National Electrical Manufacturers Association

NEMA Standards Publication TC 7-2021

Solid-Wall Coilable and Straight Electrical Polyethylene Conduit

Published by:

National Electrical Manufacturers Association
1300 North 17th Street, Suite 900
Rosslyn, Virginia 22209

www.nema.org

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Foreword

The purposes of this Standards publication for high-density polyethylene (HDPE) conduit (duct) intended for underground use in the installation and protection of electrical cables are:

a. to list dimensions and other significant requirements; and
b. to state the required properties of these products and to assist in selecting and obtaining the proper product for a particular need.

In addition, this Standard addresses the factory installation of electrical cable, or pull media commonly used to assist in the installation of cables.

User needs have been considered throughout the development of this Standard. The Polymer Raceway Products Section of NEMA, through its Members, works closely with such organizations as ASTM International, appropriate government agencies, testing laboratories, and others in the periodic review and revision of this Standard.

In the preparation of this Standards publication, input of users and other interested parties has been sought and evaluated. Inquiries, comments, and proposed or recommended revisions should be submitted to the concerned NEMA product subdivision by contacting:

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This Standard was approved by the NEMA Polymer Raceway Products Section. Approval does not necessarily imply that all Members of the Section voted for its approval. At the time of publication, the Section had the following Members:

ABB, Inc. — www.abb.com — Memphis, TN
Anamet Electrical, Inc. — www.anacondasealtite.com — Mattoon, IL
Atkore International — www.atkore.com — Harvey, IL
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Electri-Flex Company — www.electriflex.com — Roselle, IL
FRE Composites Group — www.frecomposites.com — Saint-Andre-d'Argenteuil, QC, Canada
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Phoenix Contact — www.phoenixcontact.com — Middletown, PA
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Southwire Corporation — www.southwire.com — Carrollton, GA
Underground Devices, Inc. — www.udevices.com — Northbrook, IL
United Fiberglass of America, Inc. — www.unitedfiberglass.com — Springfield, OH

Members of the Plastics Pipe Institute were active in providing suggestions and comments in the revision of this Standard.

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Section 1
General

1.1 Scope

This Standard covers several wall types of high-density polyethylene (HDPE) conduit for use in providing a protective raceway for electrical cables or communication cables buried underground or concrete encased.

Note: Typical applications for HDPE conduit include power distribution, site lighting, signal and control, and supervisory control and data acquisition (SCADA).

Equivalent wall types compared with other Standards are listed below in Table 1.

Table 1
Equivalent Wall Types by Other Standards

NEMA TC 7	ASTM F2160 and D3485	ASTM D3035	UL 651A and 1990
EPEC-40	Schedule 40	--	Schedule 40
EPEC-80	Schedule 80	--	Schedule 80
EPEC-11	SDR 11	--	EPEC-A
EPEC-13.5	DR 13.5	--	EPEC-B
EPEC-15.5	DR 15.5	--	--
EPEC-17	--	DR 17 (dimensions only)	--

Note: The values stated in U.S. customary (I-P) units are to be regarded as the Standard.

1.2 Referenced Standards

In this publication, reference is made to the Standards listed below. Where all or part of an ASTM International, NFPA, or UL, etc., Standard specification is incorporated by reference in these specifications, the referenced Standard shall be the latest edition and revision. Copies are available from the indicated sources.

ASTM International
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959

D618-21 *Standard Practice for Conditioning Plastics for Testing*

D638-14 *Standard Test Method for Tensile Properties of Plastics*

D790-17 *Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials*

D792-20 *Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement*

D1238-20 *Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer*

D1505-18 *Standard Test Method for Density of Plastics by the Density-Gradient Technique*

D1600-18	*Standard Terminology for Abbreviated Terms Relating to Plastics*
D1693-15e1	*Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics*
D2122-16	*Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings*
D2412-21	*Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading*
D2837-21	*Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products*
D3035-15	*Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter*
D3350-21	*Standard Specification for Polyethylene Plastics Pipe and Fittings Materials*
D3485-15	*Standard Specification for Coilable High Density Polyethylene (HDPE) Cable in Conduit*
D4883-18	*Standard Test Method for Density of Polyethylene by the Ultrasound Technique*
F412-20a	*Standard Terminology Relating to Plastic Piping Systems*
F2160-16	*Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD)*

Institute of Electrical and Electronics Engineers
2001 L St NW Suite 700
Washington, DC 20036

IEEE 1210-2014	*Standard Tests for Determining Compatibility of Cable-Pulling Lubricants With Wire and Cable*

National Fire Protection Association
Batterymarch Park
Quincy, MA 02169

NFPA 70-2020	*National Electrical Code*© (NEC)

