



Standard Specification for Carbon Steel Wire for Wire Rope¹

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1. Scope

1.1 This specification covers uncoated and four classes of round, metallic coated, cold-drawn, carbon steel wire for wire rope in five strength levels. This specification specifies:

- 1.1.1 Dimensional tolerances,
- 1.1.2 Mechanical characteristics,
- 1.1.3 Chemical composition requirements,
- 1.1.4 Coating requirements (if applicable), and
- 1.1.5 Packaging requirements.

1.2 The values stated for metric equivalents are provided for informational purposes only.

2. Referenced Documents

2.1 This specification incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at their appropriate place in the text and the publications are listed. For dated references, subsequent amendments to or revisions of any of these publications apply to this specification only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to would apply.

2.2 ASTM Standards:

- A 90/A 90M Test Method for Weight (Mass) of Coating on Iron or Steel Articles with Zinc or Zinc-Alloy Coatings²
- A 510 Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel-Coated³
- A 938 Test Method for Torsion Testing of Wire³
- B 6 Specification for Zinc (Slab Zinc)⁴
- B 750 Specification for Zinc-5 % Aluminum Mischmetal Alloy (UNS Z38510) in Ingot Form for Hot-Dip Coatings⁴
- E 8 Test Methods of Tension Testing of Metallic Materials⁵
- E 380 Practice for Use of International System of Units (SI) (the Modernization Metric System)⁶

2.3 ISO/EN Standards:

EN 10264-1.2 Steel Wire and Wire Products—Steel Wire for Wire Rope⁷

2.4 Industry Standard:

API 9A Specification for Wire Rope⁸

2.5 Industry References:

AIME/ISS Carbon Steel, Wire and Rods⁹

AIAG 02.00 Primary Metals Identification Tag Application⁹

2.6 Non-Referenced Industry Applicable Standards:

ISO Std. 2232 Drawn Wire for General Purpose Non-Alloy Steel Wire Ropes⁷

3. Terminology

3.1 Definitions:

3.1.1 *actual diameter*—the arithmetic mean of the minimum and maximum diameter measurements in one location on the wire.

3.1.2 *breaking force level (Levels 1,2,3,4 or 5)*—a wire strength based on the minimum load carrying capability of a designated wire.

3.1.3 *drawn-galvanized*—a zinc coating that is applied to the wire prior to the final cold drawing operation by either an electro-deposition or hot-galvanizing process.

3.1.4 *drawn-Zn5 Al-MM*—a zinc-aluminum alloy (mischmetal) coating that is applied to the wire prior to the final cold drawing operation by a molten coating process.

3.1.5 *final-coated Zn5 Al-MM*—a zinc-aluminum alloy (mischmetal) coating that is applied to the wire after the final cold drawing operation by a molten coating process.

3.1.6 *final-galvanized*—a zinc coating that is applied to the wire after the final cold drawing operation by either an electro-deposition or hot-galvanizing process.

3.1.7 *nominal diameter*—the diameter of the wire expressed in inches (millimetres) and specified by the user to designate the wire size. It is the basis for the determination of the values of all characteristics of the wire for acceptance purposes.

3.1.8 *ovality*—the arithmetic difference between the maximum diameter and the minimum diameter in one location on the wire; it shall not be greater than half the tolerance specified in the respective tables referred to in the following parts of this specification.

⁷ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

⁸ Available from American Petroleum Institute, 1801 K Street, N.W., Washington, DC 20226.

⁹ Available from Automotive Industry Action Group (AIAG), 26200 Lahser Road, Suite 200, Southfield, MI 48034-7100.

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

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² *Annual Book of ASTM Standards*, Vol 01.06.

³ *Annual Book of ASTM Standards*, Vol 01.03.

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.

3.1.9 *uncoated wire*—the surface of a wire furnished with a residual lube film as a result of cold-drawing said wire.

4. Ordering Information

4.1 It is the responsibility of the purchaser to specify all requirements that are necessary for material ordered under this specification. Such requirements shall include, but are not limited to the following:

- 4.1.1 Quantity (mass),
- 4.1.2 Name of material (drawn steel wire for wire rope),
- 4.1.3 Wire type (uncoated, drawn- or final-galvanized/Zn5 Al-mm coated),
- 4.1.4 Wire diameter,
- 4.1.5 Wire strength grade (Level 1 through 5),
- 4.1.6 Packaging (Section 14),
- 4.1.7 Cast or heat analysis; if requested,
- 4.1.8 Certification or test report; if requested, and
- 4.1.9 ASTM designation and date of issue.

5. Materials and Manufacture

5.1 The base metal rod used in the manufacture of rope wire shall be rolled from good commercial quality steel. The steel may be either ingot cast or strand cast.

5.2 A sufficient discard shall be made to ensure freedom from detrimental piping and undue segregation.

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

5.4 The wire shall be furnished in one of five types, as specified:

- 5.4.1 Uncoated,
- 5.4.2 Drawn-galvanized,
- 5.4.3 Final-galvanized,
- 5.4.4 Drawn Zn5/Al-MM, and
- 5.4.5 Final coated Zn5/Al-MM.

5.5 Uncoated, drawn-galvanized and drawn-Zn5 Al-MM wire can be furnished in Levels 1 through 5. Final-galvanized and final-coated Zn5 Al-MM wire is usually furnished in Levels 1 through 4.

5.6 The method utilized in the production of either drawn- or final-galvanized wire types may be by an electro-deposition or hot-dip galvanizing process at the option of the producer.

5.6.1 The slab zinc used in galvanized zinc coatings shall be as specified in Specification B 6.

5.7 The method utilized in the production of Zn5 Al-MM wire types may be either a continuous hot-dip alloy coating or two step coating where the first coating is zinc followed by a final bath having an aluminum content up to 7.2 % to prevent depletion of the aluminum content of the bath.

5.7.1 The bath metal used in continuous hot-dip Zn-5 Al-MM alloy coating shall meet the chemical composition

limits specified in Specification B 750.

6. Chemical Composition

6.1 Upon agreement with the purchaser, the wire manufacturer shall apply a steel of suitable chemical composition that will satisfy the properties of the material ordered.

6.2 A quantitative analysis of each cast or heat shall be made by the steel producer or his representative to determine the percentage of the elements specified. The analysis shall be made from a test sample preferably taken during the pouring of the cast or heat. The chemical composition thus determined shall be reported, if required, to the purchaser or his representative.

6.3 An analysis may be made by the purchaser from the finished wire. The chemical composition thus determined as to the elements required shall conform to the product analysis requirements specified in Table 3 of Specification A 510 or as agreed upon between the purchaser and the manufacturer.

7. Wire Diameter

7.1 The wire shall be measured using a micrometer with an minimum accuracy of 0.0001 in. (0.002 mm) for all diameters.

7.2 All diameter values measured in one location along the wire shall be within the tolerance limits given in Table 1 for uncoated and drawn-galvanized or drawn-Zn5 Al-MM rope wire or Table 2 for final-galvanized or final-coated Zn5 Al-MM rope wire.

