Designation: A 111 – 99a (Reapproved 2004)ε1

Standard Specification for Zinc-Coated (Galvanized) "Iron" Telephone and Telegraph Line Wire[1]

This standard is issued under the fixed designation A 111; 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.

ε[1] NOTE—Editorially changed paragraph 6.1 in May 2004.

1. Scope

1.1 This specification covers "iron" wire with Class A, Class B, and Class C zinc coatings, suitable for use in telephone, telegraph, and signal transmission.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in brackets are for information only.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

A 90/A 90M Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products

A 902 Terminology Relating to Metallic Coated Steel Products

B 6 Specification for Zinc

B 193 Test Method for Resistivity of Electrical Conductor Materials

3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, see Terminology A 902.

4. Ordering Information

4.1 Orders for wire under this specification shall include the following:

4.1.1 Size (in decimal fractions of an inch or [millimetre]),

4.1.2 Grade,

4.1.3 Class of zinc coating (A, B, or C),

4.1.4 Mandrel test for zinc coating (as desired, mandrels Nos. 1 to 12 for Class A or as desired, mandrels Nos. 3 to 12 for Classes B and C), and

4.1.5 ASTM designation and year of issue.

NOTE 1—*Example*—A typical order including the necessary information to guide the manufacturer, is as follows:

5000 lb of 0.109-in. Grade BB wire, Class A coating, mandrel No. 3, ASTM Specification A 111.

5. Zinc for Coating

5.1 The zinc used for the coating shall be any grade of zinc conforming to Specification B 6.

6. Base Metal

6.1 The base metal shall be made by any commercially-accepted steel-making process of such quality and purity that, when processed and zinc coated, the finished wire will have the properties prescribed in this specification for its size and grade.

7. Joints

7.1 The wire shall be furnished in coils of one continuous length. Welds made prior to the final wire drawing shall be permitted.

8. Sampling

8.1 The inspector shall select at random during the visual examination specified in Section 18, 1 sample coil from every 10 coils in the first 100 coils of the lot, and 1 sample coil for every additional 35 coils but not less than 3 coils from the entire lot. From each coil of galvanized wire thus selected, a sample of suitable length shall be taken for the weight of coating, the mechanical and the electrical tests as specified in Sections 9-14, inclusive.

9. Weight of Coating

9.1 The weight of zinc coating, in ounces per square foot or [grams per square metre] of uncoated wire surface, shall be not less than that specified in Table 1.

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

Current edition approved May 1, 2004. Published June 2004. Originally approved in 1926. Last previous edition approved in 1999 as A 111 - 99a.

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

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States.

Copyright ASTM International
Reproduced by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Not for Resale

TABLE 1 Minimum Weights of Zinc Coating

Nominal Diameter of Coated Wire, in. [mm]	Minimum Weight of Zinc Coating, oz/ft² [g/m²] of Uncoated Wire Surface		
	Class A	Class B	Class C
0.109 [2.77] and over	0.80 [245]	1.60 [490]	2.40 [730]
0.083 [2.11]	0.70 [215]	1.40 [425]	2.10 [640]

9.2 *Weight of Coating Test*—The zinc coating shall be tested for weight by a stripping test in accordance with Test Method A 90/A 90M.

10. Adherence of Coating

10.1 The zinc coating shall remain adherent when the wire is wrapped at a rate of not more than 15 turns per minute in a close helix of at least two turns around a cylindrical mandrel of the diameter specified. The mandrel diameter shall be approximately an even multiple of the diameter of the wire tested. The mandrel shall be specified by the number corresponding to this diameter ratio. For example, mandrel No. 1 and mandrel No. 12 designate mandrel diameters respectively one and twelve times the wire diameter.

NOTE 2—The coatings on all commercially available wire manufactured to meet this specification will pass a wrap test on mandrel No. 12. Coatings are available for passing wrap tests on mandrels as small as No. 1 for Class A, and No. 3 for Classes B and C. Coatings passing wrap tests on mandrels of intermediate sizes may be specified.

10.2 The zinc coating shall adhere firmly to the wire and shall be considered as meeting this requirement if, due to wrapping about the specified mandrel, it does not flake and none of the coating can be removed from the wire by rubbing with the bare fingers. Loosening or detachment during the adhesion test of superficial, small particles of zinc formed by mechanical polishing of the surface of zinc-coated wire shall not be considered cause for rejection.

11. Breaking Strength

11.1 The breaking strength of the galvanized wire shall not be less than that specified in Table 2 when tested in accordance with Test Methods and Definitions A 370.

12. Elongation

12.1 The elongation of the galvanized wire shall be not less than 10 % in 10 in. [254 mm] when tested in accordance with Test Methods and Definitions A 370. The elongation shall be determined as the permanent increase in length after failure of a marked section of the wire originally 10 in. [254 mm] in length.

