



Designation: A407 – 23

# Standard Specification for Steel Wire, Cold-Drawn, for Coiled-Type Springs<sup>1</sup>

This standard is issued under the fixed designation A407; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope\*

1.1 This specification covers round, cold-drawn, steel spring wire having properties and quality intended for the manufacture of the following types of upholstery springs:

1.1.1 *Type A*—Coiled (Marshall pack),

1.1.2 *Type B*—Coiled and knotted,

1.1.3 *Type C*—Coiled and knotted (offset style),

1.1.4 *Type D*—Coiled and hooked (single and cross helicals),

1.1.5 *Type E*—Coiled and hooked (short tension—regular tensile strength),

1.1.6 *Type F*—Coiled and hooked (short tension—high tensile strength),

1.1.7 *Type G*—Regular lacing,

1.1.8 *Type H*—Automatic lacing,

1.1.9 *Type I*—Zig-zag (U-formed),

1.1.10 *Type J*—Square-formed, and

1.1.11 *Type K*—Sinuous for furniture spring units.

1.2 These types of upholstery springs are used in the manufacture of automotive seat springs, furniture springs, bed spring units, mattresses, furniture cushions, and automobile seats. This wire is not intended for the manufacture of mechanical springs.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recom-*

*mendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

[A370 Test Methods and Definitions for Mechanical Testing of Steel Products](#)

[A941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys](#)

[E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications](#)

2.2 *AIAG Standard:*

[AIAG B-10 Trading Partner Labels Implementation Guidelines](#)<sup>3</sup>

## 3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, refer to Terminology [A941](#).

## 4. Ordering Information

4.1 Orders for material under this specification shall include the following information for each ordered item:

4.1.1 Quantity (weight),

4.1.2 Name of material (name of specific type required) (Section 1 and [Table 1](#)),

4.1.3 Diameter ([Table 2](#)),

4.1.4 Packaging, marking, and loading (Section 14), and

4.1.5 ASTM designation and date of issue.

4.2 The purchaser shall have the option to specify additional requirements, including but not limited to:

4.2.1 Requirements for certifications, heat analysis, or test reports, (see Sections 6 and 13),

4.2.2 Special packing, marking, and loading requirements (see Section 14),

4.2.3 Other special requirements, if any.

NOTE 1—A typical ordering description is as follows: 50 000 lb [15 000 kg], cold-drawn upholstery spring wire Type B for coiling and knotting,

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.03 on Steel Rod and Wire.

Current edition approved April 1, 2023. Published April 2023. Originally approved in 1957. Last previous edition approved in 2018 as A407 – 18. DOI: 10.1520/A0407-23.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from Automotive Industry Action Group (AIAG), 4400 Town Center, Southfield, MI 48075-1104, [www.aiag.org](http://www.aiag.org).

