



Designation: A 627 – 95

Standard Specification for Homogeneous Tool-Resisting Steel Bars for Security Applications¹

This standard is issued under the fixed designation A 627; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers requirements for the performance characteristics including conventional mechanical tests, simulated service tests and testing equipment for determining the characteristics of homogeneous tool-resisting steel bars and does not preclude the possibility of severing or penetrating this material by cutting means other than those described herein. This material can be severed with tungsten/carbide coated or tipped saws.

1.2 Three tests, describing minimum performance characteristics required for bars of different diameters covered by this specification are: (1) drop-weight test, (2) cutting test, and (3) deflection test.

1.3 The values stated in inch-pound units are to be regarded as the standard.

2. Referenced Documents

2.1 ASTM Standards:

C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens²

E 4 Practices for Force Verification of Testing Machines³

E 329 Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction⁴

2.2 Other Documents:

U. S. Federal Specification GGG-B-451c, dated April 11, 1960, and Amendments 1, 2, and 3: Blade, Hand Hacksaw and Blade, Power Hacksaw⁵

3. Terminology

3.1 *bars*—round, ribbed, hexagonal, or other shaped bars that can readily be reduced to a round cross-sectional shape, $\frac{7}{8}$ to 1 in. (22.2 to 25.4 mm) in diameter (see Fig. 1).

3.2 *cutting test*—a simulated service test in which the rating is based on the calculated theoretical number of a specific type of ordinary hacksaw blades required to cut through the bar.

3.3 *equipment manufacturer*—a manufacturer who fabricates and assembles security products, including tool-resisting steel enclosures, for installation in areas requiring security against ingress and egress. This manufacturer processes the semifinished bar to produce a finished bar suitable for fabrication into components and is responsible for all heat-treating and other fabricating processes to obtain the performance characteristics specified herein. This manufacturer is also responsible for fabricating and assembling all ancillary items so as not to impair the performance characteristics of the bar.

3.4 *homogeneous bar*—a bar that is nominally of uniform chemistry throughout.

3.5 *lot*—all bars of the same nominal diameter from the same mill heat.

3.6 *performance characteristic*—the response to any one test (drop-weight, cutting, or deflection) shown in Table 1.

3.7 *test completion*—conduct of one test sequence for each lot of bars.

3.8 *testing laboratory*—a recognized testing laboratory, capable of complying with Practice E 329, selected by the equipment manufacturer.

3.9 *test sequence*—conduct of drop-weight test and cutting test on one specimen bar, and conduct of deflection test on one additional specimen bar.

4. Ordering Information

4.1 Orders for material under this specification shall include the following information:

4.1.1 Name of material (homogeneous tool-resisting steel),

4.1.2 Dimensions (nominal diameter),

4.1.3 Cross section (double-ribbed round, hexagon, other shapes),

4.1.4 ASTM designation (A 627),

4.1.5 Test reports (if required),

4.1.6 Certification (if required), and

4.1.7 Special requirements (if any).

4.2 Bars of different nominal diameters may be specified or shown on drawings. Each bar of the nominal diameter tested

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² *Annual Book of ASTM Standards*, Vol 04.02.

³ *Annual Book of ASTM Standards*, Vol 03.01.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.

⁵ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

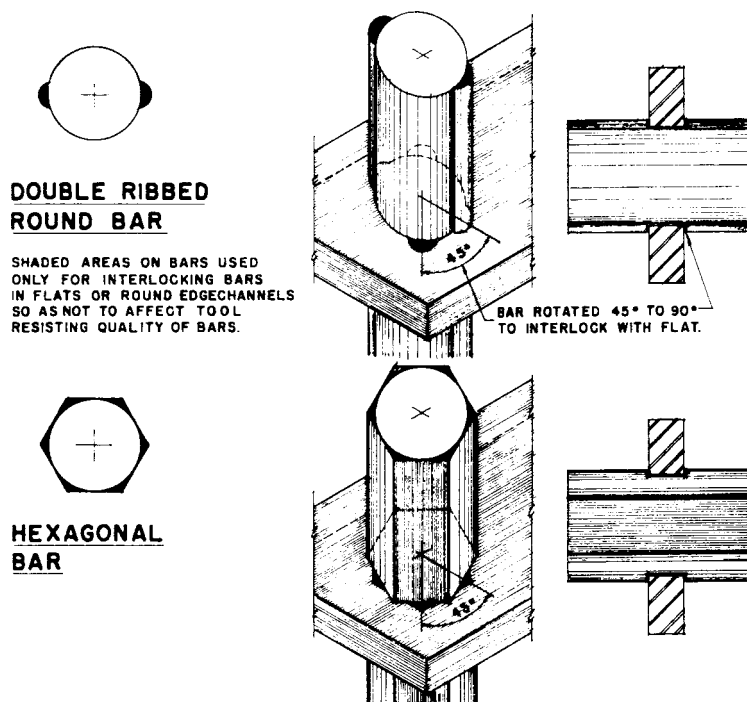


FIG. 1 Shaped Bars

TABLE 1 Minimum Acceptable Performance Characteristics for Homogeneous Tool-Resisting Steel Bars