Underwriters Laboratories Inc.
333 Pfingsten Road
Northbrook, IL 60062

UL 651A Ed. 5	*Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit*
UL 1990 Ed.3	*Nonmetallic Underground Conduit with Conductors*

Section 2
Definitions and Abbreviations

2.1 Definitions

Definitions of terms used in this Standard shall be in accordance with ASTM F412. Abbreviations shall be in accordance with ASTM D1600 unless otherwise specified.

quality control test: An in-plant test that is conducted on a given test frequency to determine whether a product is in accordance with the specification requirements.

ovality: A conduit's deviation from roundness typically as a consequence of coiling, handling, or installation.

qualification test: A non-repetitive evaluation conducted on an existing, altered, or new product to determine acceptability.

rework plastic (thermoplastic): A plastic from a manufacturer's own production that has been reground or pelletized for reuse by the same manufacturer.

reprocessed plastic: A thermoplastic prepared from usually melt processed scrap or reject parts by a plastics processor, or from non-Standard virgin material or non-uniform virgin material.

2.2 Abbreviations

EPEC: Electrical polyethylene conduit

HDPE: High-density polyethylene

SDR: Standard dimension ratio

CIC: Cable in conduit

SCADA: Supervisory control and data acquisition

Section 3
General Requirements

3.1 Materials

3.1.1 Electrical Conduit

Electrical polyethylene conduit (EPEC) shall be made from high-density polyethylene classified in accordance with ASTM D3350 and Table 2.

Reworked clean polyethylene compound from the manufacturer's own production, and approved reprocessed material, may be re-extruded into conduit, either alone or blended with virgin compound. Conduit containing rework and/or reprocessed materials shall meet all the material and product requirements of this Standard.

3.1.2 UV Stabilization for Buried Conduit, Outdoor Storage Stability

Conduit for direct burial installations shall be UV stabilized with a sufficient amount of UV stabilizer to protect the conduit from UV degradation and color stability for a minimum of one (1) year of outside storage.

> Note: Acceptable cell class for color and UV resistance properties in Table 2 may be achieved by utilizing a pre-compounded material or by blending a base natural material with black or color concentrates.

Permanent color identification shall be permitted to be as solid color, as co-extruded stripes, as co-extruded skin, or a combination of these. Co-extruded color identification shall be stabilized for UV and color stability for one (1) year of outside storage, for conduit that is to be direct buried. For color stripes, a minimum of 3 color stripes shall be spaced equally, approximately at intervals of 120 degrees around the circumference of the conduit.

Solid yellow or black with yellow stripes shall not be used for identification of conduit because of the risk of misidentification with gas pipe. Typical coloring for power applications is red, telecommunications is orange, and cable TV is terra-cotta.

3.2 Dimensions and Lengths

Polyethylene conduit shall meet the dimensions shown in Table 3.

3.2.1 Average Outside Diameter

The average outside diameter of the conduit shall be as shown in Table 3 and shall be measured in accordance with 5.2.1 of this Standard.

3.2.2 Wall Thickness

The minimum and maximum wall thickness shall be as shown in Table 3 and shall be measured in accordance with 5.2.2 of this Standard.

3.2.3 Ovality

The maximum allowable ovality will be as stated in 4.1.3 and shall be measured in accordance with 5.2.3.

3.2.4 Reel, Coiled, and Stick Lengths

Contact the manufacturer for the availability of conduit in reel, coiled, and stick lengths.

3.3 Workmanship

Polyethylene conduit shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other defects that could cause damage or compromise the physical strength of the conduit. It shall be as uniform as practicable in color, opacity, density, and other physical properties.

3.3.1 Bonding to Conduit

If pull media or cable is installed at the factory, there shall be no bonding of the installed material to the inner conduit wall. This shall be verified during the production of the conduit by free movement of the pull media or cable inside the conduit.

3.3.2 Excess Pull Member

If pull media is installed at the factory, its length shall be equal to or greater than the conduit length. In addition, the pull media and inside of the conduit may be coated with a lubricant that prevents abrasion of conduit bends during cable pulling and lowers pull tensions on the cable.

3.3.3 Friction Reduction

Lubricants applied to the conduit inside diameter (ID) and/or cable for CIC shall be compatible with cable jacket and insulation materials and shall be tested in accordance with IEEE 1210 to show that the dielectric strength and physical properties are not adversely affected. If co-extruded lubricated surfaces are used as a component of the inner wall, they shall be permanently bonded so as not to delaminate under frictional loading.

3.4 Inspections

The manufacturer shall inspect the conduit at time of manufacture for compliance with dimensional requirements, performance requirements, and freedom from defects as defined in Section 4.