TABLE 2 Breaking Strength Requirements

Nominal Diameter of Coated Wire, in. [mm]	Size (Birmingham Wire Gage)	Breaking Strength, min, lbf [N]
		Grade BB
0.238 [6.05]	4	2 270 [10 100]
0.203 [5.16]	6	1 650 [7 340]
0.165 [4.19]	8	1 090 [4 850]
0.148 [3.76]	9	880 [3 910]
0.134 [3.40]	10	720 [3 200]
0.120 [3.05]	11	575 [2 560]
0.109 [2.77]	12	475 [2 110]
0.083 [2.11]	14	275 [1 220]

13. Ductility

13.1 The base metal of the galvanized wire of each grade shall not fracture when the wire is wrapped at a rate of not more than 15 turns per minute in a close helix of at least two turns around a cylindrical mandrel of a diameter equal to the nominal diameter of the wire tested.

14. Resistivity

14.1 The weight resistivity of the wire expressed in ohm pound per square mile [ohm gram per square metre] at 68°F [20°C] shall conform to the requirements specified in Table 3.

14.2 *Resistivity Test*— The resistivity shall be determined in accordance with Test Method B 193.

15. Size and Permissible Variations

15.1 *Size*—The size of the galvanized wire shall be expressed as the diameter of the wire in decimal fractions of an inch or [millimetre].

15.2 *Permissible Variations*—The permissible variations of the galvanized wire from the nominal diameter shall be as follows:

Nominal Diameter of Wire, in. [mm]	Permissible Variations, plus or minus, in. [mm]
0.109 [2.77] and over	0.004 [0.10]
0.083 [2.11]	0.003 [0.08]

15.3 *Gaging*—The wire of each coil selected for purpose of test (Section 8) shall be gaged in three places; one near each end of the coil and one approximately at the middle. A coil shall be rejected if the diameter, at any point, is not within the limits specified in 15.2.

16. Workmanship, Finish, and Appearance

16.1 The galvanized wire shall be free of splints, scales, inequalities, flaws, and other imperfections not consistent with good commercial practice. The coating shall be continuous and reasonably uniform.

17. Inspection

17.1 The manufacturer shall afford the inspector representing the purchaser all reasonable facilities, without charge, to satisfy him that the material is being furnished in accordance with this specification. All tests and inspection shall be made at the place of manufacture, prior to shipment, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

TABLE 3 Resistivity Requirements

Class of Coating	Weight Resistivity, max, Ω·lb/mile² [Ω·g/m²]
	Grade BB
A	6200 [1.092]
B	6050 [1.062]
C	5900 [1.033]

Copyright ASTM International
Reproduced by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Not for Resale

18. Rejection

18.1 The inspector shall visually examine the entire shipment of lot of coils for surface imperfections. If, after visual examination, more than 3 % of the coils in the entire lot are found defective, the entire lot shall be subject to rejection. If more than 3 % of the samples selected in accordance with Section 8 fail to pass any of the tests specified in Sections 9-15, inclusive, the entire lot shall be subject to rejection. If not more than 3 % of the samples fail, a second set of samples, consisting of two specimens from each of the coils from which the original nonconforming samples were taken, shall be cut and tested for the nonconforming properties. If any of these samples fail, the entire lot shall be subject to rejection.

19. Packaging

19.1 The finished wire shall be furnished in compact coils reasonably symmetrical in shape. The diameter of the eye of each coil shall be not less than 17 in. [432 mm], nor more than 24 in. [610 mm].

19.2 The weight of wire in each coil shall conform, within a variation of plus or minus 10 %, to the nominal values specified in Table 4.

19.3 Each coil shall be securely bound in four separate places, equally spaced, with at least two wrappings of galvanized wire not smaller than 0.080 in. [2.0 mm] in diameter. As an alternative, coils may be securely bound in three separate places, equally spaced, with a zinc-coated steel strap. The steel crimping seal used to fasten the strap shall be either zinc-coated or painted steel. For bundles with a nominal weight less than 100 lb [45.4 kg] the steel strap shall be not less than ½ in. [12.7 mm] wide by 0.020 in. [0.51 mm] thick. For bundles with a nominal weight of 100 lb [45.4 kg] or more, the steel strap shall be not less than ⅝ in. [15.9 mm] wide by 0.020 in. [0.51 mm] thick, and each binder shall be looped around several strands of wire and then passed around the coil and tightened. The outer end of each coil shall be bent back over the binding wire or strap or else tucked into the coil and shall be identified by an appropriate tag to facilitate locating the end.

TABLE 4 Nominal Amount of Wire in Each Coil

Nominal Diameter of Coated Wire, in. [mm]	Size (Birmingham Wire Gage)	Approximate Length, ft [m]	Nominal Weight of Wire in Each Coil, lb [kg]
0.238 [6.05]	4	1 320 [402]	200 [91]
0.203 [5.16]	6	1 760 [536]	193 [88]
0.165 [4.19]	8	2 640 [805]	191 [87]
0.148 [3.76]	9	2 640 [805]	154 [70]
0.134 [3.40]	10	2 640 [805]	126 [57]
0.120 [3.05]	11	2 640 [805]	101 [46]
0.109 [2.77]	12	2 640 [805]	83 [38]
0.083 [2.11]	14	2 640 [805]	48 [22]

20. Marking

20.1 To each coil of wire shall be securely attached a durable tag showing the size, grade, class of coating, ASTM designation A 111, and the name or mark of the manufacturer.

21. Keywords

21.1 iron products—zinc-coated; steel wire—zinc-coated; telephone/telegraph wire

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org).

Copyright ASTM International
Reproduced by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Not for Resale