 2006. Published December 2006.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.2.3 *braking slip friction, n*—tangential force generated between the test tire and the test surface.

3.2.4 *braking slip ratio, n*—ratio of relative braking slip circumferential speed to identical unbraked wheel circumferential speed, usually defined as a percent.

3.2.4.1 *Discussion*—An equivalent definition is the ratio of the relative braking slip velocity to the horizontal velocity of the wheel axle.

3.2.5 *continuous reading, fixed slip-measuring equipment (CFME), n*—apparatus that can be moved over the test surface at the chosen test speed and includes a test wheel, a system for braking the test wheel, and instrumentation for measuring the resulting frictional force between the test tire and test surface.

3.2.6 *fixed slip, n*—braking system that forces the test wheel to roll at a constant slip or fixed reduction of its free rolling speed.

3.2.7 *frictional force, n*—resistance generated when one surface moves relative to another with which it is in contact.

3.2.8 *instantaneous friction reading, n*—braking force divided by load or equivalently divided by torque on the test wheel (generated by braking force) divided by load times tire radius (moment arm).

3.2.9 *load force, n*—dynamic instantaneous vertical force acting on the test wheel.

3.2.10 *nominal water film thickness, n*—thickness of the film that the water application system is designed to create ahead of the test tire on an entirely smooth test surface.

3.2.11 *rate of water flow, n*—rate at which water is applied to the test surface in front of the test tire.

3.2.12 *reporting length, n*—defined length over which the BFC is calculated.

3.2.13 *standard nominal water film thickness, n*—nominal water film thickness associated with CFME measurements of a particular type of test application to facilitate comparisons between the results of different tests.

3.2.14 *standard test speed, n*—steady test speed associated with CFME measurements of a particular type of test application to facilitate comparisons between the results of different tests.

3.2.15 *test speed, n*—steady test speed associated with CFME measurements.

3.2.16 *water application system, n*—system for depositing a given amount of water in front of the test tire so that it passes between the tire contact area and the test surface.

3.3 *Definitions of Terms Specific to This Standard:*

3.3.1 *certifying calibration, n*—verification of test equipment, calibration equipment (separate or inbuilt), calibration procedures, and equipment operation recommended to be carried out once a year; the procedure records both as found values and adjusted values.

3.3.2 *field calibration, n*—primary force calibration or the equivalent carried out before each test or series of tests by a trained operator using calibration equipment supplied by the manufacturer; this equipment may be built into the CFME.

3.3.3 *friction map, n*—presentation of friction readings obtained down the length of a test surface (typically an airport runway) over a series of selected paths down the surface.

3.3.4 *operational friction testing, n*—measurement of the friction of a surface in response to an operational need and in whatever conditions exist at the time of the test, which may include contamination by ice, snow, slush, or water; these tests do not include the application of water.

3.3.5 *routine friction testing, n*—measurement of the friction of a surface under standardized test conditions that normally includes a standard test speed and a rate of water flow which gives a standard nominal water film thickness.

3.3.6 *test tire, n*—standard tire for pavement friction testing; test tires for routine friction testing shall have a smooth tread.

4. Summary of Test Method

4.1 The test system is moved over the test surface at the chosen test speed with the test wheel, fitted with a test tire, and forced to roll at a particular braking slip ratio.

4.2 If routine friction testing is taking place, the rate of water flow is adjusted to the test speed so that the chosen nominal water film is achieved.

4.3 The braking force or torque is measured (see Terminology E 867) and the load is measured, calculated, or assumed to be the same as the dead weight load.

4.4 The instantaneous friction reading is calculated.

4.5 Either the instantaneous friction reading is recorded or the BFC for each friction length is calculated and recorded.

4.6 Test speed (see Test Method F 457), rate of water flow, and other essential supporting data are recorded.

5. Significance and Use

5.1 CFMEs are used to measure skid resistance on runways, roads, and various other trafficked surfaces. These tests may comprise operational testing, performed to obtain an immediate assessment of skid resistance in current conditions or routine testing in standardized conditions which include the application of a precise amount of water in front of the test tire.

5.2 Standard test speeds and nominal water film thicknesses are according to national or international agency standards, the type of CFME, and the test application. Some examples of typical applications are given in Appendix X1.