3.5 Internal Ribs

Optional internal ribbed profiles meant for reducing friction shall be agreed upon between the manufacturer and customer. The internal rib shall be of a longitudinal design and shall prevent the introduction of a continuous twist force in one direction with a rib height that does not exceed 0.030 in. (0.8 mm) and shall be in addition to the major wall thickness. Internal ribs shall not be factored into determining cable fill factors or ID reductions. This conduit shall comply with all other requirements of this Standard.

Table 2
D3350 Cell Classification Material Requirements for HDPE Conduit per ASTM F2160 Note 4

Properties	ASTM Test Method	Acceptable Cell Class	Minimum Values
Density	D1505, D792, or D4883	3 or 4	> 0.941 g/cm^3
Melt index (190/2.16)	D1238	3 or 4, or 2 in accordance with Note 1	< 0.4 g/10 min.
Flexural modulus	D790	4 or 5	≥ 80,000 psi
Tensile strength	D638	4 or 5	≥ 3,000 psi
Slow crack growth resistance	D1693	3 or 4, or 8 in accordance with Note 2	F10 ≥ 96 h
Hydrostatic design basis	D2837	0, 1, 2, 3, or 4	Pressure-rated compounds are not required
Color and UV resistance	D3350	C for black or E for color	See Note 3

Note 1: A melt index of up to 0.55 grams/10 minutes per ASTM D1238 Condition 190/2.16 is allowable provided that all other material requirements specified in Table 4.1 are met.

Note 2: 8 is a specified ESCR per ASTM D1693, Condition B, 10% IGEPAL® requirement of F_{10} > 96 h is allowable provided that all other material requirements in Table 3.1 are met. IGEPAL is a registered trademark of Rhodia Group.

Note 3: PE materials for colored conduit black with 2% minimum carbon black, color with UV stabilizer.

Note 4: Not all cell class permutations are commercially available. Typical conduit cell class is 334480C or E.

Table 3
Sizes and Dimensions of HDPE Conduit

U.S. Customary (I-P) Units

Trade Size	Metric Trade Size (mm)	Average Outside Diameter (Inches)	Wall Thickness (Inches)											
			EPEC-40		EPEC-80		EPEC-11		EPEC-13.5		EPEC-15.5		EPEC-17	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1/2	13	0.840 ±0.004	0.109	0.129	0.147	0.167	0.076	0.096	0.062	0.082	0.062	0.082	0.062	0.080
3/4	19	1.050 ±0.005	0.113	0.133	0.154	0.174	0.095	0.115	0.078	0.098	0.068	0.088	0.062	0.082
1	25	1.315 ±0.007	0.133	0.153	0.179	0.200	0.120	0.140	0.097	0.117	0.085	0.105	0.077	0.097
1 1/4	32	1.660 ±0.008	0.140	0.160	0.191	0.214	0.151	0.171	0.123	0.143	0.107	0.127	0.098	0.118
1 1/2	38	1.900 ±0.010	0.145	0.165	0.200	0.224	0.173	0.194	0.141	0.161	0.123	0.143	0.112	0.132
2	51	2.375 ±0.012	0.154	0.174	0.218	0.244	0.216	0.242	0.176	0.197	0.153	0.173	0.140	0.160
2 1/2	64	2.875 ±0.014	0.203	0.227	0.276	0.309	0.261	0.292	0.213	0.239	0.185	0.207	0.169	0.189
3	76	3.500 ±0.018	0.216	0.242	0.300	0.336	0.318	0.356	0.259	0.290	0.226	0.253	0.206	0.231
4	102	4.500 ±0.023	0.237(1)	0.265	0.337	0.377	0.409	0.458	0.333	0.373	0.290(1)	0.325	N/A	N/A
5	127	5.563 ±0.028	0.258(1)	0.289	0.375	0.420	0.506	0.567	0.412	0.461	0.359(1)	0.402	N/A	N/A
6	152	6.625 ±0.033	0.280(1)	0.314	0.432(1)	0.484	0.602	0.674	0.491	0.550	0.427(1)	0.479	N/A	N/A
8	203	8.625 ±0.043	0.322(1)	0.361	N/A	N/A	0.784(1)	0.878	0.639(1)	0.716	N/A	N/A	N/A	N/A
10	254	10.750 ±0.054	N/A	N/A	N/A	N/A	0.977(1)	1.094	0.796(1)	0.892	N/A	N/A	N/A	N/A
12	305	12.750 ±0.064	N/A	N/A	N/A	N/A	1.159(1)	1.298	0.944(1)	1.057	N/A	N/A	N/A	N/A

