Designation: F 1641 – 95

Standard Test Method for Measuring Penetration Resistance of Security Glazing Using a Pendulum Impactor[1]

This standard is issued under the fixed designation F 1641; 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 determination of a relative measure of penetration resistance of glazing materials subject to a specific mechanized test. The test simulates a specific attack scenario involving repeated impacts from a chisel-nosed weapon applied either in conjunction with a directed application of heat (Method A), or without directed application of heat (Method B). The resulting number of impacts required to achieve a perforation is used to evaluate the degree of penetration resistance provided by the sample.

1.2 This test method may be specified to implement either Method A or Method B, or both.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*

A 36/A 36M Specification for Carbon Structural Steel[2]

2.2 *Federal Standard:*

Federal Specification GGG-C-U-Cold Chisel[3]

3. Summary of Test Method

3.1 Method A and Method B both consist of impacting the glazing sample with a steel chisel using a known repeatable kinetic energy at one location. Method A includes the simultaneous application of a propane torch flame to the impact location at a uniform time interval between impacts.

3.2 Method B consists of impacting the glazing sample with the steel chisel in the same manner as in Method A, but without the application of the propane torch flame and without regard to the interval between impacts.

3.3 All chisel impacts are to be repeated with the same magnitude of kinetic energy and at uniform time intervals as specified herein.

3.3.1 The energy of impact of the steel chisel shall be 110 ± 5 ft·lbf (15.2 ± 0.7 kg·m).

3.3.2 The time average interval between impacts shall be 6 ± 0.5 s if Method A is being performed.

3.4 This test method is intended to be performed until the glazing is perforated. However, a maximum time limit or maximum number of impacts may be established.

4. Significance and Use

4.1 This test method is fashioned to minimize variations in impacting energy. It is intended specifically to evaluate results of mechanized sharp tool impacting with and without direct application of flame.

4.2 This test method provides a means of determining a numerical penetration resistance value for comparison of glazing materials used in security applications that could be exposed to sharp implement impacts and flame.

4.3 This test method is intended for use in conjunction with other physical attack test methods to aid in security glazing product selection.

5. Apparatus

5.1 *Test Environment*—The location of the test apparatus shall be in a protected environment whose ambient temperature and relative humidity are maintained at 72 ± 5°F (22 ± 3°C) and 35 ± 10 %, respectively, with the ventilation system operating.

5.2 *Glazing Sample Frame*:

5.2.1 Unframed glazing samples shall be mounted using ⅛ by ½-in. (3 by 13-mm) preshimmed glazing tape as recommended by the glazing manufacturer on the front and back faces, in a steel test frame designed and constructed to ensure that all four edges of the test specimen are rigidly supported and restrained from rebound.

[1] This test method is under the jurisdiction of ASTM Committee F-12 on Security Systems and Equipmentand is the direct responsibility of Subcommittee F12.10 on Systems, Products, and Services.

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[2] *Annual Book of ASTM Standards*, Vol 01.04.

[3] Available from General Services Administration, 7th and A Sts. SW, Washington, DC 20407.

5.2.2 The glazing sample frame shall provide a 1 in. (25.4 mm) bite on all four edges.

5.2.3 The glazing frame shall be securely mounted to a rigid frame such that the impact surface of the sample is oriented in a vertical position.

5.3 *Impact Device*:

5.3.1 A device shall be designed and constructed so that the chisel tip delivers a kinetic energy of 110 ± 5 ft·lbf (15.2± 0.7 kg·m) upon impact with the glazing sample surface.

5.3.2 The device shall be designed to ensure that the chisel tip will impact the sample normal to the original impact surface of the glazing. This will require a rigid pendulum arm and a bearing assembly at the pivot point that allows unrestricted motion in the plane of intended rotation without twisting of the pendulum arm. A recommended assembly design is shown as an example in Fig. 1.

5.3.3 The weight of the chisel end of the pendulum arm, as defined in A1.3, shall be 11 ± 0.25 lb (5.0 ± 0.05 kg). The length of the pendulum arm shall be sufficient so that the chisel end of the assembly achieves the required kinetic energy.