8. Tensile Properties

8.1 *Tensile Test Procedure:*

8.1.1 *Standard Testing Method*—The tensile test shall be carried out in accordance with Test Methods E 8. The distance between the grips of the testing machine shall not be less than 8 in. (203 mm). The speed of the movable head of the testing machine, under no load, shall not exceed 1 in./min (0.4 mm/s). Any specimen breaking within 1 in. (25.4 mm) of the jaws may be disregarded and a retest performed.

8.1.2 *Alternate Testing Method*—The tensile test shall be carried out in accordance with Test Methods E 8. The loading rate may be greater than that specified, depending on the number of tests to be carried out for the batch inspection. However, it shall not exceed the rate corresponding to a 25 % elongation between anchorages in 1 min. The minimum distance between the clamping jaws of the test machine is 4 in. (100 mm). In the event of a dispute, the tensile test shall be carried out strictly in accordance with Test Methods E 8, in particular with regard to the loading rate.

8.1.3 The minimum breaking forces are specified in Table 3 of this specification, for wire grade Levels 1 through 5. The range in breaking force for a given grade level is based on the

TABLE 1 Wire Diameter Tolerances Uncoated and Drawn-Galvanized or Zn5 Al-MM Rope Wire

Diameter Range, in.	Diameter Range, mm	Tolerance, in.		Tolerance, mm	
		Minus	Plus	Minus	Plus
0.010 to 0.025 incl.	0.25 to 0.64 incl.	0.0003	0.0007	0.01	0.02
Over 0.025 to 0.060 incl.	Over 0.64 to 1.50 incl.	0.0005	0.001	0.01	0.03
Over 0.060 to 0.093 incl.	Over 1.50 to 2.36 incl.	0.001	0.001	0.03	0.03
Over 0.093 to 0.142 incl.	Over 2.36 to 3.61 incl.	0.001	0.0015	0.03	0.04
Over 0.142 to 0.200 incl.	Over 3.61 to 5.08 incl.	0.0015	0.002	0.04	0.05
Over 0.200 to .250 incl.	Over 5.08 to 6.35 incl.	0.002	0.002	0.05	0.05

TABLE 2 Wire Diameter Tolerances Final-Galvanized or Final-Coated Zn5 Al-MM Rope Wire

Diameter Range, in.	Diameter Range, mm	Tolerance, in.		Tolerance, mm	
		Minus	Plus	Minus	Plus
0.025 to 0.061 incl.	0.64 to 1.55 incl.	0.001	0.001	0.03	0.03
Over 0.061 to 0.079 incl.	Over 1.55 to 2.01 incl.	0.002	0.002	0.05	0.05
Over 0.079 to 0.092 incl.	Over 2.01 to 2.34 incl.	0.003	0.003	0.08	0.08
Over 0.092 to 0.103 incl.	Over 2.34 to 2.62 incl.	0.003	0.003	0.08	0.08
Over 0.103 to 0.119 incl.	Over 2.62 to 3.02 incl.	0.003	0.003	0.08	0.08
Over 0.119 to 0.142 incl.	Over 3.02 to 3.61 incl.	0.003	0.003	0.08	0.08
Over 0.142 to 0.187 incl.	Over 3.61 to 4.75 incl.	0.004	0.004	0.10	0.10
Over 0.187	Over 4.75	0.004	0.004	0.10	0.10

calculated minimum tensile strength requirement (psi). While no maximum values are shown for breaking force, rope wire is generally produced to a tensile strength range of 30 000 psi. The resultant minimum breaking force of either uncoated, drawn-galvanized and drawn-Zn5 Al-MM wires of various levels shall meet or exceed the values shown in Table 3. The

resultant minimum breaking force for final-galvanized or final-coated Zn5 Al-MM wire is obtained by reducing the value stated for its level in Table 3 for uncoated wire by 10 %.

TABLE 3 Minimum Breaking Forces

Wire Diameter		Minimum Torsional Values (Number of Twists in 8 in.)					Minimum Breaking Force ^A									
in.	mm	Level 1	Level 2	Level 3	Level 4	Level 5	Level 1		Level 2		Level 3		Level 4		Level 5	
							lbf	N	lbf	N	lbf	N	lbf	N	lbf	N
0.010	0.254	274	254	234	218	190	16	70	17	80	20	90	22	100	24	110
0.011	0.279	249	231	213	196	173	18	90	21	100	24	110	27	120	29	130
0.012	0.305	228	212	195	182	158	22	100	25	120	29	130	32	150	31	160
0.013	0.330	211	196	180	168	146	26	120	29	140	34	150	37	170	41	180
0.014	0.356	196	181	167	156	136	31	140	34	160	39	180	43	200	45	210
0.015	0.381	182	169	156	145	126	36	180	39	180	45	200	49	220	53	240
0.016	0.408	171	156	146	136	118	40	180	41	200	51	230	56	250	80	270
0.017	0.432	161	149	137	126	111	48	200	50	230	57	260	63	290	63	310
0.018	0.467	152	141	130	121	105	50	230	53	250	64	290	71	320	73	340
0.019	0.483	144	133	123	114	100	56	250	62	260	72	320	79	360	85	380
0.020	0.508	136	126	116	108	94	60	280	69	310	79	360	87	390	94	420
0.021	0.533	130	120	111	103	90	68	310	73	340	87	390	100	450	100	450
0.022	0.559	124	115	106	96	86	75	340	83	360	96	430	110	490	110	490
0.023	0.584	118	110	101	94	82	80	370	91	410	100	450	120	540	120	540
0.024	0.610	113	105	97	90	78	85	400	100	450	110	490	130	580	130	580
0.025	0.635	109	101	93	86	75	90	430	110	490	120	540	140	630	150	670
0.026	0.680	105	97	89	83	72	100	450	130	540	130	560	150	670	160	720
0.027	0.686	101	93	86	80	70	110	490	130	580	140	630	160	720	170	730
0.028	0.711	97	90	83	77	67	120	540	130	580	150	670	170	760	180	810
0.029	0.737	94	87	80	74	65	130	580	140	630	170	760	180	810	200	890
0.030	0.782	90	84	77	72	62	140	630	150	670	180	810	190	850	210	940
0.031	0.787	86	81	75	69	60	150	670	160	720	190	850	210	940	220	960
0.032	0.813	85	78	72	67	56	160	720	180	810	200	890	220	980	240	1070
0.033	0.836	82	76	70	65	57	170	780	190	850	210	940	240	1070	250	1130
0.034	0.864	80	74	68	63	55	180	810	200	890	230	1030	250	1120	270	1210
0.035	0.869	77	72	66	61	53	190	860	210	940	240	1070	260	1160	280	1250
0.036	0.914	75	70	64	60	52	200	890	220	960	250	1120	280	1250	300	1340
0.037	0.940	73	68	62	58	50	210	940	230	1030	270	1210	300	1340	320	1430
0.038	0.966	71	66	61	56	49	220	960	250	1120	280	1250	310	1360	330	1470
0.039	0.991	69	64	59	55	48	230	1030	260	1160	300	1340	330	1470	350	1560
0.040	1.02	67	62	57	53	46	240	1070	270	1210	310	1360	340	1520	370	1650
0.041	1.04	66	61	56	52	45	250	1160	290	1290	330	1470	360	1610	390	1740
0.042	1.07	64	59	55	51	44	270	1210	300	1340	340	1520	380	1700	410	1830
0.043	1.09	63	58	53	50	43	280	1250	310	1380	360	1610	400	1780	430	1920
0.044	1.12	61	57	52	48	42	300	1340	330	1470	380	1700	420	1870	450	2010
0.045	1.14	60	56	51	47	41	310	1360	340	1520	390	1740	430	1920	470	2100
0.046	1.17	58	54	50	46	40	320	1430	360	1610	410	1830	450	2010	490	2130
0.047	1.19	57	53	49	45	39	340	1530	370	1650	430	1920	470	2100	510	2270
0.048	1.22	56	52	48	44	36	350	1560	390	1740	450	2010	490	2180	540	2350
0.049	1.24	55	51	47	43	36	370	1560	410	1830	470	2100	510	2270	550	2450
0.050	1.27	54	50	46	42	37	380	1700	420	1870	490	2180	530	2380	570	2500
0.051	1.30	53	49	45	42	36	400	1760	440	1960	500	2230	560	2500	610	2670
0.052	1.32	52	48	44	41	36	410	1830	480	2050	520	2320	580	2580	620	2730
0.053	1.35	51	47	43	40	36	430	1920	470	2100	540	2410	600	2670	640	2850
0.054	1.37	50	46	42	39	34	440	1960	490	2180	580	2500	620	2780	660	2990
0.055	1.40	49	45	41	38	33	460	2050	510	2270	590	2630	640	2850	690	3070