Metric (SI) Units

Trade Size	Metric Trade Size (mm)	Average Outside Diameter (mm)	Wall Thickness (mm)											
			EPEC-40		EPEC-80		EPEC-11		EPEC-13.5		EPEC-15.5		EPEC-17	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1/2	13	21.34 ±0.11	2.77	3.28	3.73	4.24	1.93	2.44	1.57	2.08	1.57	2.08	1.52	2.03
3/4	19	26.67 ±0.13	2.87	3.38	3.91	4.42	2.41	2.92	1.98	2.49	1.73	2.24	1.57	2.08
1	25	33.40 ±0.17	3.38	3.89	4.55	5.08	3.05	3.56	2.46	2.97	2.16	2.67	1.96	2.46
1 1/4	32	42.16 ±0.21	3.56	4.07	4.85	5.43	3.84	4.35	3.12	3.63	2.72	3.23	2.49	3.00
1 1/2	38	48.26 ±0.24	3.68	4.19	5.08	5.69	4.39	4.92	3.58	4.09	3.12	3.63	2.84	3.35
2	51	60.33 ±0.30	3.91	4.42	5.54	6.20	5.49	6.15	4.47	5.00	3.89	4.39	3.56	4.06
2 1/2	64	73.03 ±0.37	5.16	5.77	7.01	7.85	6.64	7.44	5.41	6.07	4.70	5.26	4.29	4.80
3	76	88.90 ±0.44	5.49	6.15	7.62	8.53	8.08	9.05	6.58	7.37	5.74	6.43	5.23	5.87
4	102	114.30 ±0.57	6.02(1)	6.73	8.56	9.58	10.39	11.63	8.46	9.48	7.37(1)	8.26	N/A	N/A
5	127	141.30 ±0.71	6.55(1)	7.34	9.53	10.67	12.85	14.39	10.47	11.73	9.12(1)	10.21	N/A	N/A
6	152	168.28 ±0.84	7.11(1)	7.97	10.97(1)	12.29	15.29	17.12	12.47	13.97	10.86(1)	12.16	N/A	N/A
8	203	219.08 ±1.10	8.18(1)	9.17	N/A	N/A	19.91(1)	22.30	16.23(1)	18.19	N/A	N/A	N/A	N/A
10	254	273.05 ±1.37	N/A	N/A	N/A	N/A	24.82(1)	27.80	20.23(1)	22.69	N/A	N/A	N/A	N/A
12	305	323.85 ±1.62	N/A	N/A	N/A	N/A	29.44(1)	32.97	23.99(1)	26.87	N/A	N/A	N/A	N/A

(1) Diameter and wall types that are available in stick lengths only as diameter or wall thickness are not conducive to coiling.

Section 4
Performance Requirements

4.1 Quality Control Tests

4.1.1 Conditioning

At the time of production, measurements and performance tests can be made at the temperature within the factory. In case of disagreement, specimens shall be conditioned per 5.1.1.

4.1.2 Dimensions

The conduit dimensions shall meet the requirements listed in Table 3 when measured in accordance with the methods listed in 5.2.

4.1.3 Ovality

The ovality (cross section) of trade size 2 in. (53 mm) and smaller conduit shall not exceed 7% when measured in accordance with 5.2.3. Coiled conduit larger than trade size 2 in. (53 mm) through 3 in. (78 mm) shall not exceed 10% when measured in accordance with 5.2.3. Kinks in a coil shall not be acceptable. See Annex A for reel tables and an additional explanation of ovality for reeled or coiled conduit. Ovality for straight lengths of conduit shall not exceed 5%.

> Note: The Plastics Pipe Institute (PPI) publication Technical Note 61 Coilable HDPE Conduit Ovality and Coil-Set provides additional information on the subject.

4.1.4 Pipe Stiffness and Compression and Recovery

Specimens of HDPE conduit shall achieve the minimum loads given in Table 4 at 5% deflection when tested in accordance with 5.3. In addition, during compression and recovery, testing specimens shall not split or crack when tested in accordance with 5.4.

