



# AEROSPACE MATERIAL SPECIFICATIONS

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc.

485 Lexington Ave., New York, N.Y. 10017

## AMS 5654

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Revised

### STEEL BARS, FORGINGS, TUBING, AND RINGS, CORROSION AND HEAT RESISTANT 18Cr - 11Ni - (Cb + Ta) (SAE 30347) Consumable Electrode Melted

1. **ACKNOWLEDGMENT:** A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.
2. **FORM:** Bars, wire, forgings, mechanical tubing, flash welded rings, and stock for forgings or flash welded rings.
3. **APPLICATION:** Primarily for parts and assemblies requiring corrosion and heat resistance and subject to very rigid inspection standards, especially when such parts are welded during fabrication. Parts and assemblies requiring oxidation resistance up to approximately 1500 F (816 C) but useful at that temperature only when stresses are low.

4. **COMPOSITION:**

	min	max
Carbon	--	0.08
Manganese	--	2.00
Silicon	--	1.00
Phosphorus	--	0.020
Sulfur	--	0.020
Chromium	17.00 - 19.00	
Nickel	9.00 - 13.00	
Columbium + Tantalum	10xC - 1.10	
Molybdenum	--	0.50
Copper	--	0.50

4.1 **Check Analysis:** Composition variations shall meet the requirements of the latest issue of AMS 2248.

5. **CONDITION:**

5.1 **Bars, Wire, Forgings, Mechanical Tubing, and Flash Welded Rings:** Solution heat treated free from continuous carbide network. Unless otherwise specified, bars, wire, and mechanical tubing shall be finished as in 5.1.1.

5.1.1 All hexagons, other bars 2.75 in. and under in diameter or distance between parallel sides, wire, and mechanical tubing 4.00 in. and under in OD shall be cold finished. Bars, other than hexagons, over 2.75 in. in diameter or distance between parallel sides and mechanical tubing over 4.00 in. in OD shall be hot finished.

5.1.2 Flash welded rings shall not be supplied unless specified or permitted on purchaser's part drawing. When supplied, they shall be manufactured in accordance with the latest issue of AMS 7490, unless otherwise specified.

5.2 **Stock for Forgings and Flash Welded Rings:** As ordered by the forging or flash welded ring manufacturer.

6. **TECHNICAL REQUIREMENTS:** When ASTM methods are specified for determining conformance to the following requirements, tests shall be conducted in accordance with the issue of the ASTM method listed in the latest issue of AMS 2350.

SAE Technical Board rules provide that: "All technical reports, including standards, approved practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standards or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

- 6.1 Tensile Properties: Wire shall have tensile strength not higher than 115,000 psi.
- 6.2 Hardness:
- 6.2.1 Bars and Mechanical Tubing: Shall have hardness as follows, or equivalent, when taken approximately midway between outer surface and center or inner surface, as applicable.

6.2.1.1 Bars:

Nominal Diameter or Distance Between Parallel Sides Inches	Hardness, Brinell	
	min	max
Up to 2.00, incl	140	255
Over 2.00	--	241

- 6.2.1.2 Mechanical Tubing: Not higher than Rockwell B 90 or equivalent.
- 6.2.2 Forgings and Flash Welded Rings: Shall have hardness not higher than Brinell 187 or equivalent.
- 6.3 Embrittlement: Specimens taken from the product shall be capable of meeting the following test:
- 6.3.1 Test specimens, after being heated at  $1200\text{ F} \pm 10$  ( $648.9\text{ C} \pm 5.6$ ) for 2 hr and air cooled, shall withstand immersion for 48 hr in a boiling aqueous solution containing 100 g of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  and 100 ml of  $\text{H}_2\text{SO}_4$  (sp gr 1.84) per liter of solution under a reflux condenser, without evidence of intercrystalline surface attack. After such immersion, the specimens shall withstand, without cracking, bending through an angle of 180 deg around a diameter equal to the thickness of the specimen.
- 6.4 Inclusion Rating: Unless otherwise specified, the inclusion rating, determined in accordance with ASTM E45, Method D, shall be as specified below. The method of selection of specimens shall be such that suitable rating of the steel being qualified is assured. No inclusion shall have length greater than 0.015 inch.

Type	Inclusion Rating			
	A	B	C	D
Thin	2	1-1/2	1-1/2	1-1/2
Heavy	1	1	1	1-1/2

7. QUALITY: Steel shall be multiple melted using consumable electrode practice in the remelt cycle, unless otherwise permitted. The product 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 all applicable requirements of the following:
- 8.1 Bars and Wire: The latest issue of AMS 2241.
- 8.2 Mechanical Tubing: The latest issue of AMS 2243.
9. REPORTS:
- 9.1 Unless otherwise specified, the vendor of the product shall furnish with each shipment three copies of a report of the results of tests for chemical composition and inclusion rating of each heat in the shipment and the results of tests on each size of wire from each heat to determine conformance to the tensile property requirements of this specification. This report shall include the purchase order number, heat number, material specification number, size, and quantity from each heat. If forgings are supplied, the part number and size of stock used to make the forgings shall also be included.