TABLE 3 *Continued*

Wire Diameter		Minimum Torsional Values (Number of Twists in 8 in.)					Minimum Breaking Force ^A									
in.	mm	Level 1	Level 2	Level 3	Level 4	Level 5	Level 1		Level 2		Level 3		Level 4		Level 5	
							lbf	N	lbf	N	lbf	N	lbf	N	lbf	N
0.056	1.42	48	44	41	36	33	470	2100	530	2360	610	2720	670	2990	710	3200
0.057	1.45	47	43	40	37	32	490	2180	550	2450	630	2810	690	3070	710	3300
0.058	1.47	46	43	39	36	32	510	2270	570	2540	650	2900	720	3210	710	3430
0.059	1.50	45	42	36	36	31	530	2360	580	2580	670	2990	740	3300	710	3520
0.060	1.52	44	41	38	35	30	540	2410	600	2670	690	3070	760	3390	810	3550
0.061	1.56	44	40	37	35	30	560	2500	620	2760	720	3210	790	3520	850	3790
0.062	1.57	43	40	37	34	29	580	2580	640	2850	740	3300	810	3610	830	3923
0.063	1.60	42	39	36	33	29	600	2670	660	2940	760	3390	840	3740	930	4310
0.064	1.63	42	38	36	33	28	620	2760	690	3070	790	3520	870	3870	930	4140
0.065	1.65	41	38	35	32	28	640	2850	710	3160	810	3610	890	3980	960	4283
0.066	1.68	40	37	34	32	28	680	2940	730	3250	840	3740	920	4100	990	4410
0.067	1.70	40	37	34	31	27	670	2990	750	3340	860	3830	950	4230	1000	4540
0.068	1.73	39	36	33	31	27	690	3070	770	3430	890	3960	980	4360	1060	4630
0.069	1.75	38	36	33	30	26	710	3160	790	3520	910	4050	1000	4450	1160	4810
0.070	1.78	38	35	32	30	26	730	3250	820	3650	940	4190	1030	4590	1110	4940
0.071	1.80	37	35	32	29	26	780	3390	840	3740	970	4320	1080	4720	1140	5080
0.072	1.83	37	34	31	29	25	780	3470	880	3830	990	4410	1090	4850	1170	5200
0.073	1.85	36	34	31	29	25	800	3580	590	3960	1020	4540	1120	4990	1210	5360
0.074	1.86	36	33	30	28	24	820	3650	910	4050	1050	4680	1150	5120	1240	5600
0.075	1.91	35	33	30	28	24	840	3740	930	4140	1070	4760	1180	5250	1270	5680
0.076	1.93	35	32	30	27	24	860	3830	960	4280	1100	4900	1210	5390	1300	5790
0.077	1.96	34	32	29	27	23	890	3960	960	4380	1130	5030	1240	5520	1340	5900
0.078	1.98	34	31	29	27	23	910	4080	1010	4500	1160	5160	1280	5700	1370	6100
0.079	2.01	33	31	28	26	23	930	4140	1030	4590	1190	5300	1310	5830	1410	6300
0.080	2.03	33	30	28	26	22	950	4230	1080	4720	1230	5430	1340	5970	1440	6400
0.081	2.03	33	30	28	26	22	960	4260	1090	4850	1250	5570	1370	6100	1480	6500
0.082	2.03	32	30	27	25	22	1000	4460	1110	4610	1280	5700	1410	6280	1510	0000
0.083	2.11	32	29	27	25	22	1020	4500	1140	5080	1310	5830	1440	6410	1550	0000
0.084	2.13	31	29	27	25	21	1050	4680	1160	5160	1340	5970	1470	6540	1580	7030
0.085	2.16	31	29	26	24	21	1070	4760	1190	5300	1370	6100	1510	6720	1620	7210
0.086	2.18	31	28	26	24	21	1100	4800	1220	5430	1400	6230	1540	6660	1660	7390
0.087	2.21	30	28	26	24	21	1120	4990	1250	5570	1430	6370	1580	7030	1700	7570
0.088	2.24	30	28	25	23	20	1150	5120	1270	5650	1470	6540	1610	7170	1730	7700
0.089	2.26	30	27	25	23	20	1170	5210	1300	5790	1500	6660	1650	7340	1770	7880
0.090	2.29	29	27	25	23	20	1200	5340	1330	5920	1530	6610	1680	7480	1810	8080
0.091	2.31	29	27	24	23	20	1220	5430	1360	6050	1560	6940	1720	7660	1850	8230
0.092	2.34	28	26	24	22	19	1250	5670	1390	6190	1600	7120	1760	7830	1890	8410
0.093	2.36	28	26	24	22	19	1280	5700	1420	6320	1630	7260	1790	7970	1930	8590
0.094	2.39	28	26	24	22	19	1300	5790	1450	6450	1670	7430	1830	8150	1970	8770
0.095	2.41	28	25	23	22	19	1330	5920	1480	6590	1700	7570	1870	8320	2010	8900
0.096	2.44	27	25	23	21	18	1360	6050	1510	6720	1740	7740	1910	8500	2050	9130
0.097	2.46	27	25	23	21	18	1390	6190	1540	6880	1770	7880	1950	8680	2090	9300
0.098	2.49	27	25	23	21	18	1410	6280	1570	6990	1810	8060	1990	8860	2140	9529
0.099	2.51	26	24	22	21	18	1440	6410	1600	7120	1840	8190	2030	9030	2180	9700
0.100	2.54	26	24	22	20	18	1470	6540	1630	7260	1880	8370	2070	9210	2220	9880
0.101	2.57	26	24	22	20	18	1500	6580	1680	7390	1910	8500	2110	9390	2260	10000
0.102	2.59	26	24	22	20	17	1530	6810	1700	7570	1950	8680	2150	9570	2310	10210
0.103	2.62	25	23	21	20	17	1560	6940	1730	7700	1990	8860	2190	9750	2360	10410
0.104	2.64	25	23	21	20	17	1580	7030	1760	7830	2030	9030	2230	9920	2390	10610
0.105	2.67	25	23	21	19	17	1610	7170	1790	7970	2080	9170	2270	10100	2440	10810
0.106	2.69	25	23	21	19	17	1640	7300	1830	8150	2100	9350	2310	10280	2480	11010
0.107	2.72	24	22	21	19	16	1670	7430	1860	8280	2140	9520	2350	10460	2530	11280
0.108	2.74	24	22	20	19	16	1700	7570	1890	8410	2180	9700	2400	10680	2580	11430
0.109	2.77	24	22	20	19	16	1730	7700	1930	8590	2220	9880	2440	10860	2620	11630
0.110	2.79	24	22	20	18	16	1770	7880	1960	8720	2260	10060	2480	11040	2670	11830
0.111	2.82	23	22	20	18	16	1800	8010	2000	8900	2300	10240	2530	11260	2710	12050
0.112	2.84	23	21	20	18	16	1830	8150	2030	9030	2340	10410	2570	11440	2760	12230
0.113	2.87	23	21	19	18	15	1880	8280	2070	9210	2380	10590	2610	11610	2810	12500
0.114	2.90	23	21	19	18	15	1890	8410	2100	9350	2420	10770	2660	11840	2860	12730
0.115	2.92	22	21	19	18	15	1920	8550	2140	9620	2480	10950	2700	12020	2910	12950
0.116	2.95	22	21	19	17	15	1960	8720	2170	9660	2500	11130	2750	12240	2950	13130
0.117	2.97	22	20	19	17	15	1990	8860	2210	9840	2540	11300	2790	12420	3000	13350
0.118	3.00	22	20	18	17	15	2020	8960	2240	9970	2580	11480	2840	12640	3050	13670
0.119	3.02	22	20	18	17	15	2050	9120	2290	10150	2620	11660	2890	12880	3100	13790
0.120	3.05	21	20	18	17	14	2090	9300	2320	10320	2670	11880	2930	13040	3150	14030
0.121	3.07	21	20	18	17	14	2120	9440	2360	10500	2710	12080	2960	13260	3200	14210
0.122	3.10	21	19	18	17	14	2150	9570	2390	10640	2750	12240	3030	13480	3250	14160
0.123	3.12	21	19	18	16	14	2190	9750	2430	10610	2800	12460	3070	13660	3310	14730
0.124	3.15	21	19	18	16	14	2220	9660	2470	10990	2840	12640	3120	13880	3360	14950
0.125	3.18	21	19	17	16	14	2260	10080	2510	11170	2880	12820	3170	14110	3410	15170
0.126	3.20	20	19	17	16	14	2290	10190	2550	11360	2930	13040	3220	14330	3460	15200

