AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
29 West 39th Street
New York City

AMS 4139 F

Issued 10-1-45
Revised 2-1-56

ALUMINUM ALLOY FORGINGS
5.6Zn - 2.5Mg - 1.6Cu - 0.25Cr (7075-T6)

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

2. FORM: Die forgings, hand forgings, and forging stock.

3. COMPOSITION:

Zinc	5.1 - 6.1
Magnesium	2.1 - 2.9
Copper	1.2 - 2.0
Chromium	0.18 - 0.40
Iron	0.7 max
Silicon	0.50 max
Manganese	0.30 max
Titanium	0.20 max
Other Impurities, each	0.05 max
Other Impurities, total	0.15 max
Aluminum	remainder

4. CONDITION:

4.1 Die Forgings: Unless otherwise specified, solution and precipitation heat treated. Quenching from the solution temperature shall be at a rate fast enough for the material to meet the following requirements, but shall be as slow as practicable in order to keep internal stresses at a minimum.

4.2 Hand Forgings: As forged, unless otherwise specified.

4.3 Forging Stock: As fabricated.

5. TECHNICAL REQUIREMENTS:

5.1 Die Forgings:

5.1.1 Tensile Properties:

5.1.1.1 Test Specimens: Test specimens, machined from separately forged coupons or from forging stock representing the forgings and in either case heat treated with the forgings, or machined from prolongations on heat treated forgings, shall conform to the following requirements:

Tensile Strength, psi	75,000 min
Yield Strength at 0.2% Offset or at 0.0166 in. in 2 in. Extension Under Load (E = 10,300,000), psi	65,000 min
Elongation, % in 4D	10 min

5.1.1.2 Forgings, With Grain Flow: When test speciments are machined from forgings not over 3 in. in thickness with the axis approximately parallel to the forging lines, the tensile properties shall conform to those specified in 5.1.1.1, except that elongation may be as low as 7.0%, unless otherwise agreed upon by purchaser and vendor.

5.1.1.3 Forgings, Across Grain Flow: When test specimens are machined from forgings not over 3 in. in thickness so that the axis is other than approximately parallel to the forging flow lines, the tensile properties shall conform to the following requirements:

Tensile Strength, psi	71,000 min
Yield Strength at 0.2% Offset or at 0.0160 in. in 2 in. Extension Under Load (E = 10,300,000), psi	62,000 min
Elongation, % in 4D	3 min

5.1.1.3.1 The elongation requirement applies only to test specimens having a gage length diameter not less than 0.25 in. and cut so that the length of the specimen is in a plane parallel to the parting plane.

5.1.1.3.2 If any individual specimen fails to meet the requirements of 5.1.1.3, two additional specimens shall be cut from adjacent areas in the same forging or from the same area in two additional forgings. Should either of these specimens fail to meet the values specified in 5.1.1.3, the entire lot may be rejected.

5.1.2 Hardness: Forgings shall have hardness not lower than Brinell 135 using 500 kg load and 10 mm ball or 1000 kg load and 9/16 in. ball, or not lower than Brinell 140 using 1000 kg load and 10 mm ball.

5.2 Hand Forgings:

5.2.1 Tensile Properties After Heat Treatment: Hand forgings 3 in. and under in thickness, and test coupons not more than 3 in. in thickness from larger hand forgings, shall, after proper solution and precipitation heat treatment, conform to the following requirements, based on the cross-sectional area of the forging before maching. Tensile test specimens shall be taken substantially parallel to and perpendicular to the length of the hand forging in such a manner as to represent the center of the forging.

Ident. Class.	Cross Sectional Area Square Inches	Tensile Strength psi, min			Yield Strength at 0.2% Offset psi, min			Elongation % in 2 in. or 4D min		
		Longitudinal	Long Transverse	Short Transverse	Longitudinal	Long Transverse	Short Transverse	Longitudinal	Long Transverse	Short Transverse
CL A	16 & under	75,000	73,000	70,000	63,000	61,000	61,000	9.0	4.0	2.0
CL B	Over 16 to 36, incl	73,000	71,000	68,000	60,000	59,000	59,000	7.0	3.0	2.0
CL C	Over 36 to 144, incl	71,000	69,000	66,000	59,000	57,000	57,000	4.0	2.0	1.0
CL D	Over 144 to 256, incl	70,000	67,000	64,000	58,000	56,000	56,000	4.0	2.0	1.0

5.2.1.1 Routine testing for longitudinal properties is not required.

5.2.2 Hardness After Heat Treatment: Hand forgings 3 in. and under in thickness and larger forgings with sections machined to 3 in. and under in thickness before heat treating shall, after proper solution and precipitation heat treatment, have hardness not lower than Brinell 135 using 500 kg load and 10 mm ball or 1000 kg load and 9/16 in. ball, or not lower than Brinell 140 using 1000 kg load and 10 mm ball.

5.3 Forgings with Special Requirements: When purchase order specifies "Special Purpose", detailed grain flow in forgings and/or minimum tensile property requirements of tensile test specimens cut from forgings shall be as specified on the drawing or as agreed upon by purchaser and vendor.

5.4 Forging Stock:

5.4.1 When a sample of stock is forged to a test coupon and heat treated in the same manner as forgings, a tensile test specimen taken from the heat treated coupon shall have properties not lower than those specified in 5.1.1.1 and 5.1.2. If a test specimen taken from the stock after heat treatment in the same manner as forgings has properties not lower than those specified in 5.1.1.1 and 5.1.2, the test shall be accepted as equivalent to the test of a forged coupon. Neither of these tests is required in routine inspection.

5.4.2 Unless otherwise specified, tolerances shall be in accordance with commercial practice for the class ordered.

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