



Designation: F1774 – 20

# Standard Specification for Climbing and Mountaineering Carabiners<sup>1</sup>

This standard is issued under the fixed designation F1774; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

## 1. Scope

1.1 This specification covers six mechanical tests and the minimum performance requirements for carabiners designed specifically for the sports of climbing and mountaineering.

1.2 Two different types of carabiners are defined in this standard, non-locking carabiners and locking carabiners.

1.3 Tests contained herein are destructive in nature. Carabiners subjected to any of these tests shall not be used in any way after testing except in evaluating the results of such testing.

1.4 This specification does not imply approval of any method of use of climbing and mountaineering carabiners. In addition, the test load values contained herein are not to be interpreted as the forces which a climbing and mountaineering carabiner may be subjected to, or expected to sustain in actual field use.

1.5 This specification is limited to carabiners made of steel or aluminum alloys only.

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

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:*<sup>2</sup>

- B117 Practice for Operating Salt Spray (Fog) Apparatus
- E4 Practices for Force Verification of Testing Machines

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee F32 on Search and Rescue and is the direct responsibility of Subcommittee F32.01 on Equipment, Testing, and Maintenance.

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

2.2 *Other Standard:*

EN 566:1994 Mountaineering equipment. Slings. Safety requirements and test methods

## 3. Terminology

3.1 *Definitions:*

3.1.1 *carabiner, n*—a self-closing gated, load-bearing, connective device. Some carabiner models may have *cocking* or *blocking* devices, that when activated, override the self-closing features.

3.1.2 *durably affixed, adj*—the manner of attaching information directly to the product which endures for the life of the product.

3.1.3 *failure, n*—an arbitrary point beyond which a material or product ceases to be functionally capable of its intended use. In this application, the point at which some part of the carabiner physically breaks or distorts to an extent that the test members are released.

3.1.4 *locking carabiner, n*—a carabiner with a mechanism that reduces the possibility of a gate being opened inadvertently. A locking mechanism requires at least two different consecutive manual actions to open the gate.

3.1.5 *nonlocking carabiner, n*—any carabiner that does not have a mechanism that reduces the possibility of a gate being opened inadvertently.

3.1.6 *normal body weight, n*—a standardized weight that represents a *typical* climber, defined as Function Test Force No. 1.

3.1.7 *ultimate strength, n*—the maximum force sustained by a carabiner during an ultimate force test, prior to its failure.

## 4. Requirements

4.1 *Product information shall include the following items:*

4.1.1 *Manufacturer's or Distributor's Name or Logo*—A clear indication as to who is responsible for the primary manufacture or distribution, or both, of the product.

4.1.2 *Major Axis Gate Closed Ultimate Strength*—A clear indication as to the major axis gate closed strength by either symbol or pictorial representation.

4.1.3 *Minor Axis Gate Closed Ultimate Strength*—A clear indication as to the minor axis gate closed ultimate strength by either symbol or pictorial representation.

4.1.4 *Major Axis Gate Open Ultimate Strength*—A clear indication as to the major axis gate open ultimate strength by either symbol or pictorial representation.

4.1.5 *Lot Number*—A manufacturer's or distributor's lot number.

4.1.6 Either symbol or pictorial representation to read the manufacturer's or distributor's instructions.

4.2 Lettering, symbols, and pictorial representations shall be durably affixed to the carabiner.

4.3 Lettering, symbols, and pictorial representations shall be a minimum of 2 mm ( $\frac{5}{64}$  in.) in height.

## 5. Significance and Use

5.1 *Gate Function During Body Weight Test*—This test simulates a climber's body weight of Function Test Force No. 1 and verifies that the gate functions as intended under body weight force.

5.2 *Major Axis Gate Closed 70 % Force Test*—This test verifies that the gate functions as originally intended after Function Test Force No. 2 has been applied and released.

5.3 *Locking Mechanism Test*—This test verifies that the locking mechanism keeps the gate in the locked position between forces of 0 kN and Function Force Test No. 3.

5.4 *Major Axis Gate Closed Ultimate Strength Test*—This test is intended to show the force required to physically fail the carabiner.

5.5 *Major Axis Gate Open Ultimate Strength Test*—This test simulates a potential inadvertent use of a carabiner. It is intended to show the force required to physically fail the carabiner.

5.6 *Minor Axis Gate Closed Ultimate Strength Test*—This test simulates a potential inadvertent use of a carabiner. It is intended to show the force required to fail physically the carabiner along the minor axis.