TABLE 3 *Continued*

Wire Diameter		Minimum Torsional Values (Number of Twists in 8 in.)					Minimum Breaking Force ^A									
in.	mm	Level 1	Level 2	Level 3	Level 4	Level 5	Level 1		Level 2		Level 3		Level 4		Level 5	
							lbf	N	lbf	N	lbf	N	lbf	N	lbf	N
0.127	3.23	20	19	17	16	14	2330	10370	2580	11480	2970	13220	3270	14550	3510	15320
0.128	3.25	20	18	17	16	13	2360	10500	2620	11600	3020	13440	3320	14770	3570	15390
0.129	3.25	20	18	17	16	13	2400	10660	2680	11840	3080	13620	3370	15000	3620	16110
0.130	3.30	20	18	17	15	13	2430	10610	2700	12020	3110	13640	3420	15220	3670	16330
0.131	3.33	20	18	17	15	13	2470	10990	2740	12190	3150	14020	3470	15440	3730	16800
0.132	3.35	19	18	16	15	13	2500	11130	2780	12370	3200	14240	3620	15660	3780	16830
0.133	3.38	19	18	16	15	13	2540	11300	2820	12550	3250	14480	3670	15890	3840	17090
0.134	3.40	19	18	16	15	13	2580	11460	2860	12730	3290	14640	3620	16110	3890	17310
0.135	3.43	19	17	16	15	13	2610	11610	2900	12900	3340	14860	3670	16330	3950	17580
0.136	3.45	19	17	16	15	13	2650	11790	2940	13080	3390	15080	3720	16550	4000	17800
0.137	3.48	19	17	16	15	13	2690	11970	2990	13310	3430	15260	3780	16820	4080	18060
0.138	3.51	18	17	16	14	12	2720	12100	3030	13480	3480	15480	3630	17040	4120	18330
0.139	3.53	18	17	15	14	12	2760	12260	3070	13660	3530	15710	3880	17260	4170	18560
0.140	3.56	18	17	15	14	12	2800	12460	3110	13840	3580	15630	3940	17530	4230	18820
0.141	3.58	18	17	15	14	12	2840	12640	3150	14020	3630	16150	3990	17750	4290	19090
0.142	3.61	18	17	15	14	12	2880	12820	3200	14240	3680	16370	4040	17980	4350	19360
0.143	3.63	18	16	15	14	12	2910	12950	3240	14420	3720	16550	4100	18240	4400	19680
0.144	3.65	18	16	15	14	12	2960	13130	3260	14600	3770	16770	4150	18470	4460	19840
0.145	3.66	18	16	15	14	12	2990	13310	3330	14820	3820	17000	4210	18730	4620	20110
0.146	3.71	18	16	15	14	12	3030	13480	3370	15000	3870	17220	4280	18950	4680	20380
0.147	3.73	17	16	15	13	12	3070	13880	3410	15170	3920	17440	4320	19220	4640	20640
0.148	3.76	17	16	14	13	11	3110	13840	3480	15400	3960	17710	4370	19440	4700	20910
0.149	3.78	17	16	14	13	11	3150	14020	3500	15570	4030	17930	4430	19710	4760	21180
0.150	3.81	17	16	14	13	11	3190	14190	3550	15800	4080	18150	4490	19980	4820	21450
0.151	3.84	17	15	14	13	11	3230	14370	3590	15970	4130	18380	4540	20200	4880	21710
0.152	3.86	17	15	14	13	11	3270	14550	3640	16200	4180	18800	4600	20470	4940	21980
0.153	3.89	17	15	14	13	11	3310	14730	3680	16370	4230	18820	4660	20730	5010	22290
0.154	2.91	16	15	14	13	11	3350	14910	3730	18800	4290	19090	4710	20980	5070	22580
0.155	3.94	16	15	14	13	11	3400	15130	3770	16770	4340	19310	4770	21220	5130	22830
0.156	3.96	16	15	14	13	11	3440	15310	3820	17000	4390	19630	4830	21490	5190	23090
0.157	3.99	16	15	14	13	11	3480	15480	3880	17180	4440	19760	4890	21750	5260	23400
0.158	4.01	16	15	13	12	11	3520	15880	3910	17400	4600	20030	4950	22020	5320	23670
0.159	4.04	16	15	13	12	11	3560	15840	3980	17620	4550	20240	5010	22290	5380	23940
0.160	4.06	16	14	13	12	10	3600	16020	4010	17840	4610	20510	5070	22560	5450	24250
