



Designation: F 1157 – 90 (Reapproved 1994)^{ε1}

Standard Practice for Classifying the Relative Performance of the Physical Properties of Security Seals¹

This standard is issued under the fixed designation F 1157; 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.

^{ε1} NOTE—Section 8, Keywords, was added in November 1994.

1. Scope

1.1 This practice presents methods for testing the physical properties of security seals. Where appropriate, the various tests include particular apparatus or procedural specifications required for different types of security seals.

1.2 This practice will serve as a basis for comparing the response of various security seals under different modes of attack. The security seal to be evaluated shall first be placed in an appropriate classification, and then tested in the manner designated as most suitable for that class of seal, in accordance with Classification F 832.

NOTE 1—See Guide F 1158 for procedures on the inspection and evaluation of tampering of security seals.

1.3 A security seal is a device intended to detect tampering or entry. Single use locking devices are to be evaluated under this specification. Therefore, the following procedures are to reflect the relative performance of security seals when subject to various physical attacks.

1.4 This practice is not intended to be fully comprehensive, since certain types of security seals, such as labels, are not addressed. Further, it is the responsibility of users of this practice to interpret their specific security needs concerning the application of seals, and to determine the grade of seal appropriate for their particular application. ASTM assumes no responsibility for losses occurring as a result of a defeated seal whether the defeat is apparent or the seal is not suited for its application.

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

1.6 The following safety hazards caveat pertains only to the test procedures portion, Section 6, of this practice. *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:

F 832 Classification for Security Seals²

F 883 Performance Specification for Padlocks²

F 946 Guide for Establishing Security Seal Control and Accountability Procedures²

F 1158 Guide for Inspection and Evaluation of Tampering of Security Seals²

3. Terminology

3.1 Definition:

3.1.1 *seal*—a passive, one-time locking device which is used to indicate tampering or entry, afford limited resistance (to entry) or provide a combination of both functional aspects.

4. Summary of Practice

4.1 A security seals shall be evaluated in accordance with its classification into one of five general groups and its performance in the following: a test to determine pull strength, a shear cutting test, a bending test, an impact test, a low-temperature impact test, and a high-temperature pull test. A total of 18 seals shall be used to complete minimum testing.

4.2 A security seal shall receive a rating designation which denotes its general classification and its performance in each of the required tests. This rating shall be obtained by testing three individual seals in each specific test, and by taking the average of the data points.

5. Seal Classification

5.1 *General*—For the purpose of defining the most appropriate configuration by which to evaluate a security seal in subsequent tests, a seal shall be classified as an initial step.

5.2 For the purpose of comparing the physical properties of security seals, seals are grouped in accordance with the following description of application seals:

5.2.1 Groups:

5.2.1.1 *Group I*—Flexible cable and wire seals.

¹ This practice is under the jurisdiction of ASTM Committee F-12 on Security Systems and Equipment and is the direct responsibility of Subcommittee F 12.50 on Locking Devices.

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² *Annual Book of ASTM Standards*, Vol 15.07.

5.2.1.2 Group 2—Strap and cinch seals.

5.2.1.3 Group 3—Rigid bolt and rod seals, including heavy duty metal padlock type.

5.2.1.4 Group 4—Twisted rod or wire seals (pigtail).

5.2.1.5 Group 5—Padlock type seals, scored seals, metal or plastic base.

5.3 If a particular security seal does not appear to fall into any of these general classifications, the closest description shall be chosen by the user, keeping in mind that effectiveness of the testing procedures may be jeopardized by a faulty classification choice. These general groupings shall be assigned the arbitrary numerical listing of one through five, respectively, as shown in 5.2.1. This listing shall then be designated in the security seal's overall evaluation to serve as a reference indicating the particular test configurations with which it was tested.

5.4 The required performance levels in any test category (see Section 11) shall not be affected by this general classification (see 5.2.1); only the manner in which the seal is physically manipulated during subsequent testing shall be affected by this portion of the evaluation. All seals will be tested in a locked position.

5.5 Seals often have unique identification to prevent duplication and reapplication. Evaluation of this uniqueness is not required.

6. Test Procedures

6.1 Pull (Tensile) Test:

6.1.1 Conduct a pull test to determine the strength of a security seal's locking mechanism. Apply a tensile load to the locked seal in a manner that simulates a reversal of the motion needed to lock the seal. Hardware necessary to perform this test will be indicated by the configuration of the seal. See Fig. 1(a), (b), (c), and (d) for a schematic drawing of this test, as applied to the various general classifications of seals.

