American National Standard

ANSI C80.5-1994

Aluminum Rigid Conduit—(ARC)

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American National Standard

Aluminum Rigid Conduit—(ARC)

Secretariat
National Electrical Manufacturers Association

Approved May 1995
American National Standards Institution, Inc.

Abstract
This standard has been developed to specify dimensions and weights for Aluminum Rigid Conduit, elbows, couplings and nipples for use as an electrical raceway. Trade size designators (metric size designators) range from 1/2 (16 ARC) to 6 (155 ARC). Basic data for threads are included as well as requisite tests for mechanical properties of the conduit.

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Foreword (This Foreword is not part of American National Standard C80.5-1994)

This standard was developed by the Accredited Standards Committee on Raceways for Electrical Wiring Systems, C80. The objective of the committee is to produce a comprehensive specification that would establish uniform dimensions and standard construction requirements for rigid metal conduit, electrical metallic tubing, intermediate metal conduit and rigid aluminum conduit raceway products and their associated components.

The standard was originally approved in 1950 and revised in 1953, 1959, 1963, 1966, 1977, 1983 and 1990.

Suggestions for improvement of this standard will be welcome. They should be sent to the National Electrical Manufacturers Association, 1300 N. 17th Street, Rosslyn, Virginia 22209.

This standard was processed and approved for submittal to ANSI by the Accredited Standards Committee on Raceways for Electrical Wiring Systems, C80. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the C80 Committee had the following members:

J. A. Gruber, Chairman
J. A. Gauthier, Secretary

Organization Represented	*Name of Representative*
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American Iron and Steel Institute	M.Palivoda
American Pipe Fittings Association	R.T.Bryson
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American National Standard for Aluminum Rigid Conduit—(ARC)

1 Scope

1.1 This standard covers the requirements for seamless rigid aluminum-alloy conduit for use as a raceway for the wires or cables of an electrical system. The conduit is furnished in nominal 10-ft. (3.05-m) lengths, threaded on each end with one coupling attached.

1.2 This standard also covers conduit couplings, elbows, bends, and nipples and lengths other than 10 ft (3.05 m).

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below.

ANSI/ASME B1.20.1-1983 (R1992), *Pipe Threads, General Purpose (inch)*

3 Definitions

3.1 Threaded coupling
A threaded aluminum coupling is an internally threaded aluminum cylinder for connecting two sections of rigid aluminum conduit.

3.2 Elbow and bend
An aluminum elbow or bend is a curved section of rigid aluminum conduit threaded on each end.

3.3 Nipple
An aluminum nipple is a straight section of rigid aluminum conduit not more than 2 ft. (0.61 m) long and threaded on each end.

4 Units of measurement

The values states in inch-pound units are to be regarded as the standard. The metric equivalents may be approximate.

5 General requirements

5.1 Circular cross section
Rigid aluminum conduit shall have a circular cross section sufficiently accurate to permit the cutting of threads in accordance with table 1.

5.2 Wall thickness
The wall thickness shall be uniform throughout.

5.3 Interior surface
The interior surface shall be free from injurious defects.

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5.4 Alloy

The conduit shall be made of an aluminum alloy containing not more than 0.40% copper.

6 Detailed requirements

6.1 Threading and chamfering

Each length of conduit, nipple, elbow, and bend shall be threaded on both ends, and each end shall be chamfered or otherwise treated to remove burrs and sharp edges. Threads shall comply with the requirements of 6.4.

6.2 Identification

Each length of conduit, nipple, elbow and bend shall be identified with the manufacturer's name or trademark and the words, "rigid aluminum conduit." However, close threaded nipples need not be so identified.

6.3 Dimensions

The dimensions and weights of rigid aluminum conduit shall be in accordance with table 1.

6.4 Threads

The number of threads per inch (25.4 mm), and the length of the threaded portion at each end of each length of conduit, nipple, elbow and bend shall be as indicated in table 1, and shall conform to American National Standards for Pipe Threads (inch), ANSI/ASME B1.20.1-1983 (R1992). The perfect thread shall be tapered for its entire length, and the taper shall be 3/4 in./ft. (62.5 mm/m).

6.5 Couplings

Couplings shall comply with the following requirements:

6.5.1 The coupling shall be made of an aluminum alloy containing not more than 0.40% copper.

6.5.2 Couplings shall be so made that all threads on the conduit will be covered when the coupling is pulled tight on standard conduit threads.

6.5.3 Both ends of the coupling shall be chamfered to prevent damage to the starting thread.

6.5.4 The outside diameter and length of couplings shall be as indicated in table 3.

6.5.5 Couplings shall be straight tapped.

6.5.6 Each length of finished conduit shall have one coupling attached.

6.6 Elbows, bends and nipples

Conduit elbows, bends and nipples shall be made of a similar grade of aluminum as that employed in straight lengths of rigid aluminum conduit, and shall be threaded, and marked for identification according to the applicable requirements for rigid aluminum conduit. The dimensions of 90-degree elbows and the weights of nipples shall be as indicated in table 4.