0.161	4.09	16	14	13	12	10	3650	16240	4050	18020	4660	20730	5130	22820	5510	24510
0.162	4.11	16	14	13	12	10	3690	16420	4100	18240	4720	21000	5190	23090	5580	24830
0.163	4.14	15	14	13	12	10	3730	16600	4150	18470	4770	21220	5250	23360	5640	25090
0.164	4.17	15	14	13	12	10	3780	16820	4200	18690	4830	21490	5310	23630	5710	25400
0.165	4.19	15	14	13	12	10	3820	17000	4240	18870	4880	21710	5370	23890	5770	25870
0.166	4.22	15	14	13	12	10	3880	17180	4290	19090	4940	21980	5430	24160	5840	25680
0.167	4.24	15	14	13	12	10	3910	17400	4340	19310	4990	22200	5490	24430	5900	26250
0.168	4.27	15	14	13	12	10	3950	17580	4390	19530	5050	22470	5560	24690	5970	26560
0.169	4.29	15	14	12	12	10	4000	17800	4440	19760	5110	22740	5620	25000	6040	26870
0.170	4.32	15	14	12	11	10	4040	17980	4490	19980	5180	22960	5660	25270	6100	27140
0.171	4.34	15	13	12	11	10	4080	18150	4540	20200	5220	23220	5740	25540	6170	27450
0.172	4.37	15	13	12	11	10	4130	18380	4590	20420	5280	23490	5800	25800	6240	27760
0.173	4.39	14	13	12	11	10	4170	18550	4640	20640	5330	23710	5870	26120	6310	28070
0.174	4.42	14	13	12	11	10	4220	18780	4690	20870	5390	23980	5930	26380	6380	28380
0.175	4.45	14	13	12	11	9	4270	19000	4740	21090	5450	24250	6000	26690	6450	28700
0.176	4.47	14	13	12	11	9	4310	19180	4790	21310	5510	24510	6060	26960	6510	28960
0.177	4.50	14	13	12	11	9	4360	19400	4840	21530	5570	24780	6120	27230	6580	29270
0.178	4.52	14	13	12	11	9	4400	19580	4890	21780	5630	25050	6190	27540	6650	29590
0.179	4.55	14	13	12	11	9	4450	19800	4940	21980	5690	25320	6250	27810	6720	29900
0.180	4.57	14	13	12	11	9	4500	20020	5000	22250	5750	25580	6320	28120	6790	30210
0.181	4.60	14	13	12	11	9	4540	20200	5050	22470	5810	25850	6390	28430	6860	30620
0.182	4.62	14	13	11	11	9	4590	20420	5100	22690	5870	26120	6450	28700	6940	30880
0.183	4.65	14	12	11	11	9	4640	20640	5150	22910	5930	26380	6520	29010	7010	31190
0.184	4.67	13	12	11	10	9	4680	20820	5210	23180	5990	26650	6580	29270	7060	31500
0.185	4.70	13	12	11	10	9	4730	21050	5260	23400	6050	26920	6650	29590	7150	31810
0.186	4.72	13	12	11	10	9	4780	21270	5310	23630	6110	27180	6720	29900	7220	32120
0.187	4.75	13	12	11	10	9	4830	21460	5360	23850	6170	27450	6790	30210	7290	32430
0.188	4.78	13	12	11	10	9	4880	21710	5420	24110	6230	27720	6850	30480	7370	32790
0.189	4.80	13	12	11	10	9	4920	21890	5470	24340	6290	27980	6920	30790	7440	33100
0.190	4.83	13	12	11	10	9	4970	22110	5530	24600	6350	28250	6990	31100	7510	33410
0.191	4.85	13	12	11	10	9	5030	22340	5580	24830	6420	28580	7080	31410	7590	33770
0.192	4.88	13	12	11	10	8	5070	22580	5630	25050	6480	28830	7130	31720	7660	34080
0.193	4.90	13	12	11	10	8	5120	22780	5690	25320	6540	29100	7200	32030	7740	34430
0.194	4.93	13	12	11	10	8	5170	23000	5740	25540	6610	29410	7270	32340	7810	34750
0.195	4.95	13	12	11	10	8	5220	23220	5800	25800	6670	29670	7340	32650	7890	35100
0.196	4.96	13	12	11	10	8	5270	23450	5850	26030	6730	29940	7410	32970	7960	35410
0.197	5.00	13	11	10	10	8	5320	23670	5910	26290	6800	30250	7480	33280	8040	36770

