

# AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.  
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STEEL, WIRE  
0.60-0.75C  
Valve Spring Quality

1. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.
2. FORM: Cold-drawn, hardened and tempered wire supplied as coils of wire or as finished springs.
3. COMPOSITION:

Check Analysis  
Under Min or Over Max

Carbon	0.60 - 0.75	0.01	0.01
Manganese	0.50 - 0.90	0.02	0.02
Silicon	0.12 - 0.30	0.02	0.02
Phosphorus	0.025 max	--	0.005
Sulfur	0.030 max	--	0.005

4. CONDITION: Unless otherwise specified, cold drawn, hardened and tempered.
5. TECHNICAL REQUIREMENTS:

## 5.1. Wire:

### 5.1.1. Tensile Properties:

Nominal Diameter Inch		Tensile Strength, psi min	max	Reduction of Area % min
0.093 to 0.120, incl		210,000	230,000	45
Over 0.120 to 0.148, incl		205,000	225,000	45
Over 0.148 to 0.192, incl		200,000	220,000	45
Over 0.192 to 0.250, incl		195,000	215,000	45

5.1.1.1. Square wire shall have a tensile strength within the limits specified above except reduction of area requirement does not apply.

5.1.2. Twist: A 10-inch specimen twisted 7 turns forward and then reversed until failure shall show a square break normal to the axis of the wire without splits or cracks.

5.1.3. Decarburization: The surface of the wire shall exhibit no ferritic area when transverse sections of the wire are mounted, micro-etched, and examined at a magnification of 100 diameters.

Section 7C of the SAE Technical Board rules provides that: "All technical reports, including standards approved and 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 standard 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 Committee will not investigate or consider any patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

5.1.4 Etching: The surface of the wire shall show no evidence of rust spots, pits, cracks, laps, injurious die marks, torn surfaces or any other defects which may be detrimental to springs after samples have been etched in hydrochloric acid solution (1 volume of 1.19 sp gr HCl to 1 volume of water) at 165-175 F for a sufficient length of time to reveal all defects when examined at 7-10 diameters magnification. Each end of each coil of wire shall pass this etching test. If 25% of the coils of wire from one shipment of steel are rejected the entire shipment shall be rejected.

#### 5.2 Finished Springs:

5.2.1 It is the responsibility of the spring manufacturer to supply springs to the drawing, to the material specification and to the satisfaction of the purchaser.

5.2.2 After coiling, the springs shall be stress relieved by heating to 725-750 F, holding at heat one hour and then allowing to cool in air. With permission of the purchaser this treatment may be changed.

5.2.3 Each spring shall be subjected to magnetic particle inspection.

#### 6. QUALITY:

6.1 The material shall be uniform in quality and temper and shall not be wavy or crooked.

6.2 The surface shall be free from imperfections such as seams, pits, die marks, scratches, and other defects tending to impair the fatigue value of springs.

#### 7. TOLERANCES:

7.1 Diameter: The following variations in wire diameter are permissible:

Nominal Diameter Inch	Tolerance, Inch Plus and Minus
0.093 to 0.148, incl	0.001
Over 0.148 to 0.177, incl	0.0015
Over 0.177 to 0.250, incl	0.002

7.2 Round wire shall not be out-of-round more than one-half the total tolerance specified in 7.1.

7.3 Square or rectangular wire tolerances may be 0.001 in. greater than those for round wire.

#### 8. REPORTS:

8.1 Unless otherwise specified, the vendor of wire shall furnish with each shipment three copies of a report of the results of tests for chemical composition of each heat in the shipment. This report shall include the purchase order number, heat number, material specification number, size, and quantity from each heat.