6. Apparatus

6.1 *Basic Measurements:*

6.1.1 The test apparatus shall be equipped with a force transducer to provide a direct measurement of the braking force or a torque transducer to measure the torque on the test wheel generated by this force or both.

6.1.2 The design of the test apparatus shall ensure that unless the average load force acting on the test wheel remains within 1 % of the static wheel load over the reporting length, the apparatus shall be equipped with a force transducer to measure the load force.

6.1.3 The test apparatus shall include a mechanism for measuring test speed and distance traveled.

6.1.4 Unless the test apparatus is to be used solely for operational testing, it shall include a mechanism for measuring rate of water flow.

6.2 *Tolerance for Adverse Conditions:*

6.2.1 The exposed portions of the system shall tolerate 100 % relative humidity (RH) (rain or spray) and all other

adverse conditions, such as de-icing chemicals, dust, shock, and vibrations that may be encountered in the type of testing for which the equipment is designed. The suspension system shall minimize the influence of normal pavement roughness on the accuracy and fidelity of the data collection.

6.3 *Accuracy, Resolution, and Stability of Measuring System*:

6.3.1 At outside ambient air temperatures between –40 and 45°C (–40 and 110°F), overall static system measurement accuracy shall be ±1.5 % of full scale.

6.3.2 Certifying calibration or other time stability calibration shall not be required more than once a year unless the measuring system sustains damage requiring significant repair.

6.3.3 If there is a force transducer that provides a direct measurement of the braking force, it shall do so with minimal inertial effects. It is recommended that this transducer provides output directly proportional to force with hysteresis less than 1 % of the applied load up to the maximum expected loading. The mounting of the braking force-measuring transducer shall be such that the effects of cross-axle loading or torque loading shall be less than 1 % of the applied load. The braking force transducer shall be mounted in such a manner as to experience less than 1° angular rotation with respect to its longitudinal measuring plane at the maximum expected loading.

6.3.4 If there is a torque transducer that measures the torque on the test wheel generated by the braking force, this shall provide output directly proportional to torque with hysteresis less than 1 % of the applied load and nonlinearity up to the maximum expected loading less than 1 % of the applied load. The sensitivity to any cross-axis loading shall be less than 1 % of the applied load. Torque transducer measurements include rolling tire/wheel inertial effects, which shall be compensated for at all test speeds.

6.3.5 If the load force is measured, the accuracy of the measurement shall conform to the requirements set out in 6.3.3. If the load force is assumed constant, it shall be possible to show that the assumed dynamic wheel load is within ±2 % of the actual dynamic wheel load.

6.3.6 Distance shall be measured with a resolution of 0.1 % and an accuracy of ±0.5 % and shall be continuously recorded.

6.3.7 Speed shall be measured with a resolution of 2 kmh (1 mph) and an accuracy of ±1 kmh (±0.5 mph). It is recommended that these measurements be continuously recorded.

6.4 *Braking Slip*:

6.4.1 The test apparatus shall be such that the chosen fixed braking slip can be maintained within ±3 % of full scale throughout the length of the test surface at the chosen test speed (for example, if the chosen fixed braking slip is 15 %, a braking slip between 12 and 18 % shall be maintained).

6.5 *Test Speed*—With the test tire operating at the chosen fixed braking slip, the test apparatus shall be capable of maintaining the chosen test speed within ±3 % for the duration of the survey.

6.6 *Test Tire*—The test tire shall conform to the applicable ASTM, ISO, or BSI specification or equivalent. Applicable ASTM standards include Specifications E 501, E 524, E 1551 and E 1844.

6.7 *Water Application System*:

6.7.1 Water shall be applied to the test surface just ahead of the test tire so as to provide the chosen nominal water film thickness across the full width of the test tire at any test speed.

6.7.2 The water application system shall be protected from the effects of side winds, either by use of a flexible nozzle very close to the test surface or by shielding the nozzle in some way or by using a jet of water with horizontal speed equal and opposite to the test speed and applied slightly wider than the width of the test tire tread.

6.7.3 Water used for testing shall be reasonably clean and have no chemicals such as wetting agents or detergents added and shall not be above 30°C (86°F).