TABLE 3 Continued

Wire Diameter		Minimum Torsional Values (Number of Twists in 8 in.)					Minimum Breaking Force ^A									
in.	mm	Level 1	Level 2	Level 3	Level 4	Level 5	Level 1		Level 2		Level 3		Level 4		Level 5	
							lbf	N	lbf	N	lbf	N	lbf	N	lbf	N
0.198	5.03	12	11	10	10	8	5370	23890	5970	26580	6880	30520	7550	33590	8110	36080
0.199	5.05	12	11	10	10	8	5420	24110	6020	26780	6920	30790	7620	33900	8190	36440
0.200	5.06	12	11	10	9	8	5470	24340	6080	27050	6990	31100	7690	34210	8260	36750
0.201	5.11	12	11	10	9	8	5520	24580	6130	27270	7050	31380	7780	34520	8340	37100
0.202	5.13	12	11	10	9	8	5570	24780	6190	27540	7120	31680	7830	34630	8420	37460
0.203	5.16	12	11	10	9	8	5620	25000	6250	27810	7180	31940	7900	35150	8490	37770
0.204	5.18	12	11	10	9	8	5670	25230	6300	28030	7250	32250	7970	35480	8570	38130
0.205	5.21	12	11	10	9	8	5720	25460	6360	28300	7320	32570	8050	35810	8650	38480
0.206	5.23	12	11	10	9	8	5780	25720	6420	28560	7380	32830	8120	36120	8730	38840
0.207	5.26	12	11	10	9	8	5830	25940	6480	28830	7450	33140	8190	36440	8810	39190
0.208	5.28	12	11	10	9	8	5880	26180	6530	29050	7510	33410	8270	36790	8890	39650
0.209	5.31	12	11	10	9	8	5930	26380	6590	29320	7580	33720	8340	37100	8960	39860
0.210	5.33	12	11	10	9	8	5990	26650	6650	29590	7650	34030	8410	37410	9040	40220
0.211	5.36	12	11	10	9	8	6040	26870	6710	29850	7710	34300	8490	37770	9120	40570
0.212	5.38	12	11	10	9	8	6090	27090	6770	30120	7780	34610	8560	38080	9200	40930
0.213	5.41	11	11	10	9	8	6140	27320	6830	30390	7850	34920	8630	38390	9280	41380
0.214	5.44	11	10	10	9	7	6200	27580	6890	30650	7920	35230	8710	38750	9360	41640
0.215	5.46	11	10	9	9	7	6250	27810	6940	30880	7990	35550	8780	39080	9440	42000
0.216	5.49	11	10	9	9	7	6300	28030	7000	31140	8050	35810	8880	39420	9520	42350
0.217	5.51	11	10	9	9	7	6380	28300	7080	31410	8120	36120	8940	39770	9610	42750
0.218	5.54	11	10	9	9	7	6410	28520	7120	31680	8190	36440	9010	40080	9690	43110
0.219	5.56	11	10	9	9	7	6460	28740	7180	31940	8260	36750	9090	40440	9770	43460
0.220	5.59	11	10	9	8	7	6520	29010	7240	32210	8330	37080	9160	40750	9850	43830
0.221	5.61	11	10	9	8	7	6570	29230	7300	32480	8400	37370	9240	41110	9930	44180
0.222	5.64	11	10	9	8	7	6630	29500	7360	32740	8470	37680	9320	41460	10020	44580
0.223	5.65	11	10	9	8	7	6680	29720	7430	33080	8540	37990	9390	41770	10100	44930
0.224	5.89	11	10	9	8	7	6740	29990	7490	33320	8610	38300	9470	42130	10150	45290
0.225	5.72	11	10	9	8	7	6790	30210	7550	33590	8680	38620	9550	42490	10260	45640
0.226	5.74	11	10	9	8	7	6850	30480	7610	33880	8750	38930	9630	42840	10350	46040
0.227	5.77	11	10	9	8	7	6900	30700	7670	34120	8820	39240	9700	43150	10430	46400
0.228	5.79	11	10	9	8	7	6960	30980	7730	34390	8890	39550	9780	43510	10520	46600
0.229	5.82	11	10	9	8	7	7020	31230	7790	34680	8980	39880	9880	43860	10600	46000
0.230	5.84	10	10	9	8	7	7070	31450	7880	34970	9040	40220	9940	44230	10680	47000
0.231	5.97	10	10	9	8	7	7130	31720	7930	35230	9110	40530	10030	44580	10770	47000
0.232	5.50	10	10	9	8	7	7180	31940	7980	35500	9180	40840	10100	44930	10850	48270
0.233	5.92	10	9	9	8	7	7240	32210	8040	35770	9250	41150	10180	45290	10940	48670
0.234	5.94	10	9	9	8	7	7300	32480	8110	36080	9320	41460	10260	45640	11030	49070
0.235	5.97	10	9	9	8	7	7360	32700	8170	36350	9400	41820	10340	48000	11110	49420
0.236	5.99	10	9	8	8	7	7410	32970	8230	36610	9470	42130	10420	46360	11200	49830
0.237	6.02	10	9	8	8	7	7470	33230	8300	36930	9540	42440	10500	46710	11280	50180
0.238	6.05	10	9	8	8	7	7530	33500	8360	37190	9620	42800	10580	47070	11370	50580
0.239	6.07	10	9	8	8	7	7580	33720	8430	37500	9690	43110	10680	47420	11460	50980
0.240	6.10	10	9	8	8	6	7640	33990	8490	37770	9760	43420	10740	47780	11580	51360
0.241	6.12	10	9	8	8	6	7700	34260	8550	38040	9840	43780	10820	48130	11630	51740
0.242	6.15	10	9	8	8	6	7780	34620	8620	38350	9910	44090	10900	48490	11720	52150
0.243	6.17	10	9	8	8	6	7820	34790	8680	38620	9990	44440	10980	48850	11810	52540
0.244	6.20	10	9	8	8	6	7870	35010	8750	38930	10080	44750	11070	49250	11900	52940
0.245	6.22	10	9	8	7	6	7930	35280	8810	39190	10140	45110	11150	49600	11990	53340
0.246	6.25	10	9	8	7	6	7990	35550	8880	39510	10210	45420	11230	49960	12070	53700
0.247	6.27	10	9	8	7	6	8050	35810	8940	39770	10290	46780	11310	50310	12160	54100
0.248	6.30	10	9	8	7	6	8110	38080	9010	40080	10380	48090	11400	50710	12250	54500
0.249	6.32	10	9	8	7	6	8170	36350	9080	40390	10440	48440	11480	51070	12340	54600
0.250	6.36	10	9	8	7	6	8230	36610	9140	40660	10510	48780	11580	51430	12430	56300

^A 1 lbf = 4.448222 N.

9. Torsional Properties

9.1 *Torsion Test*—The torsion test shall be conducted in accordance with Test Method A 938 with the following modifications. The standard distance between the jaws of the testing machine is $8 \pm 1/16$ in. (203 ± 1 mm). In order to save time during tests, the distance between the jaws of the testing machine may be shortened to as small as 100 wire diameters (less than 8 in.) (203 mm). One end of the wire is to be rotated with respect to the other end at a uniform speed not to exceed sixty 360° (6.28 rad) revolutions per minute, until breakage occurs. The machine must be equipped with an automatic

counter to record the number of revolutions (twists) causing breakage. One jaw shall be fixed axially and the other jaw movable axially and arranged for applying tension weights to wire under test. Tests in which breakage occurs within $1/8$ in. (3.18 mm) of the jaw may be disregarded.

9.2 *Torsional Response Values*—The minimum number of twists for bright (uncoated) or drawn galvanized wire of the grades and sizes listed in Table 3 shall be the number of 360° (6.28 rad) revolutions in an 8-in. (203 mm) length that the wire must withstand before breakage occurs. When the distance between the jaws of the testing machine is different than 8 in.