## 6. Apparatus and Conditions

6.1 *Test Apparatus*—The test apparatus shall be maintained in good operation condition, used only in the proper loading range, and calibrated periodically in accordance with the latest revision of Practices E4.

### 6.2 Test Fixtures and Supplies:

6.2.1 There are four total test pins required, two pins with  $6 \pm 0.05$ -mm radius and two pins with  $5 \pm 0.05$ -mm radius. Pins must be AISI SAE Type 01 Tool Steel (commonly purchased as 01 Drill Rod) and heat-treated to minimum Rockwell hardness, C scale 60. The mean surface roughness,  $R_a$ , must not exceed  $0.8 \mu\text{m}$  and the peak to valley height,  $R_{max}$ , must not exceed  $6.3 \mu\text{m}$ . The fixture should be designed in such a way that the pins do not rotate and that the carabiner is free to locate itself on the pins when the force is applied. See Figs. 1 and 2.

### 6.2.2 Molybdenum-Based Grease.

6.3 *Test Conditions*—The ambient temperature shall be between 15 and 23°C (59 and 73°F).

## 7. Hazards

7.1 Carabiners may disengage or eject parts from the test fixture. Use a safety screen and wear safety glasses while testing. Do not perform this test alone.

## 8. Sampling

8.1 *Sample Selection*—Randomly select the carabiners from the same production lot in accordance with 8.2.2. Each user of this test method may specify the lot size from which the carabiners are to be selected.

### 8.2 Number of Samples:

8.2.1 The same number of carabiners must be used for each of the tests in this specification.

8.2.2 A minimum of five will be used, in sequence, for the gate function during body weight, major axis gate closed 70 %, and major axis gate closed ultimate strength tests. A minimum of five will be used for the major axis gate open ultimate strength test. A minimum of five will be used for the minor axis gate closed ultimate strength test.

## 9. Performance Specifications

### 9.1 Gate Function During Body Weight Test:

9.1.1 Function Test Force No. 1 will be used for this test. Each of the carabiners subjected to the body weight test shall show no evidence of distortion that impairs the designed function.

9.1.2 While the body weight force is applied, the carabiner gate shall open and close as designed and with the same quality and performance as before the test. (The use of tools or any device other than finger pressure is not allowed.)

9.1.3 When a locking carabiner is locked while the body weight force is applied, the locking mechanism must be able to be rotated to its unlocked position by hand after the force is removed. (The use of tools or any device other than finger pressure is not allowed.)

9.2 *Major Axis Gate Closed 70 Force Test*—Function Test Force No. 2 will be used for this test. Each of the carabiners subjected to the 70 % force test shall show no evidence of distortion that impairs the designed function after the test is conducted. The locking mechanism of a locking carabiner shall open and close as originally intended and with the same quality and performance as before the test. (The use of tools or any device other than finger pressure is not allowed.)

9.3 *Locking Mechanism Test*—Function Test Force No. 3 will be used for this test. With the locking mechanism in the locked position and an inward force of 50 N applied to the center of the gate, the gate must not open as Function Test Force No. 3 is applied to the major axis of the carabiner. When the load is released, the gate and locking mechanism must be fully functional. (The use of tools or any device other than finger pressure is not allowed.)

### 9.4 Major Axis Gate Closed Ultimate Strength Test:

9.4.1 Each of the non-locking carabiners subjected to this test shall have an ultimate strength equal to or greater than the major axis gate closed minimum ultimate strength for non-locking carabiners listed in Table 1.

