



Designation: F 694 – 02

## Standard Test Method for Heel-Attaching Strength of Women's Shoes<sup>1</sup>

This standard is issued under the fixed designation F 694; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method covers the determination of heel attachment strength on women's and misses' shoes through application of a static load to the heel. Shoe heels may be made of various materials, including wood, plastic, leather, or rubber. The heels may be attached to the shoe body with nails, screws, staples, cement, or a combination of these.

1.2 This test method is applicable for testing heel heights 1½ in. (38 mm) and higher. (Heel heights are manufactured in ⅛-in. increments.) *This testing is applicable for front or back of heel.*

### 2. Terminology

#### 2.1 Definitions:

2.1.1 *heel breast, n*—the forward face of the heel. It is often concave towards the shank.

2.1.2 *insole, n*—that part of the shoe which is between the foot and the outsole, and to which the upper is fastened during manufacture. It may or may not be covered on the foot side by an aesthetic material referred to as a socklining.

2.1.3 *outsole, n*—the bottom sole of the shoe, the surface of which is exposed to wear.

2.1.4 *pricker points, n*—in testing footwear, a modification of the foot form in which needle points of steel ⅛ in. (3.2 mm) long are used to prevent vertical movement of the test specimen.

2.1.5 *shank, n*—the steel or wood piece inserted in the arch of the shoe for reinforcement.

2.1.6 *shankboard, n*—the back part of the insole which is fabricated from a firm fibreboard. It is contoured to the arch of the foot for support.

2.1.7 *top lift, n*—the top or outer layer or wearing surface of leather, rubber, plastic, or composition on the heel of a shoe.

2.1.8 For definitions of other terms relating to footwear, refer to the Footwear Products Glossary.<sup>2</sup>

<sup>1</sup> This method is under the jurisdiction of ASTM Committee F13 on Safety and Traction for Footwear and is the direct responsibility of Subcommittee F13.20 on Construction.

Current edition approved July 10, 2002. Published August 2002. Originally published as F 694 – 80. Discontinued January 2001 and reinstated as F 694 – 02.

<sup>2</sup> *Manual on Standards for the Footwear Industry*, available from Footwear Products Assn., 1611 N. Kent St., Arlington, VA 22209.

### 3. Summary of Test Method

3.1 A shoe is mounted vertically on a mounting form and secured with holding clamps. Pressure is applied to the shoe heel by means of a vertical piston and a hand-operated hydraulic pump. A hydraulic pressure gage indicates the amount of pressure in pounds-force (or newtons) exerted against the heel. This pressure, when multiplied by the lever arm through which it is applied, gives the torque value for heel-attaching strength.

### 4. Significance

4.1 Heel-attaching strength is an important factor in the design of a safe and comfortable shoe that adequately supports the foot.

### 5. Apparatus

5.1 *Self-Contained Device*,<sup>3</sup> consisting of a hand-operated hydraulic pump, a piston, a pressure gage, and a suitable mount with security clamps to hold the test specimen rigidly in position as sketched in Fig. 1 and Fig. 2.

NOTE 1—The area of the piston head on this tester is 0.9968 in.<sup>2</sup> (6.43 cm<sup>2</sup>). This is sufficiently close enough to 1.000 in.<sup>2</sup> (6.43 cm<sup>2</sup>) to permit a direct gage reading of pounds-force (or newtons) exerted on the heel.

### 6. Sampling

6.1 Tests should be made on each new style shoe, and on any shoe where the construction method or material is changed, such as length of nail, insole material, nailing pattern, etc.

6.2 Conduct routine testing to determine if adequate heel-attaching strength is being maintained.

6.3 Perform random testing on a sufficient number of shoes from production or from stock to give reliable results.

### 7. Preparation of Apparatus and Test Specimens

7.1 Temporarily mount the test specimen on the shoe-mounting form.

<sup>3</sup> A suitable device is available from Creativity, Inc., 58 Rantoul St., Beverly, MA 01915 and Whitley Industries, Inc., 14 Everberg Road, Woburn, MA 01801.