6.7.4 The nominal water film thickness shall be in accordance with the manufacturer's handbook and the test application.

6.7.5 Rate of water flow shall be continuously measured and it is recommended that it be continuously recorded.

6.7.6 Regulation of rate of water flow shall be within ±10 %.

6.8 *Signal-Conditioning and Recording Systems*:

6.8.1 All signal-conditioning and recording equipment shall provide linear output and allow data reading resolution to meet the requirements of 6.3. All systems except the smoothing filter described in 6.8.3 shall provide a minimum bandwidth of at least 0 to 20 Hz (flat within ±1 %).

6.8.2 Measurements shall be recorded in phase and all force signals shall be referenced to a common time base and be passed through the same filter.

6.8.3 A low-pass electronic filter, typically between 4.8 Hz/-3db/4 pole and a 10 Hz/-3db/8 pole, shall be installed in the signal-conditioning circuit.

6.8.4 The static signal-to-noise ratio shall be at least 100 to 1 at full scale on all recording channels.

7. Hazards

7.1 The test apparatus shall comply with all applicable laws and regulations, and all necessary precautions shall be taken to ensure maximum safety of operating personnel and other traffic. No test that involves surface wetting shall be made when the pavement temperature is below 2°C (35°F) and there is a consequent danger that water may freeze on the pavement.

8. Preparation of Apparatus

8.1 Field calibration is carried out according to the manufacturer's handbook.

8.2 Test speed and rate of water flow is chosen according to the test site and the manufacturer's handbook.

8.3 Particular attention shall be paid to the condition of the test tire.

8.3.1 A new test tire shall not be used until it has been conditioned by running at fixed slip at the normal tire inflation pressure to obtain a smooth, uniform rubber tread surface free of any curing agents. For tires not conditioned and tested by the supplier, conditioning may typically be carried out by the operator running the tire dry for about 30 m (100 ft) followed by about 300 m (1000 ft) on a wet surface. The operator shall be aware that these lengths are typical and, on an aggressive surface, the tire shall not be run dry for as much as 30 m and, on a smooth surface, longer conditioning will be required.

8.3.2 A test tire exhibiting damage, flat spots, and other irregularities that may affect test results shall not be used.

8.3.3 A test tire worn to the extent that it is unlikely to complete the test (or series of tests) shall not be used. Criteria for determining wear on the measuring tire are given in the appropriate tire standards (see Specifications E 501, E 524, E 1551 and E 1844) and the appropriate manufacturer's handbooks.

8.3.4 For all test tires, the appropriate tire standards (see Specifications E 501, E 524, E 1551 and E 1844) provide storage limitations and guidance. If these requirements have not been observed, the tire shall not be used.

8.3.5 Just before each series of tests, the test tire shall be brought to operational readiness by running the test apparatus in test mode and test conditions according to the manufacturer's handbook. The test tire inflation pressure shall then be set to the required value.

9. Calibration

9.1 Field calibration of the force transducers or torque transducers or both is carried out before each test. The calibration signal shall be at least 50 % of the normal vertical load, and the calibration process shall be such that the effects of cross-axle loading or torque loading shall be less than 1 % of the applied load.

9.2 Certifying calibration is performed once per year on a regular basis and also after any major repair to the equipment.

9.3 Calibration of the distance- and speed-measuring systems is carried out to meet the requirements set out in 6.3.6 and 6.3.7.

10. Procedure

10.1 The start point for the test, both longitudinal and lateral, is clearly established at the test site.

10.2 A run-in is established of sufficient length to allow the chosen test speed and rate of water flow (in the case of routine testing) to be achieved before the start point.

10.3 If there is the possibility of a delay between completing the process described in 8.3.5 and starting the test, the run-in is also long enough to bring the test tire back to its stable test condition.

11. Faulty Tests

11.1 Tests that are faulty shall be treated as outliers in accordance with Practice E 178. Reasons for identifying a test as faulty include:

11.1.1 Incorrect test speed;

11.1.2 Incorrect rate of water flow;

11.1.3 Incorrect start or finish point;

11.1.4 Incorrect track (normally defined by distance from the center line of the runway or road);

11.1.5 Test tire not having been brought to operational readiness before the start of the test (see 8.3.5);

11.1.6 Test tire tread exceeds wear limits at end of test run;

11.1.7 Incorrect test tire inflation pressure;

11.1.8 Inappropriate surface conditions (for example, buildup of water from previous routine tests); and

11.1.9 Anomalous test values.

12. Test Data

12.1 Measurements made with a CFME have little value without supporting data. This supporting data may be manually collected by the operator or automatically collected and written to the computer file.

