



Standard Practice for Validation of Walkway Tribometry Using Research-based Reference Materials¹

This standard is issued under the fixed designation F2508; 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 reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This practice establishes a procedure for validating walkway tribometry using reference materials that have been ranked and differentiated by human subjects in a peer-reviewed study.

1.2 This practice describes the necessary materials, specifications, and cleaning processes for reference materials.

1.3 This practice applies to walkway tribometers without reference to the nature of the scale of the readings produced by them.

1.4 The validation procedure defined by this practice is not intended to establish a “safe” threshold value for any walkway surface.

1.5 The values stated in SI units are to be regarded as standard. The values given in parentheses are for information only and are not considered standard.

1.6 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

D1349 Practice for Rubber—Standard Conditions for Testing

¹ This practice is under the jurisdiction of ASTM Committee F13 on Pedestrian/Walkway Safety and Footwear and is the direct responsibility of Subcommittee F13.10 on Traction.

Current edition approved Aug. 15, 2023. Published July 2024. Originally approved in 2011. Last previous edition approved in 2016 as F2508 – 16^{ε1}. DOI: 10.1520/F2508-23.

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

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

E2282 Guide for Defining the Test Result of a Test Method

F1646 Terminology Relating to Walkway Safety and Footwear

F3539 Practice for Creation of Walkway Tribometer Interlaboratory Study Reports and Test Procedures

2.2 *ISO Standard:*³

ISO Guide 30 Reference materials — Selected terms and definitions

2.3 *ASTM Adjuncts:*

Sample tiles, 12 in. or 6 in.⁴

3. Terminology

3.1 For terms used in this practice not identified herein, refer to Terminology **F1646**.

3.2 *Definitions:*

3.2.1 *coordinator, n*—an entity that works with a brand or type of walkway tribometer on behalf of users.

3.2.1.1 *Discussion*—A coordinator is typically a manufacturer, distributor, laboratory, researcher, or representative thereof.

F3539

3.2.2 *slider, n*—a mounted material on a walkway tribometer that comes into frictional contact with the surface being tested.

F3539

3.2.3 *laboratory verification, n*—a coordinator-defined procedure for periodically confirming that a tribometer is performing according to coordinator-defined parameters.

F3539

3.2.4 *user, n*—the operator of an individual tribometer.

F3539

3.2.5 *user verification, n*—the coordinator-defined procedure for a user to verify that their individual tribometer is

³ Available from International Organization for Standardization (ISO), ISO Central Secretariat, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <https://www.iso.org>.

⁴ Available from ASTM International Headquarters. For 12 in. tiles, order Adjunct No. **ADJF2508AWP**, **ADJF2508DAT**, and **ADJF2508CRO**; for 6 in. tiles, order Adjunct No. **ADJF2508AWP6**, **ADJF2508DAT6**, and **ADJF2508CRO6**. Original adjunct produced in 2011.

performing and being operated within coordinator-defined parameters. **F3539**

3.2.6 *reference material, n*—material, sufficiently homogeneous and stable with respect to one or more specified properties, which has been established to be fit for its intended use in a measurement process. **ISO Guide 30**

3.2.7 *observation, n*—the process of obtaining information regarding the presence or absence of an attribute of a test specimen, or of making a reading on a characteristic or dimension of a test specimen. **E2282**

3.2.8 *observed value, n*—the value obtained by making an observation. **E2282**

3.2.9 *test result, n*—the value of a characteristic obtained by carrying out a specified test method.

3.2.9.1 *Discussion*—The test method specifies that one or a number of individual observations be made, and their average or another appropriate function, (such as the median or the standard deviation), be reported as the test result. It can also require standard corrections to be applied, such as correction of gas volumes to standard temperature and pressure. Thus, a test result can be a result calculated from several observed values. In the simple case, the test result is the observed value itself. **E2282**

3.2.10 *test determination, n*—the value of a characteristic or dimension of a single test specimen derived from one or more observed values. **E2282**

3.2.11 *repeatability conditions, n*—conditions where independent test results are obtained with the same method on identical test items in the same laboratory by the same operator using the same equipment within short intervals of time. **E177**

3.2.12 *repeatability limit (r), n*—the value below which the absolute difference between two individual test results obtained under repeatability conditions may be expected to occur with a probability of approximately 0.95 (95 %). **E691**

3.2.13 *reproducibility conditions, n*—conditions where test results are obtained with the same method on identical test items in different laboratories with different operators using different equipment. **E177**

3.2.14 *reproducibility limit (R), n*—the value below which the absolute difference between two test results obtained under reproducibility conditions may be expected to occur with a probability of approximately 0.95 (95 %). **E691**

3.2.15 *validation, n*—the set of operations that establishes, under specified conditions, the proper ranking and differentiation of reference materials by a walkway tribometer, and the performance of the tribometer to within established limits.

4. Summary of Practice

4.1 Under the terms of this practice, validation consists of three criteria. An individual walkway tribometer is validated by a user or coordinator if a) its *test results* rank the *reference materials* from this practice in the proper order as established

by human subject research,⁵ b) it statistically differentiates between *test results* obtained for each *reference material*, and c) it generates *test results* on each *reference material* within established limits.

4.1.1 In this practice, the generic term *reference material* (abbreviated as “RM”) refers to specific ceramic tiles as described in Section 7.

4.2 The procedure for ranking RM frictional properties using a limited population of ambulating human subjects is supported by a peer-reviewed study.⁵

5. Significance and Use

5.1 To be meaningful, walkway tribometer *test results* must be linked to the performance of humans walking over specific walking surface conditions that vary in slip potential. *Validation* under this practice does not apply to an entire class or model of tribometers; it applies to an individual tribometer unit as operated by the person conducting the validation.

5.1.1 When the *user* performs the *validation*, it demonstrates that the tribometer/operator passes the three *validation* criteria under *repeatability conditions*. When the *coordinator* performs the *validation*, it demonstrates that the tribometer/operator passes the three *validation* criteria under *reproducibility conditions*. As the *reproducibility limit* for a particular RM may be greater than the *repeatability limit*, it may be more challenging for a tribometer to pass *validation* when attempted by the *coordinator*. Statistically, a *coordinator*-validated tribometer better accommodates multiple operators.

5.2 This practice prescribes a series of RMs with known relative slip potential ranging from high to low (as determined by human testing in laboratory conditions) upon which walkway tribometers shall be validated. The relative slip potential of each RM was established from human subject walking trials.⁵

5.3 The scientific study upon which the validation process is based was conducted with a select population of younger adults (mean age 25 years, range 21 to 40 years) who were free from significant gait deviations while walking in a straight path on a level surface with a mean walking velocity of 1.4 m/s $\pm$ 5 %. This walking velocity is reported as the normal walking velocity for adults without gait pathology.⁶

5.4 All subjects walked in Gibson-style shoes whose soles were constructed of smooth styrene butadiene rubber (SBR) with 75A Shore hardness. The shoe style and sole material is not representative of all combinations available in the marketplace.

5.5 The RMs defined in this practice (see [Annex A1](#)) are not representative of all walkway surfaces. The outcome of the *validation* practice reflects performance on the type of RMs and surface conditions defined in this practice only. The RMs utilized are from specific manufacturing lots of product made

⁵ Blanchette, M. G., et al, “Human Slip Assessment of Candidate Reference Surfaces for Walkway Tribometer Validation: An Update to Standard ASTM F2508,” *Journal of Testing and Evaluation*, Vol. 50, No. 2, September 2021.

⁶ Perry J. and Burnfield JM. *Gait Analysis*—2nd edition. 2010. Slack Incorporated, Thorofare, NJ.