



Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire [Metric]¹

This standard is issued under the fixed designation A 641M; 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 (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers soft, medium, and hard temper zinc-coated (galvanized) carbon steel wire in coils for general use.

NOTE 1—This specification is the metric companion to Specification A 641, and is compatible in technical content.

2. Referenced Documents

2.1 ASTM Standards:

A 90 Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles²

A 700 Practices for Packaging, Marking, and Loading Methods for Steel Products for Domestic Shipment³

B 6 Specification for Zinc (Slab Zinc)⁴

E 8 Test Methods of Tension Testing of Metallic Materials⁵

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications⁶

2.2 Military Standards:

MIL-STD-129 Marking for Shipment and Storage⁷

MIL-STD-163 Steel Mill Products Preparation⁷

2.3 Federal Standard:

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)⁷

3. Terminology

3.1 Definitions:

3.1.1 *carbon steel*—a steel that has no minimum content specified or required for aluminum, chromium, cobalt, columbium, molybdenum, nickel, titanium, tungsten, vanadium, or zirconium or any other element added to obtain a desired alloying effect; that the specified minimum copper content not exceed 0.40 %; or that the maximum content for any of the following elements not exceed these percentages: manganese 1.65, silicon 0.60, or copper 0.60.

3.1.2 *zinc-coated (galvanized) wire*—wire produced by passing individual wires through a bath of molten zinc (hot-dip galvanizing) or through an electrolytic cell (electrogalvanizing) containing a solution of a zinc salt. The wire is usually thermally treated in the same operation by

passing through molten lead, molten salt, or a muffle furnace followed by a cleaning or a pickling operation preceding galvanizing.

3.2 Descriptions of Terms Specific to This Standard:

3.2.1 *classes of zinc coating (galvanizing)*—wire produced having minimum zinc coatings as measured in grams per square metre of surface (Test Method A 90) “in four classes; Class 1, Class 3 or A, Class B and Class C” as shown in Tables 1 and 2. Zinc coated (galvanized) wire can also be produced as “regular coating” and no specified minimum weight of coating is required.

3.2.2 *temper*—as applied to zinc-coated (galvanized) wire, refers to stiffness or resistance to bending. It has customarily been expressed by tensile strength as shown in the three ranges of Table 3. The temper of a given chemical composition can be controlled by the use of a different thermal treatment for each temper. Different properties can also be obtained by varying the chemical composition for a given thermal treatment. A thorough understanding of the end use of the wire, which involves both tensile strength and ductility, should be reached between the user and the manufacturer of the zinc-coated (galvanized) wire. Requirements for both chemical composition and mechanical properties may be technologically impracticable.

4. Ordering Information

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

4.1.1 Quantity (weight),

4.1.2 Coated wire diameter,

4.1.3 Class of coating (see 3.2.1),

4.1.4 Temper (soft, medium, or hard) (Table 3),

4.1.5 Packaging requirements, and

4.1.6 ASTM designation and year of issue.

NOTE 2—A typical ordering description is as follows: 50 000 kg, 3.00-mm diameter Galvanized Wire, Class 1, Soft Temper in 1000-kg

TABLE 1 Minimum Weight of Zinc per Unit Area of Uncoated Wire Surface

Wire Diameter, mm	Class 1 Coating, g/m ²
0.20 to under 0.25	20
0.25 to under 0.40	25
0.40 to under 0.50	30
0.50 to under 0.60	35
0.60 to under 0.80	40
0.80 to under 1.10	45
1.10 to under 1.50	55
1.50 to under 1.90	65
1.90 to under 2.30	75
2.30 to under 3.20	85
3.20 to under 4.00	100
4.00 to under 4.90	115
4.90 to under 5.90	150
Over 5.90	190

¹ This specification is under the jurisdiction of ASTM Committee A-5 on Metallic-Coated Iron and Steel Products and is the direct responsibility of Subcommittee A05.12 on Wire Specifications.

Current edition approved March 15, 1991. Published May 1991. Originally published as A 641M - 84. Last previous edition A 641M - 84.

² Annual Book of ASTM Standards, Vol 01.06.

³ Annual Book of ASTM Standards, Vol 01.05.

⁴ Annual Book of ASTM Standards, Vol 02.04.

⁵ Annual Book of ASTM Standards, Vol 03.01.

⁶ Annual Book of ASTM Standards, Vol 14.02.

⁷ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

TABLE 2 Minimum Weight of Zinc per Unit Area of Uncoated Wire Surface

Wire Diameter, mm	Class 3 or A Coating, g/m ²	B Coating, g/m ²	C Coating, g/m ²
1.30 to 1.60, incl	180	360	540
Over 1.60 to 1.90, incl	210	420	630
Over 1.90 to 2.30, incl	220	440	660
Over 2.30 to 2.70, incl	230	460	690
Over 2.70 to 3.10, incl	240	480	720
Over 3.10 to 3.50, incl	260	520	780
Over 3.50 to 3.90, incl	270	540	810
Over 3.90 to 4.50, incl	275	550	825
4.51 and over	300	600	900

coils on tubular carriers to ASTM A 641M-_____.

5. Materials and Manufacture

5.1 The steel shall be manufactured by the open-hearth, electric-furnace, or basic-oxygen process.

5.2 The slab zinc when used shall be any grade of zinc conforming to Specification B 6.

6. Mechanical Requirements

6.1 When tested in accordance with Methods E 8, the zinc-coated wire shall conform to the requirements prescribed in Table 3 for tensile strength.

