The Engineering Society
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SAE J217 DEC88

Stainless Steel 17-7 PH Spring Wire and Springs

SAE Recommended Practice
Reaffirmed December 1988

Submitted for Recognition as
an American National Standard

The Engineering Society For Advancing Mobility Land Sea Air and Space®
400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

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MATERIALS PRACTICE

SAE J217

Issued November 1970
Reaffirmed December 1988

Reaffirming J217 NOV70

STAINLESS STEEL 17-7 PH SPRING WIRE AND SPRINGS

1. SCOPE:

This recommended practice covers a high quality corrosion resisting steel wire, cold drawn, formed, and heat treated to produce uniform mechanical properties. It is magnetic in all conditions. It is intended for the manufacture of springs and wire forms that are to be heat treated after forming to enhance the spring properties. This recommended practice covers basic materials and processing requirements of springs and forms fabricated therefrom.

2. MANUFACTURING AND WORKMANSHIP:

The steel shall be made by the electric arc, electric induction, or other suitable commercial processes, using proper controls to prevent injurious segregation or inclusions. The wire shall be properly annealed and cold drawn to produce the specified mechanical properties after heat treatment. The wire shall be uniform in quality and shall not be kinked or improperly cast. To test for cast, a few convolutions of wire shall be cut and placed on a flat surface. The wire shall lie substantially flat on itself and not show a wavy condition. Each bundle shall be one continuous length of wire properly coiled and firmly tied. Welds are permitted prior to the final drawing operations. Care should be exercised in spring coiling and forming to avoid injurious tool and die marks and small radii in coiling and bending.

3. FINISH:

This wire is usually supplied with a thin surface film to assist in preventing galling or seizure of the wire by the coiling or forming tools. This wire is available with the following finishes: lead, oxide, copper, and others.

4. CHEMICAL COMPOSITION:

This wire shall conform to the chemical composition (percent by weight) as follows:

Carbon	0.090 max
Manganese	1.00 max
Silicon	1.00 max
Phosphorous	0.040 max
Sulfur	0.030 max
Chromium	16.00–18.00
Nickel	6.50–7.75
Aluminum	0.75–1.50

5. MECHANICAL PROPERTIES:

The tensile strength of the wire shall conform to the requirements in Table 1 for the various sizes after specimens have been heat treated at 900 ± 10°F for 1 h and air cooled. Prior to heat treating, the samples will be cleaned to remove all drawing lubricants and metallic or nonmetallic coating by immersing the wire sample in 15–25% nitric acid at room temperature for 5 min followed by a thorough water wash.

6. PERMISSIBLE VARIATION IN DIAMETER:

Permissible variations in the diameter of the wire shall be as specified in Table 2.

7. WRAP TEST:

The cold drawn wire shall withstand, without cracking, wrapping at room temperature, around an arbor equal to the nominal diameter of the wire.

8. COILING TEST:

The wire as cold drawn shall show a uniform pitch with no splits, cracks, or fractures when wound in a tightly closed coil on an arbor of the size shown in Table 3, and the resultant coil stretched to a permanent set of four times its as-wound length. This requirement shall apply only to wire having a nominal diameter of 0.016–0.125 in.

9. SURFACE CONDITION:

The surface of wire specimens shall be prepared in accordance with 10.3. The prepared specimens shall have a surface free from injurious imperfections, such as seams, pits, die scratches, and other defects which will impair the serviceability of the part.

TABLE 1 - Heat Treated Wire Tensile Strengths

Wire Diameter, in	Tensile Strength after 1 h at 900 ± 10°F (air cooled), ksi	
	Min	Max
0.016 to 0.020 incl	335	365
Over 0.020 to 0.025 incl	330	360
Over 0.025 to 0.030 incl	325	355
Over 0.030 to 0.041 incl	320	350
Over 0.041 to 0.051 incl	310	340
Over 0.051 to 0.061 incl	305	335
Over 0.061 to 0.071 incl	297	327
Over 0.071 to 0.086 incl	292	322
Over 0.086 to 0.090 incl	282	312
Over 0.090 to 0.100 incl	279	309
Over 0.100 to 0.106 incl	274	304
Over 0.106 to 0.130 incl	272	302
Over 0.130 to 0.138 incl	260	290
Over 0.138 to 0.146 incl	258	288
Over 0.146 to 0.162 incl	256	286
Over 0.162 to 0.180 incl	254	284
Over 0.180 to 0.207 incl	252	282
Over 0.207 to 0.225 incl	248	278
Over 0.225 to 0.306 incl	242	272
Over 0.306 to 0.440 incl	235	265

TABLE 2

Nominal Diameter, in	Variation, ± in	Out of Round, in
0.016 to under 0.024	0.0004	0.0004
0.024 to under 0.033	0.0005	0.0005
0.033 to under 0.044	0.00075	0.00075
0.044 to under 0.313	0.0010	0.0010
0.313-0.0440	0.0015	0.0015

TABLE 3

Nominal Wire Diameter, in	Arbor Diameter, in
0.016 to 0.024 incl	0.067
Over 0.024 to 0.034 incl	0.102
Over 0.034 to 0.045 incl	0.145
Over 0.045 to 0.055 incl	0.212
Over 0.055 to 0.078 incl	0.250
Over 0.078 to 0.125 incl	0.328

10. FINISHED PARTS:

10.1 The surface conditions on the finished parts shall be as described for the wire, except certain instances where shot peening might be used. In addition, there shall be no excessive coiling marks, nicks, or gouges which would impair the serviceability of the part. When springs are shot peened, the surface appearance will be altered. Because of a resulting decrease in the spring resistance to relaxation, shot peening is permitted only when agreed upon by the purchaser. After shot peening, the springs shall be stress relieved at 450-500°F for a minimum of 30 min at heat.

10.2 All forming shall be done on the wire in the as-drawn condition.

10.3 Springs made from this wire must be cleaned and passivated after coiling to insure maximum corrosion resistance of the stainless steel. All metallic coatings must be removed prior to heat treatment. One procedure is as follows:

(a) Remove drawing compounds from the wire surface by a 5 min dip in alkaline cleaner at approximately 190°F, followed by a water rinse.
(b) Remove metallic and most nonmetallic coatings from the wire surface and passivate the surface by immersing parts in a nitric acid solution of 15-25% at 140-160°F for 5 min or until clean. Follow with a water rinse.

10.4 After passivating, springs and forms made from this wire must be heated at 900 ± 10°F for 1 h and air cooled. No forming should be done to the wire or parts after heat treating.

RATIONALE:

Not applicable.

RELATIONSHIP OF SAE STANDARD TO ISO STANDARD:

Not applicable.

REFERENCE SECTION:

Not applicable.

APPLICATION:

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COMMITTEE COMPOSITION:

DEVELOPED BY THE SAE DIVISION 17 - SPRING WIRE:

E. H. Judd, Associated Spring Co., Livonia, MI, Chairman

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