



Standard Practice for Steel Bars, Selection Guide, Composition, and Mechanical Properties¹

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

1. Scope

1.1 This practice is intended as a guide for the selection of steel bars according to section and to the mechanical properties desired in the part to be produced. This is not a specification for the procurement of steel. Applicable procurement specifications are listed in Section 5.

1.2 Several steel compositions intended for various sections and mechanical property requirements are presented in Tables 1-6. The criteria for placing a steel composition in one of the three general class designations, Classes P, Q, and R (described in Section 4) are as follows:

1.2.1 *Classes P and Q* should be capable of developing the mechanical properties shown in Tables 1-4 by liquid quenching from a suitable austenitizing temperature, and tempering at 800°F (427°C) or higher. A hardness indicated by tests made at a location shown in Fig. 1, A, B, or C, is taken as evidence that a composition is capable of meeting other equivalent mechanical properties shown in the tables. Normal good shop practices are assumed, with control of austenitizing and tempering temperatures, and mild agitation of the part in the quenching bath.

1.2.2 *Class R* should be capable of developing the mechanical properties shown in Tables 5 and 6 as hot rolled, by cold drawing, or by cold drawing with additional thermal treatment. The locations for obtaining tension tests are described in 6.2.

1.3 It is not implied that the compositions listed in the tables are the only ones satisfactory for a certain class and mechanical property requirement. Steels with lower alloy contents are often satisfactory through the use of special processing techniques.

2. Referenced Documents

2.1 ASTM Standards:

¹ This practice is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel, and Related Alloys and is the direct responsibility of Subcommittee A01.15 on Bars.

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A 108 Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality²

A 304 Specification for Steel Bars, Alloy, Subject to End-Quench Hardenability Requirements²

A 311/A 311M Specification for Steel Bars, Carbon, Stress-Relieved, Cold-Drawn, Subject to Mechanical Property Requirements²

A 322 Specification for Steel Bars, Alloy, Standard Grades²

A 633/A 633M Specification for Normalized High-Strength Low-Alloy Structural Steel Plates³

A 675/A 675M Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties²

3. Significance and Use

3.1 If the desired mechanical properties are as described in 4.1.1 for material identified as Classes P-1 through P-7, or in 4.1.2 for material identified as Classes Q-1 through Q-7, the strength level desired can be based on hardness or the equivalent tensile or yield strength as shown in Tables 1-4. If the desired mechanical properties are as set forth in 4.1.3 for material identified as Classes R-1 through R-6, the strength level is based on yield strength as shown in Tables 5 and 6.

3.2 The user, after determining the mechanical property requirements of the critical section (that carrying the greatest stress) of the part, should select the composition or compositions from Tables 1-6 that fulfill these requirements and is most suitable for processing.

4. Classification

4.1 Steel bar compositions under this practice are classified according to mechanical property requirements and the critical section size of the part to be produced, as follows:

4.1.1 *Classes P-1 through P-7* comprise bars for parts to operate under severe service conditions requiring high yield strength (90 000 psi (621 MPa) and over), good ductility, and relatively high notch toughness. The applicable section sizes,

² *Annual Book of ASTM Standards*, Vol 01.05.

³ *Annual Book of ASTM Standards*, Vol 01.04.

