AERONAUTICAL MATERIAL SPECIFICATIONS

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York 17, N.Y.

AMS 4616A

Issued 7-1-56
Revised 1-15-58

SILICON BRONZE
92Cu - 3.2Si - 2.8Zn - 1.5Fe

1. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

2. FORM: Rods, bars, forgings, forging stock, and tubing.

3. APPLICATION: Primarily for anti-friction bearing cages.

4. COMPOSITION:

Copper	90.0 min
Silicon	2.4 - 4.0
Zinc	1.5 - 4.0
Iron	1.0 - 2.0
Manganese	1.0 max
Phosphorus	0.10 max
Total Named Elements	99.5 min

5. CONDITION:

5.1 Rods, Bars, and Tubing: Hot rolled or drawn, or extruded, then cold finished if necessary, and stress relieved.

5.2 Forgings: Stress relieved.

5.3 Forging Stock: As ordered by the forging manufacturer.

6. TECHNICAL REQUIREMENTS:

6.1 Tensile Properties: Material, excluding forging stock, shall conform to the following requirements; tensile test specimens from rods and bars over 1.5 in. in diameter or distance between parallel sides shall have their axes located approximately midway between center and surface.

Tensile Strength, psi	56,000 min
Yield Strength at 0.2% Offset or at 0.0065 in. in 2 in. Extension Under Load (E = 15,700,000), psi	20,000 min
Elongation, % in 4D	30 min

6.2 Hardness: Material, excluding forging stock, shall have hardness not lower than Brinell 90, using 1000 kg load, on the surface, except on rounds where a flat, as necessary for accuracy, may be made, or not lower than Rockwell B 55 when taken half-way between center and surface of the cross section.

6.3 Grain Size: Shall conform to the following requirements, when determined in accordance with ASTM E79-49T.

6.3.1 Forgings: Maximum grain size shall be 0.500 mm except that not more than 25% Ø of the area may show grains up to 1.000 mm; these requirements apply only to the outer half of the radius of forgings for anti-friction bearing cages.

Ø 6.3.2 Bars and Tubing: Average grain size shall be not larger than 0.200 millimeter.

6.4 Mercurous Nitrate Test: Test specimens as in 6.4.1 and 6.4.2 shall be capable of withstanding, without cracking, immersion for 15 min. in an aqueous solution containing 10 g of mercurous nitrate (11.4 g of $HgNO_3.2H_2O$ or 10.7 g of $HgNO_3.H_2O$) and 10 ml of nitric acid (sp gr 1.42) per liter of solution, using at least 10 ml of solution per sq in. of test specimen surface area.

6.4.1 Rods, Bars, and Tubing: Test specimens shall be of full cross section and shall have length of either 6 in. or twice the diameter or least distance between parallel sides, whichever is greater.

6.4.2 Forgings: Test specimens may be any convenient size or shape, or an entire forging may be used.

7. QUALITY: Material shall be uniform in quality and condition, clean, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts.

8. TOLERANCES: Unless otherwise specified, tolerances shall conform to the following:

8.1 Bars and Rods: The latest issue of AMS 2221. Diameter, thickness, and width tolerances shall be as specified below:

8.1.1 Rounds, Hexagons, and Octagons: Table I, Refractory.

8.1.2 Squares: Table IV.

8.1.3 Rectangles, Thickness: Table IV.

8.1.4 Rectangles, Width: Table VII, Refractory.

8.2 Tubing: The latest issue of AMS 2223 as applicable. Diameter and wall thickness tolerances shall be as specified below:

8.2.1 Diameter: Table I, Refractory.

8.2.2 Wall Thickness: Table III.

9. REPORTS:

9.1 Unless otherwise specified, the vendor of the product shall furnish with each shipment three copies of a report showing the results of tests to determine conformance to the requirements of this specification or stating that the chemical composition and tensile properties of the product conform to the requirements specified. This report shall include the purchase order number, material specification number, size, and quantity.