5.3.4 The impact device shall be designed with suitable attachments at the chisel housing to ensure that the chisel can be quickly removed from the sample surface if it becomes embedded. Such attachments shall be securely connected to the chisel housing so as not to hinder the free travel of the

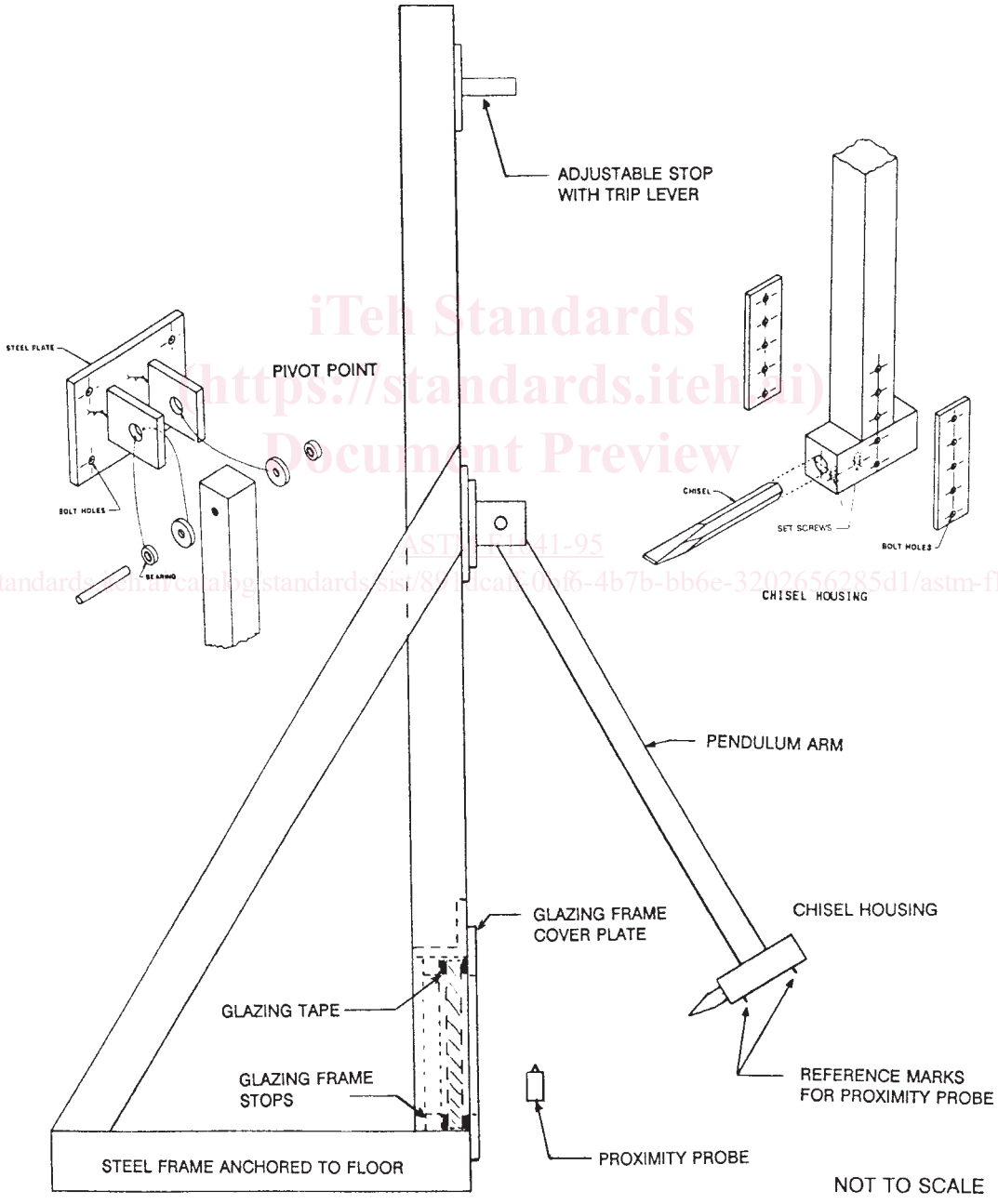

FIG. 1 Example of a Pendulum Impact Device