12.2 Essential supporting data includes:

12.2.1 Sufficient locational referencing for the test to be repeated if required and for friction data collected to be analyzed in conjunction with other locationally referenced data. Test site, lateral position (such as distance from center line) of the track tested by the CFME, and longitudinal position of each friction length are required;

12.2.2 CFME type and serial number;

12.2.3 Test speed, intended and actual (it is recommended that the actual test speed be recorded for each friction length);

12.2.4 Rate of water flow, intended and actual (it is recommended that the actual rate of water flow be recorded for each friction length). If operational testing is being carried out, rate of water flow will be zero;

12.2.5 Surface condition prior to the test;

12.2.6 Date of test; and

12.2.7 Tire type, serial number, and inflation pressure.

12.3 Nonessential but recommended supporting data include:

12.3.1 Surface temperature, test tire temperature, and ambient temperature;

12.3.2 Weather conditions;

12.3.3 Time of start of test;

12.3.4 Operator; and

12.3.5 Test surface type(s).

13. Report

13.1 The test report shall include all the items listed in 12.2 and it is recommended that it also include the items listed in 12.3.

14. Precision and Bias

14.1 *Precision*—The measurements made in this test method are of the frictional force between a test tire operating at a selected slip and a test surface. Many parameters may cause this frictional force to vary and, consequently, measurements obtained using different types of CFME, or at different test speeds, or with different amounts of water (or other contamination) will not necessarily agree with each other.

14.2 *Bias*—There are no standards or references with which the results of this test can be compared.

15. Keywords

15.1 braking slip friction; braking slip ratio; fixed slip; operational friction testing; routine friction testing

APPENDIX

(Nonmandatory Information)

X1. TEST PROCEDURES

X1.1 CFMEs are used to measure skid resistance on a wide variety of surfaces in a wide variety of circumstances. Consequently, there are many different test procedures governing their use (see Test Method F 408).

X1.2 *Airports*:

X1.2.1 Operational testing is carried out to determine whether a winter-contaminated runway is suitable for use (see Test Method F 408). It usually consists of two runs, one on either side of the runway centerline, the distance from the centerline being determined by the width of undercarriage of the largest aircraft using the runway. The standard test speed is typically 65 kmh (40 mph).

X1.2.2 Routine testing is carried out to obtain data for scheduling remedial work on the runway surface. A single run on either side of the centerline may be regarded as sufficient or a set of runs covering the whole width of the runway may be preferred. At 3-m (10-ft) spacing, the friction map that can be prepared from a set of runs of this kind provides useful information on rubber buildup and surface polishing. Standard test speeds are typically 65 or 95 kmh (40 or 60 mph) and standard nominal water film thickness is typically 1.00 mm (0.04 in.).

X1.2.3 For all runway testing, it is recommended that the start point for the test shall be as near the runway start as is consistent with the need to achieve the chosen test speed, chosen rate of water flow, and stable condition of the test tire, and that the finish point for the test shall be as near the runway end as is consistent with safe deceleration.

X1.3 *Roads*:

X1.3.1 Operational testing is not often carried out on roads.

X1.3.2 Routine testing is usually carried out on the left wheel track of each lane. The length of the test may be as little as 100 m (300 ft) or as much as 50 km (30 miles). Standard test speeds as low as 20 kmh (12 mph) and as high as 80 kmh (50 mph) have been established for particular types of CFME and particular applications. Standard nominal water film thicknesses are typically 0.25, 0.50, and 1.00 mm (0.01, 0.02, and 0.04 in.) according to the type of CFME and the application.

X1.4 *Other*:

X1.4.1 On footways and helidecks where the CFME is manually pushed, a standard test speed of 5 kmh (3 mph) has been established. Standard nominal water film thicknesses are typically 1.0 and 0.5 mm (0.04 and 0.02 in.).

BIBLIOGRAPHY

(1) *Aerodromes, Annex 14 to the Convention on International Civil Aviation, Volume I, Aerodrome Design and Operations*, fourth edition, International Civil Aviation Organization, Montreal, Quebec, Canada, July 2004.

(2) *Airport Services Manual, Part 2, Pavement Surface Conditions*, fourth edition, Doc 9137, AN/898, International Civil Aviation Organization, Montreal, Quebec, Canada, 2002.