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7 Test procedures

Ductility shall be determined by the following: conduit shall be capable of being bent cold into a quarter of a circle around a mandrel, the radius of which is shown in table 4, without developing cracks.

8 Examination of product

8.1 Place of inspection

All tests and inspections shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere with normal manufacturing processes.

8.2 Visual inspection

Each length of conduit shall be examined visually, both on the outside and inside, to determine if the product is free from slivers, burrs, scale, or other similar injurious defects.

8.3 Retests

If any samples of rigid aluminum conduit tested as prescribed in this specification should fail, two additional samples shall be tested, both of which shall comply with the requirements of this specification.

9 Marking

9.1 Identification

Each length of conduit, nipple, elbow shall be identified with the manufacturer's name or trademark and the "rigid aluminum conduit." However, close threaded nipples need not be so identified.

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Table 1 – Dimensions of threads for rigid aluminum conduit

Customary Inch-Pound Units					Metric Units				
Trade Size Designator	Threads per In.	Pitch diameter at end of thread Eo, taper 3/4 in. per ft.	Length of Thread (In.) Effective L_2	Length of Thread (In.) Overall L_4	Metric Trade Size Designator	Threads per 25.4 mm	Pitch diameter at end of thread E_o, taper 62.5 mm. per meter	Length of Thread (mm) Effective L_2	Length of Thread (mm) Overall L_4
1/2	14	0.7584	0.53	0.78	16 ARC	14	19.263	13.46	19.81
3/4	14	0.9677	0.55	0.79	21 ARC	14	24.580	13.97	20.07
1	11-1/2	1.2136	0.68	0.98	27 ARC	11-1/2	30.825	17.27	24.89
1-1/4	11-1/2	1.5571	0.71	1.01	35 ARC	11-1/2	39.550	18.03	25.65
1-1/2	11-1/2	1.7961	0.72	1.03	41 ARC	11-1/2	45.621	18.29	26.16
2	11-1/2	2.2690	0.76	1.06	53 ARC	11-1/2	57.633	19.30	26.92
2-1/2	8	2.7195	1.14	1.57	63 ARC	8	69.075	28.96	39.88
3	8	3.3406	1.20	1.63	78 ARC	8	84.851	30.48	41.40
3-1/2	8	3.8375	1.25	1.68	91 ARC	8	97.473	31.75	42.67
4	8	4.3344	1.30	1.73	103 ARC	8	110.094	33.02	43.94
5	8	5.3907	1.41	1.84	129 ARC	8	136.924	35.81	46.74
6	8	6.4461	1.51	1.95	155 ARC	8	163.731	38.35	49.53

NOTE— Applicable tolerances:

Thread length (L_4): ±1 thread, recommended practice +0, -1

Pitch diameter: ±1 turn is the maximum variation permitted from the gaging face of the working thread gauges.

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Table 2 – Dimensions and weights of rigid aluminum conduit

Trade Size Designator	Customary Inch-Pound Units: Nominal Inside Diameter (in.)	Outside Diameter (in.)	Nominal Wall Thickness (in.)	Length Without Coupling (ft. and in.)	Minimum Weight of Ten Unit Lengths with Couplings Attached (lb.)
1/2	0.632	0.840	0.104	9'11-1/4"	27.4
3/4	0.836	1.050	0.107	9'11-1/4"	36.4
1	1.063	1.315	0.126	9'11"	53.0
1-1/4	1.394	1.660	0.133	9'11"	69.6
1-1/2	1.624	1.900	0.138	9'11"	82.2
2	2.083	2.375	0.146	9'11"	115.7
2-1/2	2.489	2.875	0.193	9'10-1/2"	182.5
3	3.090	3.500	0.205	9'10-1/2"	238.9
3-1/2	3.570	4.000	0.215	9'10-1/4"	287.7
4	4.050	4.500	0.225	9'10-1/4"	340.0
5	5.073	5.563	0.245	9'10"	465.4
6	6.093	6.625	0.266	9'10"	612.5
Metric Trade Size Designator	**Metric Units: Nominal Inside Diameter (mm)**	**Outside Diameter (mm)**	**Nominal Wall Thickness (mm)**	**Length Without Coupling (Meters)**	**Minimum Weight of Ten Unit Lengths With Couplings Attached (kg)**
16 ARC	16.1	21.3	2.64	3.03	12.43
21 ARC	21.2	26.7	2.72	3.03	16.51
27 ARC	27.0	33.4	3.20	3.02	24.04
35 ARC	35.4	42.2	3.38	3.02	31.57
41 ARC	41.2	48.3	3.51	3.02	39.10
53 ARC	52.9	60.3	3.71	3.02	52.48
63 ARC	63.2	73.0	4.90	3.01	82.78
78 ARC	78.5	88.9	5.21	3.01	108.37
91 ARC	90.7	101.6	5.46	3.00	130.50
103 ARC	102.9	114.3	5.72	3.00	154.22
129 ARC	128.9	141.3	6.22	3.00	211.11
155 ARC	154.8	168.3	6.76	3.00	277.89