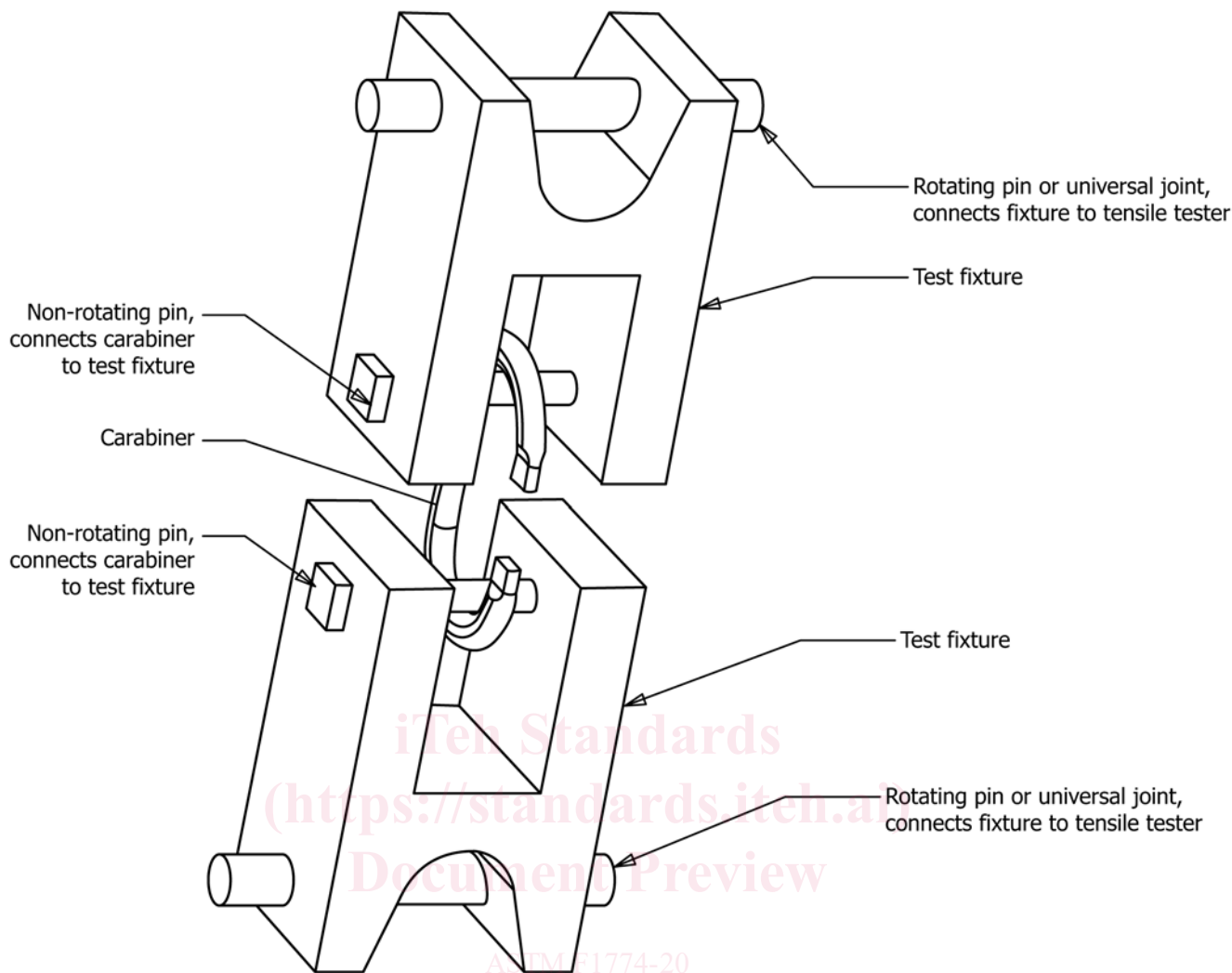


FIG. 1 Major Axis Test Setup

9.4.2 Each of the locking carabiners subjected to this test shall have an ultimate strength equal to or greater than the major axis gate closed minimum ultimate strength for locking carabiners listed in **Table 1**.

**9.5 Major Axis Gate Open Ultimate Strength Test:**

9.5.1 Each of the nonlocking carabiners subjected to this test shall have an ultimate strength equal to or greater than the major axis gate open minimum ultimate strength for nonlocking carabiners listed in **Table 1**.

9.5.2 Each of the locking carabiners subjected to this test shall have an ultimate strength equal to or greater than the major axis gate open minimum ultimate strength for locking carabiners listed in **Table 1**.

**9.6 Minor Axis Gate Closed Ultimate Strength Test:**

9.6.1 Each of the nonlocking carabiners subjected to this test shall have an ultimate strength equal to or greater than the minor axis gate closed minimum ultimate strength for nonlocking carabiners listed in **Table 1**.

9.6.2 Each of the locking carabiners subjected to this test shall have an ultimate strength equal to or greater than the

minor axis gate closed minimum ultimate strength for locking carabiners listed in **Table 1**.

9.6.3 *Corrosion Test*—Each of the carabiners subjected to the corrosion test shall not have more than light-surface corrosion following the test. In addition, each carabiner gate shall open and close with the same quality and performance as before the test. (The use of tools or any device other than finger pressure is not allowed.) Furthermore, each gate locking mechanism must be able to move through its full range of travel with the same quality and performance as before the test. (The use of tools or any device other than finger pressure is not allowed.)

**10. Procedure**

**10.1 Gate Function During Body Weight Test:**

10.1.1 Open and close the gate and gate locking mechanism (if applicable) to feel the action of each carabiner prior to conducting this test. Record any interferences in the report.

10.1.2 Apply molybdenum-based grease to the test pins where the carabiner comes in contact with the pins.