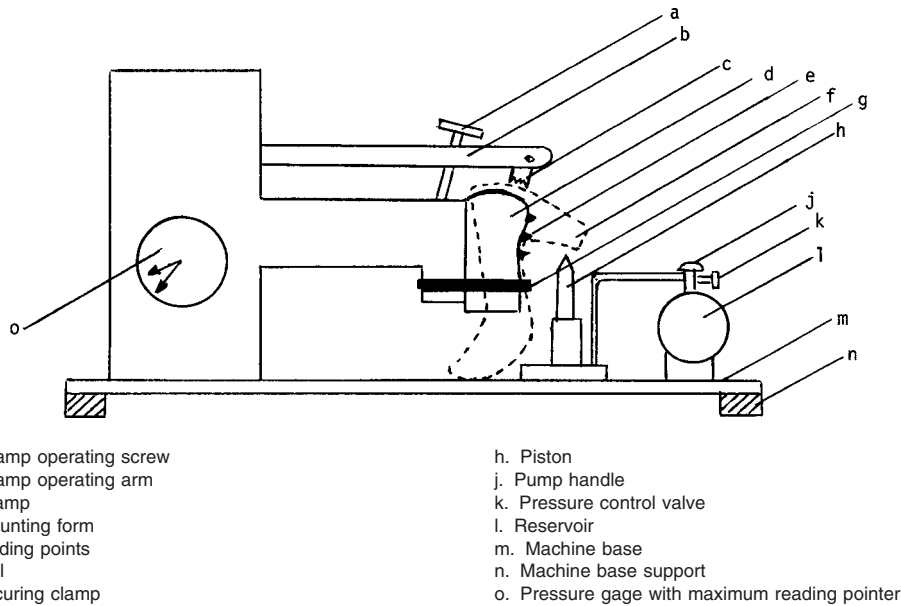


FIG. 1 Test Apparatus (Front View)

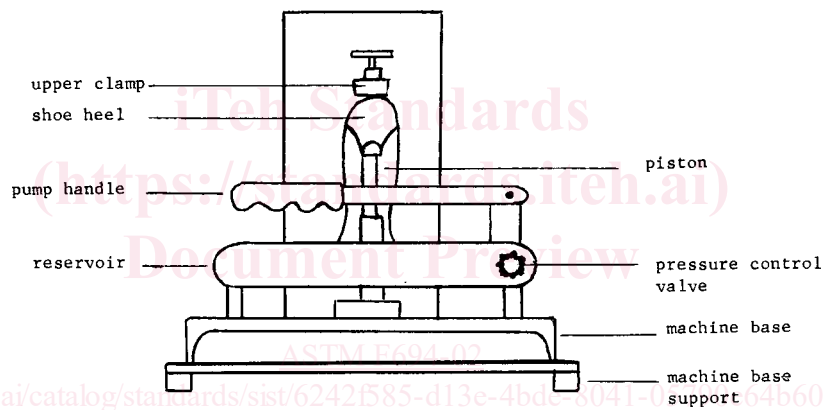


FIG. 2 Test Apparatus (End View)

7.2 Position pressure piston on the testing apparatus so as to obtain the maximum lever arm on the particular heel being tested. Secure the piston to the machine base with screws.

7.3 If the heel is to be tested from the heel breast side, make a mark on the breast at the point where the piston will engage the heel. If the heel is to be tested from the back side of the heel, make a mark on the back of the heel at the point where the piston will engage the heel.

7.4 Remove the test specimen from the shoe-mounting form. Using a three-cornered file, make a groove in the heel parallel to the toplift at the point previously marked. The maximum depth of the groove is 1 mm.

7.5 Remount the test specimens on the mounting form. Place the lower clamping ring around the shoe just in front of the heel breast and tighten securely. Adjust the upper clamp so as to prevent vertical movement of the test sample during the test.

7.5.1 For the closed-back shoes (shoes with or without a counter), the upper clamp can be used so as to prevent vertical movement of the test shoe during the testing.

7.5.2 For open-back shoes, the foot form has been modified to include four pricker points (see section 2.1.4) approximately 1/8 in. (3.2 mm) long that penetrate the insole due to the lower clamping ring and prevent vertical movement of the test shoe during the testing. This method for preventing vertical movement of the test shoe can also be used for closed-back shoes.

7.6 Measure the horizontal distance between the point where the front edge of the heel is joined to the shoe upper and the point where the piston engages the heel. Record this distance as the torque lever arm (see Fig. 3 and Fig. 4).

7.7 Close the valve (k) on the right side of the hydraulic pressure reservoir (l) by turning the knob clockwise.

7.8 On heels less than 2 in. (50.8 mm) high, cut off the forepart of shoe so the shoe will clear the piston housing.

## 8. Conditioning

8.1 Maintain the temperature of the testing room at  $73.4 \pm 3.6^\circ\text{F}$  ( $23 \pm 2^\circ\text{C}$ ) and  $50 \pm 2\%$  relative humidity.

8.2 Condition the specimens in this atmosphere for not less than 24 h prior to testing.