\*A Summary of Changes section appears at the end of this standard

**TABLE 1 Tensile Strength Requirements<sup>A</sup>**

Diameter, in. [mm]	Wire Gauge	Tensile Strength, ksi [MPa]	
		min	max
Type A, Marshall Pack			
0.048 [1.22]	18	255 [1760]	295 [2030]
0.054 [1.37]	17	250 [1720]	290 [2000]
0.062 [1.57]	16	250 [1720]	290 [2000]
0.072 [1.83]	15	240 [1660]	280 [1930]
0.080 [2.03]	14	230 [1590]	270 [1860]
0.092 [2.34]	13	225 [1550]	265 [1830]
0.106 [2.69]	12	220 [1520]	260 [1800]
Type B, Coiled and Knotted			
0.062 [1.57]	16	235 [1620]	270 [1860]
0.072 [1.83]	15	230 [1590]	265 [1830]
0.080 [2.03]	14	225 [1550]	260 [1800]
0.092 [2.34]	13	215 [1480]	250 [1720]
0.106 [2.69]	12	205 [1410]	235 [1620]
0.120 [3.05]	11	195 [1340]	225 [1550]
0.135 [3.43]	10	190 [1310]	220 [1520]
0.148 [3.76]	9	185 [1280]	215 [1480]
0.162 [4.11]	8	180 [1240]	210 [1450]
Type C, Coiled and Knotted (Offset Type)			
0.072 [1.83]	15	215 [1480]	245 [1690]
0.080 [2.03]	14	210 [1450]	240 [1660]
0.092 [2.34]	13	200 [1380]	230 [1590]
0.106 [2.69]	12	195 [1340]	225 [1550]
Type D, Coiled and Hooked (Cross Helicals)			
0.048 [1.22]	18	215 [1480]	255 [1760]
0.054 [1.37]	17	210 [1450]	250 [1720]
0.062 [1.57]	16	210 [1450]	250 [1720]
Type E, Coiled and Hooked (Short Tension, Regular Tensile Strength)			
0.080 [2.03]	14	200 [1380]	240 [1660]
0.092 [2.34]	13	200 [1380]	240 [1660]
0.106 [2.69]	12	195 [1340]	235 [1620]
Type F, Coiled and Hooked (Short Tension, High Tensile Strength)			
0.080 [2.03]	14	225 [1550]	260 [1800]
0.092 [2.34]	13	220 [1520]	255 [1760]
0.106 [2.69]	12	215 [1480]	250 [1720]
Type G, Regular Lacing Wire			
0.041 [1.04]	19	235 [1620]	275 [1900]
0.048 [1.22]	18	230 [1590]	270 [1860]
0.054 [1.37]	17	225 [1550]	265 [1830]
0.062 [1.57]	16	225 [1550]	265 [1830]
Type H, Automatic Lacing Wire			
0.041 [1.04]	19	250 [1720]	290 [2000]
0.048 [1.22]	18	245 [1690]	285 [1960]
0.054 [1.37]	17	240 [1660]	280 [1930]
0.062 [1.57]	16	235 [1620]	275 [1900]
Type I, Zig-Zag Type Automobile Seat and Back Spring Units			
		Class I	Class II
0.092 [2.34]	13	220 [1520]	230 [1590]
0.106 [2.69]	12	215 [1480]	225 [1550]
0.120 [3.05]	11	210 [1450]	215 [1480]
0.135 [3.43]	10	205 [1410]	210 [1450]
0.148 [3.76]	9	200 [1380]	205 [1410]
0.162 [4.11]	8	190 [1310]	200 [1380]
		Class I	Class II
0.092 [2.34]	13	215 [1480]	225 [1550]
0.106 [2.69]	12	210 [1450]	220 [1520]
0.120 [3.05]	11	205 [1410]	215 [1480]
0.135 [3.43]	10	200 [1380]	210 [1450]
0.148 [3.76]	9	190 [1310]	200 [1380]
0.162 [4.11]	8	180 [1240]	200 [1380]
Type J, Square-Formed Type Automobile Seat and Back Spring Units			
		Class I	Class II
0.092 [2.34]	13	215 [1480]	225 [1550]
0.106 [2.69]	12	210 [1450]	220 [1520]
0.120 [3.05]	11	205 [1410]	215 [1480]
0.135 [3.43]	10	200 [1380]	210 [1450]
0.148 [3.76]	9	190 [1310]	200 [1380]
0.162 [4.11]	8	180 [1240]	200 [1380]
Type K, Sinuous Type Furniture Spring Units			
0.092 [2.34]	13	235 [1620]	270 [1860]
0.106 [2.69]	12	235 [1620]	265 [1830]
0.120 [3.05]	11	230 [1590]	260 [1800]
0.135 [3.43]	10	225 [1550]	255 [1760]
0.148 [3.76]	9	220 [1520]	250 [1720]
0.162 [4.11]	8	215 [1480]	245 [1690]
0.177 [4.50]	7	210 [1450]	240 [1660]
0.192 [4.88]	6	207 [1430]	237 [1630]

<sup>A</sup> Tensile strength requirement for diameters not shown in this table shall conform to that shown for the next larger diameter (for example, for diameter 0.128 in. [3.25 mm] the requirement shall be the same as for 0.135 in. [3.42 mm]).

**TABLE 2 Permissible Variations in Wire Diameter<sup>A</sup>**

Diameter, in. [mm]	Permissible Variations, ± in. [mm]	Permissible Out-of-Round, in. [mm]
Sizes finer than 0.076 [1.93]	0.001 [0.02]	0.001 [0.02]
Sizes 0.076 to 0.192 [1.93 to 4.88], incl	0.002 [0.05]	0.002 [0.05]

<sup>A</sup> Permissible variation in wire diameter and out-of-round limits specified are absolute limits as defined in Practice E29.

size 0.080 in. [2.0 mm], 1500-lb [700 kg] coils on tubular carriers to ASTM A407-XX.

## 5. Materials and Manufacture

5.1 The steel shall be made by any commercially accepted steelmaking process.

5.2 The finished wire shall be free from injurious piping and undue segregation.

5.3 The wire shall be cold-drawn to produce the desired mechanical properties.

## 6. Chemical Composition

6.1 Upholstery spring wire for coiled-type springs is customarily produced within the chemical ranges shown below. Chemical composition and processing may vary depending on the gauge of wire and specific use.

Carbon, %	0.45 to 0.70 <sup>A</sup>
Manganese, %	0.60 to 1.20 <sup>A</sup>
Phosphorus, max, %	0.040
Sulfur, max, %	0.050

<sup>A</sup> In any lot in which all the wire is of the same size and type, and submitted for inspection at the same time, the carbon content shall not vary more than 0.20 %, and the manganese content shall not vary more than 0.30 %.