6.1.2 Record the load required to forcibly open (or destroy or damage) the security seal and compare it to the rating requirements listed in Table 1. Assign the appropriate letter designation to that security seal for performance in the pull test.

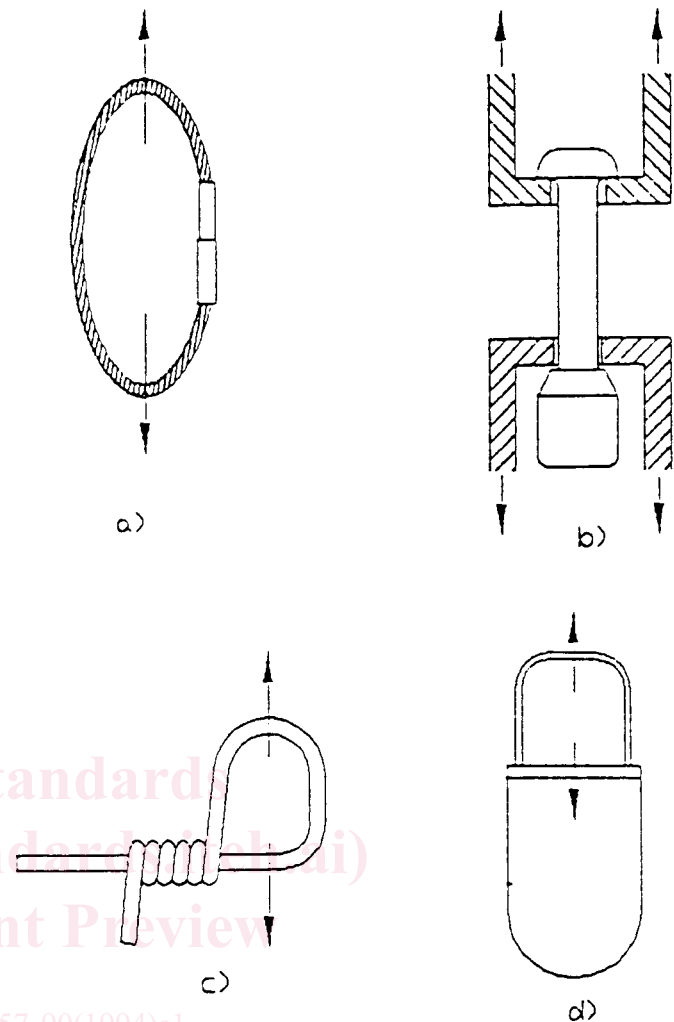
6.2 Shear Test:

6.2.1 Test security seals for ability to withstand cutting with shearing blades, as might be implemented with bolt cutters. To perform this test, use hardware that is the same as the apparatus used in the Padlock Shackle Cutting Test in Performance Specification F 833. (See Fig. 2 for a drawing of this equipment.) This equipment may suffice for testing all classifications of security seals, with the possible exception of thin metal or plastic bands, such as strap or cinch seals. In such cases, it is conceivable that a slight misalignment in the cutting blades would not sever the seal, only deform it. In this instance, use a more precise cutting apparatus which incorporates sharp, well-aligned cutting blades.

6.2.2 Record the compressive load required to sever the security seal and compare it to the rating levels given in Table 2. Assign an appropriate rating in the shear test.

6.3 Bending Test:

6.3.1 Conduct a bending test to determine the resistance of a security seal to fail under bending loads in this test. Because various designs allow for seals to be categorized as either



(a) Groups 1 and 2,
(b) Group 3,
(c) Group 4, and
(d) Group 5.

FIG. 1 Schematic Drawings of Pull (Tensile) Test as Applied to Security Seals:

TABLE 1 Pull (Tensile) Test Requirements for Grade Classification of Security Seals at Room Temperature 65°F (18°C), and at 180°F (82.2°C)

Load to Failure (lbf (N))	Seal Grade Level Awarded
5001 or more	F
3001 to 5000	E
1001 to 3000	D
201 to 1000	C
51 to 200	B
1 to 50	A

NOTE 1—1 lbf = 4.448222 N = 0.4536 kg.

flexible or rigid, test configurations to make appropriate selections for bending resistance rating must first be made. Test flexible seals for ability to withstand repeated bending loads, and test rigid seals for resistance to deformation by bending to a specified degree. Test padlock type seals (Groups 3 or 5) using particular methods appropriate for those seals, as outlined in 6.3.6 and 6.3.7. Failure is access gained (see Table 3).

6.3.2 Flexible seals include those seals classified as being