6.2 Test specimens found to contain a weld or an obvious defect shall be discarded and another test specimen obtained to verify conformance to the tensile strength requirements.

7. Dimensions and Tolerances

7.1 The permissible variation in diameter of the zinc-coated wire shall be as prescribed in Table 4.

8. Weight of Coating

8.1 When tested in accordance with Test Method A 90, the zinc-coated wire shall conform to the requirements prescribed in Tables 1 and 2 for minimum weight of zinc coating of the class required, except for regular coating.

9. Adherence of Coating

9.1 The zinc-coated wire shall be capable of being wrapped in a close helix at a rate not exceeding 15 turns/min around a cylindrical steel mandrel having a diameter as prescribed in Table 5 without cracking or flaking the zinc coating to such an extent that any zinc can be removed by rubbing with the bare fingers.

NOTE 3—Loosening or detachment during the adhesion test of superficial, small particles of zinc formed by mechanical polishing of the surface of the zinc-coated wire shall not be considered cause for rejection.

10. Number of Tests and Retests

10.1 The number of test specimens taken from the ends of

TABLE 3 Tensile Strength for Temper Designation

Wire Diameter, mm	MPa		
	Soft	Medium	Hard
0.20 to under 2.00	515 max	485 to 690	620 to 825
2.00 to under 2.50	515 max	485 to 655	585 to 795
2.50 to under 4.70	485 max	450 to 620	550 to 760
4.70 and over	485 max	415 to 585	515 to 725

TABLE 4 Diameter Tolerance for Galvanized Wire in Coils^a

Wire Diameter, mm	Tolerance, Plus and Minus, mm	
	Regular and Class 1 Coating	Class 3, A, B, and C Coating
0.20 to under 1.90	0.05	0.05
1.90 to under 3.70	0.08	0.10
3.70 to 5.90, incl	0.08	0.10
5.90 and over	0.08	0.13

^a It is recognized that the surfaces of heavy zinc coating, particularly those produced by hot galvanizing, are not perfectly smooth and devoid of irregularities. If the tolerances shown above are rigidly applied to such irregularities that are inherent to the product, unjustified rejections of wire that would actually be satisfactory for use could occur. Therefore, it is intended that these tolerances be used in gaging the uniform areas of the galvanized wire.

coils during production to assure compliance with Sections 6, 7, 8, and 9 varies with the quality control procedures and the manufacturing facilities of each manufacturer but is generally not less than 10 % of the coils produced. For the purpose of final product testing, one specimen from every ten coils or fraction thereof in a lot shall be selected at random, or a total of seven specimens, whichever is less.

10.2 A wire sample of sufficient length, approximately 1.2 m, shall be cut from either end of each coil selected for tests described in Sections 6, 7, 8 and 9.

10.3 Should one or more of the wire specimens fail any requirement, the lot shall be subjected to retest. For retest purposes, the original lot shall be regrouped into 50 coil lots or fractions thereof. Each lot shall be tested for the property in which the original sample failed to comply at a frequency of 10 % or more so that the total number of tests is at least double the original. Any lot that exhibits a failure shall be rejected. If during retesting an additional quality parameter is observed to be defective, the lot of 50 is subject to rejection for that cause. The manufacturer may test each coil in the failed lot for the property in which the failure occurred and reject only the nonconforming coils.

11. Workmanship

11.1 The zinc-coated wire shall be free of slivers, scale, and other imperfections not consistent with good commercial practice. The zinc coating shall be reasonably smooth and continuous. To ensure large continuous length coils, welds may be present in the finished wire.

12. Inspection

12.1 Unless otherwise specified in the purchase order or contract, the manufacturer is responsible for the performance of all inspection and test requirements specified in this specification. Except as otherwise specified in the purchase order or contract, the manufacturer may use his own

TABLE 5 Mandrel Diameters for Test for Adherence of Zinc Coating

Wire Diameter, mm	Mandrel Diameters for Coating Classes	
	Regular and 1	3, A, B, and C
0.20 to under 1.90	1D ^a	2D ^a
1.90 to under 3.70	1D	3D
3.70 and over	2D	4D

^a D equals nominal wire diameter being tested.

or any other suitable facilities for the performance of the inspection and test requirements unless disapproved by the purchaser at the time the order is placed. The purchaser shall have the right to perform any of the inspection and tests prescribed in this specification when such inspections and tests are deemed necessary to assure that the material conforms to prescribed requirements.

13. Rejection and Rehearing

13.1 Material that fails to conform to the requirements of this specification may be rejected. Rejection should be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the test, the producer or supplier may make claim for a rehearing.

14. Certification

14.1 When specified in the purchase order or contract, a producer'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.

15. Packaging and Package Marking

15.1 Unless otherwise specified, packaging, marking and loading for shipment shall be in accordance with Practices A 700.

15.2 When specified in the contract or order, and for direct procurement by or direct shipment to the U. S. Government, when Level A is specified, preservation, packaging, and packing shall be in accordance with the Level A requirement of MIL-STD-163.

15.3 When specified in the contract or order, and for direct procurement by or direct shipment to the U. S. Government, marking for shipment, in addition to requirements specified in the contract or order, shall be in accordance with MIL-STD-129 for U. S. military agencies and in accordance with Fed. Std. No. 123 for U. S. Government civil agencies.

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