Nominal Diameter Bars, in. (mm)	Drop Weight Test, 50 Blows, ft-lb(J) Blow	Cutting Test, Theoretical No. of Blades to Sever Bar	Deflection Test, lbf (N) of Load
7/8 (22.2)	100 (136)	1500	6000 (26 690)
1 (25.4)	150 (203)	3000	8500 (37 810)

shall meet or exceed the minimum requirements of all three tests for the diameter shown in Table 1.

4.3 The three minimum levels of performance required in Table 1 for each diameter bar are not independent characteristics, but are interrelated to each other and though any one performance characteristic may exceed, none of the other characteristics may be reduced below the minimum performance levels shown.

5. Chemical Requirements

5.1 The selection of chemical composition shall be at the discretion of the equipment manufacturer.

6. Mechanical Requirements

6.1 Drop-Weight Test:

6.1.1 *Requirements*—The specimen bar shall not crack, visibly fracture, or take a permanent set of more than 0.25 in. (6.4 mm) at the mid-span between support points under the impact of 50 consecutive blows of a force as specified in Table 1 under “Drop-Weight Test.”

6.1.2 Number of Specimens:

6.1.2.1 The equipment manufacturer shall take three bars no less than 4 ft (1.22 m) in length from the lot for which the test is conducted. These 4-ft lengths shall be durably marked after

heat treating for easy identification of mill heat number, lot number, and individual identification of the two specimen bars taken from each of the 4-ft lengths.

6.1.2.2 Two 14-in. or 356-mm specimen bars shall be cut with a friction saw from each of the 4-ft lengths after heat treating. Each 14-in. specimen bar shall be properly marked for easy identification as to mill heat number, lot number, and identity of the longer bar from which it was taken.

6.1.2.3 The testing laboratory shall, as its own choice, select two specimen bars taken from the same 4-ft length of bar for conduct of each test sequence.

6.1.2.4 It shall be the responsibility of the equipment manufacturer to determine, by visual inspection, that no unusual defects exist in the specimen bars so produced and to determine that the specimen bars represent usual conditions, which are representative of all bars to be used from the lot.

6.1.2.5 In each test sequence, one specimen bar (prepared and selected as described in 6.1.2.1-6.1.2.3, inclusive) shall be used for both the drop-weight and cutting test. A second specimen bar, prepared and selected in the same manner and taken from the same 4-ft length of bar shall be used for the deflection test in each test sequence.

6.1.2.6 All specimen bars used in all test sequences shall be durably marked for complete identification and held by the equipment manufacturer for no less than 3 years after the tests are completed.

6.1.3 Procedure:

6.1.3.1 Conduct the test on one specimen bar selected as required in 6.1.2.1-6.1.2.4 inclusive; stop after 50 consecutive blows, or sooner if the bar fails.

6.1.3.2 Drop the tup repeatedly so as to deliver 50 consecutive blows at the same point on the specimen bar. It should be properly weighted and guided so as to produce the required

impact in foot-pounds for each blow.

6.1.3.3 Make each blow at the same point and on the same side of the specimen bar, perpendicular to the 14-in. or 356-mm axis and at the midpoint (± 0.250 in. (± 6.4 mm)) between the supports of the specimen bar.

6.1.3.4 Make provision in the testing procedure to prevent the weighted tup from rebounding and again striking the test specimen with an unmeasured secondary impact after each drop from the test height.

6.1.3.5 The drop-weight machine is of simple design constructed from readily available rolled and shaped structural steel products. The weight may be raised by any mechanical or electrical hoisting equipment, or, alternatively, by hand. A mechanical or electrical mechanism to achieve quick release of the weight shall be provided. This testing machine should conform to the requirements of Sections 16 and 18 of Practices E 4 as modified by the requirements of this specification or the manufacturer of the testing machine, provided that modifications of this equipment or assembly details provide a functionally acceptable drop-weight machine.

6.1.3.6 For $\frac{7}{8}$ -in. diameter tool-resisting bar, the drop-weight machine design shall permit a weight of 20 lb to be dropped a height of 5 ft. For 1 in. diameter tool-resisting bar, the drop-weight machine design shall permit a weight of 30 lb to be dropped a height of 5 ft.