(3) Andresen, A., and Wambold, J. C., "Friction Fundamentals, Concepts and Methodology," TP 13837E, Transportation Development Centre, Transport Canada, October 1999.

(4) CAP 683 The Assessment of Runway Surface Friction for Maintenance Purposes[3]

(5) FAA Advisory Circular AC/150/5320-12 Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces[4]

(6) Goodenow, G. L., Kolhoff, T. R., and Smithson, F. D., "Tire-Load Friction Measuring System—A Second Generation," Society of Automotive Engineers, Paper No. 680137.

(7) Henry, J. J., et al. "Evaluation of Pavement Friction Characteristics," National Cooperative Highway Research Program Synthesis 291, 2000.

(8) Kummer, H. W., and Meyer, W. E., "Tentative Skid Resistance Requirements for Main Rural Highways," National Cooperative Highway Research Program, Report No. 37, Highway Research Board, 1967.

(9) *National Cooperative Highway Research Program Synthesis 291: Evaluation of Pavement Friction Characteristics, a Synthesis of Highway Practice*, February 2000.

(10) Neill, A. H., Jr., Boyd, P. L., and Hinch, J., "Filtering Techniques for Measuring Peak Braking Coefficients," *Tire Science and Technology*, Vol 6, No. 4, Nov. 1978, pp. 275-363. (Also see Test Method F 408.)

(11) "Proceedings of the 2nd International Meeting on Aircraft Performance on Contaminated Runways (IMAPCR'99)," TP 13579, 1999.

(12) Pottinger, M. G., and Yager, T. J., *The Tire Pavement Interface, STP 929*, American Society for Testing and Materials, West Conshohocken, PA, 1986.

(13) "Proceedings of the International Meeting on Aircraft Performance on Contaminated Runways (IMAPCR'96)," TP 12943, 1996.

(14) Shahin, M. Y., *Pavement Management for Airports, Roads, and Parking Lots*, Chapman & Hall, 1994.

(15) Yager, T. J., Vogler, W. A., and Baldasare, P., "Evaluation of Two Transport Aircraft and Several Ground Test Vehicle Friction Measurements Obtained for Various Runway Surface Types and Conditions," NASA TP 2917, 1990.

[3] Available from the U.K. Civil Aviation Authority, CAA House, 45-59 Kingsway, London WC2B 6TE United Kingdom.

[4] Available from the U.S. Department of Transportation, Federal Aviation Administration, 800 Independence Ave., SW, Washington, DC 20591.

RFQ No. 7780061

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

West Virginia Code §5A-3-10a states: No contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and the debt owed is an amount greater than one thousand dollars in the aggregate

DEFINITIONS:
"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Debtor" means any individual, corporation, partnership, association, limited liability company or any other form or business association owing a debt to the state or any of its political subdivisions. "Political subdivision" means any county commission; municipality; county board of education; any instrumentality established by a county or municipality; any separate corporation or instrumentality established by one or more counties or municipalities, as permitted by law; or any public body charged by law with the performance of a government function or whose jurisdiction is coextensive with one or more counties or municipalities. "Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceed five percent of the total contract amount.

EXCEPTION: The prohibition of this section does not apply where a vendor has contested any tax administered pursuant to chapter eleven of this code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

LICENSING: Vendors must be licensed and in good standing in accordance with any and all state and local laws and requirements by any state or local agency of West Virginia, including, but not limited to, the West Virginia Secretary of State's Office, the West Virginia Tax Department, West Virginia Insurance Commission, or any other state agencies or political subdivision. Furthermore, the vendor must provide all necessary releases to obtain information to enable the Director or spending unit to verify that the vendor is licensed and in good standing with the above entities.

CONFIDENTIALITY: The vendor agrees that he or she will not disclose to anyone, directly or indirectly, any such personally identifiable information or other confidential information gained from the agency, unless the individual who is the subject of the information consents to the disclosure in writing or the disclosure is made pursuant to the agency's policies, procedures and rules. Vendors should visit **www.state.wv.us/admin/purchase/privacy** for the Notice of Agency Confidentiality Policies.

Under penalty of law for false swearing (West Virginia Code, §61-5-3), it is hereby certified that the vendor acknowledges the information in this said affidavit and are in compliance with the requirements as stated.

Vendor's Name: _____

Authorized Signature: _____ Date: _____