(203 mm), as permitted by 9.1, the minimum number of twists shall be adjusted in direct proportion to the change in jaw spacing as determined by the following formula:

$$T_A = \frac{(T_L \times L_\Delta)}{L_L} \quad (1)$$

where:

- T_A = minimum number of twists for the adjusted spacing,
- T_L = minimum number of twists for 8 in. (203 mm) jaw spacing for size and grade.
- L_Δ = distance between testing machine jaws for adjusted spacing, inches (mm).
- L_L = 8 in. (203 mm).

Torsion testing of final-galvanized or final coated Zn5 Al-MM rope wire is not required, but can be produced to the torsional requirements of Table 3 for uncoated rope wire, subject to the following reduced values.

Wire over 0.120 in.	30 % of Table 3 minimum
Wire 0.080—0.120 in.	40 % of Table 3 minimum
Wire 0.035—0.079 in.	50 % of Table 3 minimum

9.3 *Torsion Test Loading*—During the torsion test, a minimum pound force as shown in Table 4 shall be applied to the wire being tested.

10. Wrap Testing

10.1 All metallic coated wire produced to this specification must meet a wrap test as a measure of steel ductility. The wrapping may be done by any hand or power device that will coil the wire in a closely wound helix about a mandrel equal to twice the nominal diameter of the material being tested for six complete turns without wire fracture.

10.2 All metallic coated wire produced to this specification must meet a wrap test as a measure of coating adherence. The wrapping may be done by any hand or power device that will

TABLE 4 Applied Load (Pound Force) for Torsion Testing

Diameter of Wire		Minimum Applied Load ^A	
in.	mm	Pounds force (lbf)	Newtons (N)
Over 0.010 to 0.016	Over 0.25 to 0.41	0.5	4
Over 0.016 to 0.020	Over 0.41 to 0.51	1	5
Over 0.020 to 0.030	Over 0.51 to 0.76	2	9
Over 0.030 to 0.040	Over 0.76 to 1.02	3	14
Over 0.040 to 0.050	Over 1.02 to 1.28	4	18
Over 0.050 to 0.060	Over 1.28 to 1.53	5	20
Over 0.060 to 0.070	Over 1.53 to 1.79	6	25
Over 0.070 to 0.080	Over 1.79 to 2.04	7	29
Over 0.080 to 0.090	Over 2.04 to 2.30	8	36
Over 0.090 to 0.100	Over 2.30 to 2.55	9	43
Over 0.100 to 0.110	Over 2.55 to 2.80	10	47
Over 0.110 to 0.120	Over 2.80 to 3.06	11	51
Over 0.120 to 0.130	Over 3.06 to 3.31	12	56
Over 0.130 to 0.140	Over 3.31 to 3.57	13	58
Over 0.140 to 0.150	Over 3.57 to 3.82	14	62
Over 0.150 to 0.160	Over 3.82 to 4.07	15	67
Over 0.160 to 0.170	Over 4.07 to 4.33	16	71
Over 0.170 to 0.180	Over 4.33 to 4.58	17	76
Over 0.180 to 0.190	Over 4.58 to 4.84	18	80
Over 0.190 to 0.200	Over 4.84 to 5.09	19	85
Over 0.200 to 0.210	Over 5.09 to 5.34	20	89
Over 0.210 to 0.220	Over 5.34 to 5.60	21	94
Over 0.220 to 0.230	Over 5.60 to 5.85	22	98
Over 0.230 to 0.240	Over 5.85 to 6.10	23	103
Over 0.240 to 0.250	Over 6.10 to 6.35	24	107

^AWeights shall not exceed twice the minimums listed.

coil the wire in a closed helix about a mandrel for six complete turns without the coating of the wire flaking or cracking. The mandrel diameter for drawn coatings (either galvanized or mischmetal) is as listed in Table 5. The mandrel for final-galvanized wire and final-coated Zn5/AL-MM is as listed in Table 6.

11. Metallic Coatings for Rope Wire

11.1 Drawn-galvanized and drawn-Zn5 Al-MM rope wire shall be made having a tightly adherent, uniform, and continuous coating. The minimum weight of zinc or zinc-alloy coating tested in accordance with Specification A 90/A 90M shall be as specified in Table 5. The mandrel diameter shall be as specified in Table 5.

11.2 Final-galvanized and final-coated Zn5 Al-MM rope wire shall be made having a tightly adherent, uniform and continuous coating. The minimum weight of zinc or zinc-alloy coating tested in accordance with Specification A 90/A 90M shall be as specified in Table 6. The mandrel diameter shall be as specified in Table 6.

12. Workmanship, Finish and Appearance

12.1 The surface of the wire shall be free from rust and excessive scale. The wire surface shall be smooth and free from detrimental discontinuities such as seams, pits, and die marks.

12.2 Each coil or spool of wire shall be one continuous length properly coiled and firmly tied.

13. Sampling and Compliance Criteria

13.1 Material testing shall be carried out by the supplier in accordance with a method approved by the purchaser. The number of test specimens taken from the end of a given package vary with the quality control procedures and the facilities of each manufacturer, but is generally not less than 10 % of the coils produced.

13.2 The purchaser may elect to have incoming acceptance testing performed. The scope of said testing and the acceptance criteria involved shall be established by the purchaser. To ensure representative sampling, the samples shall be taken at random from the coil or spool ends.

13.3 If the number of non-complying results exceeds the established acceptance criteria, the purchaser may reject the entire lot, reclassify the material or perform further testing to establish material acceptability. This additional testing shall be based solely on only the non-complying characteristic.

14. Package Marking

14.1 The coil or spool mass, dimensions and protective

TABLE 5 Weight of Coating-Mandrel Diameter Drawn-Galvanized or Drawn Zn5 Al-MM Rope Wire

Diameter of Wire		Adherence Test	Minimum Weight of Coating	
in.	mm	Mandrel Diameter ^A	oz/ft ²	kg/m ²
0.010 to 0.015	0.25 to 0.38	1D	0.05	0.015
0.018 to 0.028	0.46 to 0.71	2D	0.10	0.03
0.029 to 0.060	0.74 to 1.52	3D	0.20	0.06
0.061 to 0.090	1.55 to 2.29	4D	0.30	0.09
0.091 to 0.140	2.31 to 3.56	5D	0.40	0.12

^AWhere: D = nominal diameter of wire being tested.