6.1.3.7 The hardened tup which strikes the specimen bar shall be rounded to 0.250-in. (6.35-mm) radius and shall be heat treated to a minimum hardness of HRC 50. The radius shall be maintained between 0.250 and 0.312 in. (6.35 and 7.92 mm) throughout the drop-weight test.

6.1.3.8 The entire tup and weight shall fall freely by gravity when released, and shall be inspected after each five blows to determine that the original shape of the tup has not been

seriously deformed through repeated impact. Should the 0.250-in. radius be flattened to more than 0.312-in. radius, the test shall be interrupted and the tup shall be restored to the 0.250-in. radius before testing is continued.

6.1.3.9 The fixed anvil type supports for the 14-in. specimen bar shall be located no less than 2 in. (51 mm) above the bed of the testing machine, and spaced 12 in. (305 mm) apart $\pm \frac{1}{16}$ in. (± 1.59 mm). They shall be so constructed as to hold the same point of the specimen bar underneath the tup for each drop of the weight by preventing significant rotation or lateral movement of the specimen bar during the conduct of the 50 blows required for a test (see Fig. 2 for a typical example).

6.1.3.10 The part of the machine in which the specimen bar is placed for drop-weight testing shall be surrounded by a metal guard screen for protection, as the breaking into two halves of the bar may cause them to be ejected laterally from the machine with projectile-like velocities (see Fig. 2 for a typical example).

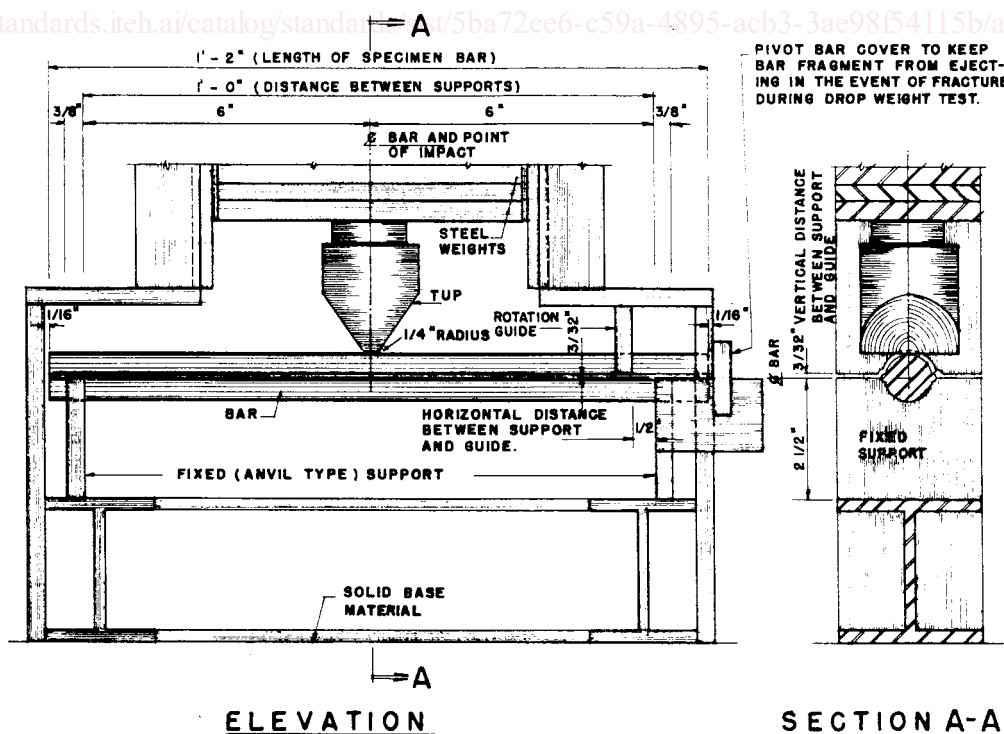
6.1.3.11 The addition of other safety devices or features are permitted provided that a functionally equivalent drop-weight machine is maintained.

6.1.3.12 The entire test machine shall be securely bolted to a rigid foundation, such as a concrete floor, so as to eliminate any possible cushioning effect that would diminish the force of the impact generated by the falling tup.

6.1.3.13 In addition to initial markings required for preparation of specimens, all specimen bars shall be given a durable marking, before beginning the drop-weight test, showing the side of the bar and the point at which the tup contacted the bar.

6.2 Cutting Test:

6.2.1 *Requirements*—The performance characteristics shall be such that the bar tested should not be severed with the “theoretical number of blades” required in Table 1 under



ELEVATION SECTION A-A
FIG. 2 Typical Example of Drop-Weight Test Apparatus