6.2 Each heat of steel shall be analyzed to determine the percentage of elements specified above. The analysis shall be made from a test sample preferably taken during the pouring of the heat. The chemical composition thus determined shall be reported to the purchaser or his representative upon request.

## 7. Mechanical Properties

### 7.1 Tension Test:

7.1.1 *Requirements*—The material as represented by tension test specimens shall conform to the requirements prescribed in **Table 1** for the various sizes and specified types.

7.1.2 *Number of Tests*—One test specimen shall be taken for each ten coils, or fraction thereof, in a lot. Each heat in a given lot shall be tested.

7.1.3 *Location of Tests*—It is permissible for test specimens to be taken from either end of the coil.

7.1.4 *Test Method*—The tension test shall be made in accordance with Test Methods and Definitions A370.

### 7.2 Wrap Test:

7.2.1 *Requirements*—The wire for zig-zag-type and for square-formed-type springs for automobile seat and back spring units, except that for coiled-type springs Type A (Marshall pack), shall wrap on itself as an arbor without

breakage. The wire for sinuous-type furniture spring units shall wrap on a mandrel twice the diameter of the wire without breakage.

7.2.2 *Number of Tests*—One test specimen shall be taken for each ten coils, or fraction thereof, in a lot. Each heat in a given lot shall be tested.

7.2.3 *Location of Tests*—It is permissible for test specimens to be taken from either end of the coil.

7.2.4 *Test Method*—The wrap test shall be made in accordance with Annex A4 of Test Methods and Definitions **A370**.

## 8. Dimensions and Permissible Variations

8.1 The diameter of the wire shall not vary from that specified by more than the tolerances specified in **Table 2**.

## 9. Workmanship

9.1 *Surface Condition*—The surface of the wire as received shall be smooth and have a uniform finish suitable for coiling or shaping the various types of springs. No serious die marks, scratches, or seams may be present.

9.2 The wire shall be properly cast. To test for cast, a few convolutions of wire shall be cut from the coil and allowed to fall on a flat surface. The wire shall lie substantially flat on itself or shall not spring up or show a wavy condition.

9.3 Each coil shall be one continuous length of wire, properly coiled. Welds made prior to cold drawing are permitted. Weld areas need not meet the mechanical requirements of this specification.

## 10. Retests

10.1 If any tested specimen exhibits an obvious defect or condition of non-conformance that is not representative of the coil from which it was collected, or shows the presence of a weld, it shall be discarded and another specimen substituted.

10.2 If any tested specimen exhibits an obvious defect or condition of non-conformance that is representative of a portion of the coil from which it was collected, the manufacturer shall remove from the coil the portion containing the obvious defect or condition of non-conformance before collecting another test specimen from the coil for the purpose of retesting.

## 11. Inspection

11.1 The manufacturer shall afford the purchaser's inspector all reasonable facilities necessary to satisfy him that the material is being produced and furnished in accordance with this specification. Mill inspection by the purchaser shall not

interfere unnecessarily with the manufacturer's operations. All tests and inspections shall be made at the place of manufacture, unless otherwise agreed to.

## 12. Rejection and Rehearing

12.1 Unless otherwise specified, any rejection based on tests made in accordance with this specification shall be reported to the manufacturer within a reasonable length of time.

12.2 Failure of any of the test specimens to comply with the requirements of this specification shall constitute grounds for rejection of the lot represented by the specimen. The lot may be resubmitted for inspection by testing every coil for the characteristic in which the specimen failed and sorting out the defective coils.

12.3 The material must be adequately protected and correctly identified in order that the producer may make proper investigation.

## 13. Certification

13.1 When specified in the purchase order or contract, a manufacturer's or supplier's certification shall be furnished to the purchaser that the material was manufactured, sampled, tested, and inspected in accordance with this specification and has been found to meet the requirements. When specified in the purchase order or contract, a report of the test results shall be furnished.

13.2 The certification shall include the specification number, year date of issue, and revision letter, if any.

## 14. Packaging, Marking, and Loading

14.1 Packaging of the coils of wire shall be by agreement between the producer and the purchaser. This agreement shall include coil dimensions and weights.

14.2 Marking shall be by a tag securely attached to each coil of wire and shall show the identity of the producer, size of the wire, type, and ASTM specification designation.

14.3 *Bar Coding*—In addition to the previously-stated identification requirements, bar coding is acceptable as a supplementary identification method. Bar coding should be consistent with AIAG B-10, Trading Partner Labels Implementation Guidelines. The bar code may be applied to a substantially affixed tag.

## 15. Keywords

15.1 coiled-type; cold-drawn; sinuous; springs; square-formed; upholstery; wire; zig-zag