TABLE 6 Weight of Coating-Mandrel Diameter Final-Galvanized or Final Coated Zn5 Al-MM Rope Wire

Diameter of Wire		Adherence Test	Minimum Weight of Coating	
in.	mm	Mandrel Diameter ^A	oz/ft ²	kg/m ²
0.025 to 0.047	0.64 to 1.19	2D	0.20	0.06
0.048 to 0.054	1.22 to 1.37	2D	0.40	0.12
0.055 to 0.063	1.40 to 1.60	2D	0.50	0.15
0.064 to 0.079	1.63 to 2.01	2D	0.60	0.18
0.080 to 0.092	2.03 to 2.34	3D	0.70	0.21
0.093 to 0.192	2.36 to 4.88	3D	0.80	0.24
0.193 and larger	4.90 and larger	3D	0.90	0.27

^A Where: D = nominal diameter of wire being tested.

covering shall be agreed upon between the manufacturer and purchaser.

14.2 The wire size, purchaser order number, ASTM speci-

fication number, heat number and manufacturer identification shall be on a tag securely attached to each package.

14.3 Bar coding of each package is acceptable as a supplementary identification method on the wire identification tag. If bar coding is used, the coding shall be consistent with the AIAG Standard 02.00, Primary Metals Identification Tag Application.

15. Keywords

15.1 metallic coated; rope; wire

APPENDIXES

(Nonmandatory Information)

X1. IMPERIAL (ENGLISH) WIRE MATERIALS (IN ACCORDANCE WITH CRITERIA SET FORTH IN EN 10264-1.2)

X1.1 *Definitions of Terms Relating to Sampling and Acceptance:*

X1.1.1 *batch*—a defined quantity of wire of the same diameter, the same grade and the same finish presented for inspection and manufactured in conditions assumed to be identical and uniform.

X1.1.2 *unit (wire package)*—A variable or fixed quantity supplied in a:

X1.1.2.1 coil of a single length or mass of wire, or

X1.1.2.2 *bobbin (Reel)*—A single length or mass of wire wound on a reel, spool or bobbin, or

X1.1.2.3 *flat coil (spoolless core)*—A single length or mass of wire wound on a cardboard center drum, or

X1.1.2.4 other wire packaging as agreed between supplier and purchaser.

X1.1.3 *base unit for sampling (m₁)*—a mass expressed in pounds (lb) conventionally with a value equal to 100 d, where “d” is the diameter of the wire expressed in inches.

X1.1.4 *size of batch (N)*: number given by the formula:

$$N = \frac{m}{2.8 \times 10^{-2} \times m_1} \quad (\text{X1.1})$$

where:

m = batch mass, tons, and

m₁ = base unit mass, lb.

Knowing that conventionally:

$$m_1 = 100 d \quad (\text{X1.2})$$

where:

d = nominal wire diameter, in.

It follows that:

$$N = \frac{m}{2.8 \times 10^{-2} \times 100d} \quad (\text{X1.3})$$

or:

$$N = \frac{0.357 m}{d} \quad (\text{X1.4})$$

X1.1.5 *sample for Testing*—a sufficient length of wire for measurement of an individual characteristic.

X1.1.6 *sampling length*—a sufficient length of wire to produce the necessary samples for testing all characteristics.

X1.1.7 *sampling*—taking all necessary samples to supply information on the batch.

X1.1.8 *sample size, n*—number of samples for tests.

X1.1.9 *non-conformance*—result of a test not complying with the requirements for a characteristic.

X1.2 *Definitions of Terms Relating to Sampling and Acceptance:*

X1.2.1 *batch*—a defined quantity of wire of the same diameter, the same grade and the same finish presented for inspection and manufactured in conditions assumed to be identical and uniform.

X1.2.2 *unit (wire package)*—a variable or fixed quantity supplied in a:

X1.2.2.1 coil of a single length or mass of wire, or

X1.2.2.2 *bobbin (Reel)*—A single length or mass of wire wound on a reel, spool or bobbin, or

X1.2.2.3 *flat coil (Spoolless Core)*—A single length or mass of wire wound on a cardboard center drum, or

X1.2.2.4 other wire packaging as agreed between supplier and purchaser.

X1.2.3 *base unit for sampling (m₁)*—a mass expressed in (kilograms) conventionally with a value equal to 100 d, where “d” is the diameter of the wire expressed in (millimetres).

X1.2.4 *size of batch (N)*—number given by the formula:

$$N = \frac{m}{10^3 \times m_1} \quad (X1.5)$$

or:

$$N = \frac{10m}{d} \quad (X1.8)$$

where:

m = batch mass, tonnes, and

m_1 = base unit mass, kg.

Knowing that conventionally:

$$m_1 = 100d \quad (X1.6)$$

where:

d = nominal wire diameter (mm).

It follows that:

$$N = \frac{m}{10^{-3} \times 100d} \quad (X1.7)$$

X1.2.5 *sample for testing*—a sufficient length of wire for measurement of an individual characteristic.

X1.2.6 *sampling length*—a sufficient length of wire to produce the necessary samples for testing all characteristics.

X1.2.7 *sampling*—taking all necessary samples to supply information on the batch.

X1.2.8 *sample size, n*—number of samples for tests.

X1.2.9 *non-conformance*—result of a test not complying with the requirements for a characteristic.

X2. METRIC WIRE MATERIALS (IN ACCORDANCE WITH CRITERIA SET FORTH IN eN 10264-1.2)

X2.1 *Definition of Terms Relating to Sampling and Acceptance*:

X2.1.1 *batch*—a defined quantity of wire of the same diameter, the same grade and the same finish presented for inspection and manufactured in conditions assumed to be identical and uniform.

X2.1.2 *unit (wire package)*—a variable or fixed quantity supplied in a:

X2.1.2.1 coil of a single length or mass of wire, or

X2.1.2.2 *bobbin (reel)*—a single length or mass of wire wound on a reel, spool or bobbin, or

X2.1.2.3 *flat coil (spoolless core)*—a single length or mass of wire wound on a cardboard center drum, or

X2.1.2.4 other wire packaging as agreed between supplier and purchaser.

X2.1.3 *base unit for sampling (m_1)*—a mass expressed in (kilograms) conventionally with a value equal to 100 d , where “ d ” is the diameter of the wire expressed in (millimetres).

X2.1.4 *size of batch (N)*: number given by the formula:

$$N = \frac{m}{10^{-3} \times m_1} \quad (X2.1)$$

where:

m = batch mass, tonnes, and

m_1 = base unit mass, kg.

Knowing that conventionally:

$$m_1 = 100d \quad (X2.2)$$

where:

d = nominal wire diameter, mm.

It follows that:

$$N = \frac{m}{10^{-3} \times 100d} \quad (X2.3)$$

or:

$$N = \frac{10m}{d} \quad (X2.4)$$

X2.1.5 *sample for testing*—a sufficient length of wire for measurement of an individual characteristic.

X2.1.6 *sampling length*—a sufficient length of wire to produce the necessary samples for testing all characteristics.

X2.1.7 *sampling*—taking all necessary samples to supply information on the batch.

X2.1.8 *sample size, n*—number of samples for tests.

X2.1.9 *non-conformance*—result of a test not complying with the requirements for a characteristic.

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