NOTES

1 The minimum weight is based on an aluminum alloy having a density of 0.098 pounds per cubic inch (2.70×10^3 kilograms per cubic meter). These minimum weights should be adjusted for alloys having different densities. The minimum weights given are the governing criteria, even though calculations of the weight of ten lengths of conduit with couplings could result in a computed weight less than the figures given if minimum dimensions are used.

2 Applicable tolerances:
Length: ±1/4 in. (6.35 mm) (without coupling)
Outside Diameter:
for trade sizes 1/2 (16 ARC) through 2 (53 ARC): ±0.015 in. (±0.38 mm)
for trade sizes 2-1/2 (63 ARC) through 4 (103 ARC: ±0.025 in. (±0.64 mm)
for trade sizes 5 (129 ARC) and 6 (155 ARC): ±1%

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Table 3 – Dimensions of couplings

Customary Inch — Pound Units			Metric Units		
Trade Size Designator	Outside Diameter (in.)	Minimum Length (in.)	Metric Trade Size Designator	Outside Diameter (mm)	Minimum Length (mm)
1/2	1-5/64	1-9/16	16 ARC	27.38	39.69
3/4	1-21/64	1-5/8	21 ARC	33.73	41.28
1	1-9/16	2	27 ARC	39.69	50.80
1-1/4	1-61/64	2-1/16	35 ARC	49.61	52.39
1-1/2	2-7/32	2-1/16	41 ARC	56.36	52.39
2	2-3/4	2-1/8	53 ARC	69.85	53.98
2-1/2	3-9/32	3-1/8	63 ARC	83.34	79.38
3	3-13/16	3-1/4	78 ARC	96.84	82.55
3-1/2	4-7/16	3-3/8	91 ARC	112.71	85.73
4	5	3-1/2	103 ARC	127.00	88.90
5	6-7/32	3-3/4	129 ARC	157.96	95.25
6	7-5/16	4	155 ARC	185.74	101.60

NOTES—Applicable tolerances:
Outside diameter: No plus tolerances
Minus tolerances
-1% for trade sizes 1-1/4 (35 ARC) and larger
-0.015 in. (0.38 mm) for trade sizes 1 (27 ARC) and smaller

Table 4 –Dimensions of 90-degree elbows and weights of nipples per hundred

Customary Inch-Pound Units						Metric Units			
	Elbows		Nipples			Elbows		Nipples	
Trade Size Designator	Minimum Radius to Center of Conduit (in.)	Minimum Straight Length L_s at Each End (in.)	A Lb.	B Lb.	Metric Trade Size Designator	Minimum Radius to Center of Conduit (mm)	Minimum Straight Length L_s at Each End (mm)	A kg	B kg
1/2	4	1-1/2	0.022	0.7	16 ARC	101.60	38.10	0.010	0.32
3/4	4-1/2	1-1/2	0.031	1.4	21 ARC	114.30	38.10	0.014	0.64
1	5-3/4	1-7/8	0.043	3.1	27 ARC	146.05	47.63	0.020	1.41
1-1/4	7-1/4	2	0.057	3.5	35 ARC	184.15	50.80	0.026	1.59
1-1/2	8-1/4	2	0.070	3.8	41 ARC	209.55	50.80	0.032	1.72
2	9-1/2	2	0.093	4.9	53 ARC	241.30	50.80	0.042	2.22
2-1/2	10-1/2	3	0.149	20.8	63 ARC	266.70	76.20	0.068	9.43
3	13	3-1/8	0.194	24.2	78 ARC	330.20	79.38	0.088	10.98
3-1/2	15	3-1/4	0.229	31.1	91 ARC	381.00	82.55	0.104	14.11
4	16	3-3/8	0.272	39.8	103 ARC	406.40	85.73	0.123	18.05
5	24	3-5/8	0.367	58.8	129 ARC	609.60	92.08	0.166	26.67
6	30	3-3/4	0.488	69.2	155 ARC	762.00	95.25	0.221	31.39

NOTE—Each lot of 100 nipples shall weigh not less than the number of pounds (kilograms) determined by the formula:
$W = 100 * (LA) - B$
where:
W is the weight of 100 nipples in pounds (kilograms)
L is the length of one nipple in inches (millimeters)
A is the weight of nipple per inch (25.4 mm) in pounds (kilograms)
B is the weight in pounds (kilograms) lost in threading 100 nipples

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