Table 4
Minimum Load for Pipe Stiffness Test, Minimum Pipe Stiffness, and Test Values
(U.S. Customary Units)

Trade Size	Metric Trade Size (mm)	EPEC-40		EPEC-80		EPEC-11		EPEC-13.5		EPEC-15.5		EPEC-17	
		PS[1]	Test Values	PS[1]	Test Values	PS[1]	Test Values	PS[1]	Test Values	PS[1]	Test Values	PS[1]	Test Values
		lbs/in/in	lbsF[2]	lbs/in/in	lbsF[2]	lbs/in/in	lbsF[2]	lbs/in/in	lbsF[2]	lbs/in/in	lbsF[2]	lbs/in/in	lbsF[2]
1/2	13	1190	222	3420	560	360	74	180	39	160	35	N/A	N/A
3/4	19	630	156	1820	405	360	93	180	48	120	33	90	25
1	25	510	160	1400	402	360	116	180	60	120	41	90	31
1 1/4	32	280	116	790	303	360	147	180	76	120	52	90	40
1 1/2	38	200	97	580	261	360	168	180	87	120	60	90	45
2	51	120	74	370	215	360	210	180	109	120	74	90	57
2 1/2	64	160	119	430	300	360	254	180	132	120	90	90	68
3	76	100	92	300	261	360	309	180	161	120	110	90	83
4	102	60	72	190	218	360	398	180	207	120	141	N/A	N/A
5	127	40	61	140	202	360	492	180	256	120	174	N/A	N/A
6	152	30	55	120	207	360	585	180	305	120	208	N/A	N/A
8	203	20	48	N/A	N/A	360	762	180	397	N/A	N/A	N/A	N/A
10	254	254	N/A	N/A	N/A	N/A	360	935	180	500	N/A	N/A	N/A
12	305	305	N/A	N/A	N/A	N/A	360	1110	180	590	N/A	N/A	N/A

(Metric (SI) Units)

Trade Size	Metric Trade Size (mm)	EPEC-40		EPEC-80		EPEC-11		EPEC-13.5		EPEC-15.5		EPEC-17	
		PS[1]	Test Values	PS[1]	Test Values	PS[1]	Test Values	PS[1]	Test Values	PS[1]	Test Values	PS[1]	Test Values
		kPa	N	kPa	N	kPa	N	kPa	N	kPa	N	kPa	N
1/2	13	7985	961	22498	2425	2416	321	1208	167	1120	156	N/A	N/A
3/4	19	4227	674	12212	1754	2416	402	1208	209	810	143	604	108
1	25	3422	695	9394	1740	2416	503	1208	262	810	180	604	136
1 1/4	32	1879	502	5301	1311	2416	635	1208	331	810	227	604	171
1 1/2	38	1342	418	3892	1130	2416	727	1208	378	810	259	604	196
2	51	805	322	2483	932	2416	909	1208	473	810	324	604	245
2 1/2	64	1074	513	2885	1297	2416	1100	1208	573	810	393	604	297
3	76	671	398	2013	1129	2416	1339	1208	697	810	478	604	361
4	102	403	314	1275	944	2416	1721	1208	896	810	614	N/A	N/A
5	127	268	262	939	875	2416	2128	1208	1108	810	760	N/A	N/A
6	152	201	236	805	898	2416	2534	1208	1319	810	905	N/A	N/A
8	203	134	207	N/A	N/A	2416	3299	1208	1718	N/A	N/A	N/A	N/A
10	254	N/A	N/A	N/A	N/A	2416	4100	1208	2200	N/A	N/A	N/A	N/A
12	305	N/A	N/A	N/A	N/A	2416	4900	1208	2600	N/A	N/A	N/A	N/A

(1) The minimum values for pipe stiffness (PS) are calculated using the minimum allowable flexural modulus specified in Table 1 of 80,000 psi. The calculated values are derived as outlined in Appendix X2 of ASTM D2412.

(2) The minimum values shown for force (LbsF) are calculated based on the test requirements of 5% deflection of the average ID at a deflection rate of 0.5"/minute on a sample six inches long from the minimum PS values.

Section 5
Test Methods

5.1 Conditioning, Test Conditions, and Sampling

5.1.1 Conditioning Test Specimens

Unless otherwise indicated, all test specimens shall be conditioned in accordance with Procedure A in ASTM D618 at 73° ±3.6°F (23° ±2.0°C), without regard to relative humidity. Shorter time periods shall be permitted for quality control testing if it can be shown that specimens have reached equilibrium.

5.1.2 Sampling

Samples shall be selected at random.

5.2 Dimensions

5.2.1 Outside Diameter (Average)

The average outside diameter (OD) of the conduit shall be determined by use of a Vernier circumferential wrap tape, a dial type caliper, or other instrument, as defined in ASTM D2122.

5.2.2 Wall Thickness

The wall thickness shall be measured by a ball anvil micrometer or equivalent means at one end of the conduit to the nearest +0.001 in. as defined in ASTM D2122.

5.2.3 Ovality

The ovality shall be measured as defined in ASTM F2160 and calculated as follows:

$$\%\ Ovality = \frac{Maximum\ OD - Minimum\ OD}{(Minimum\ OD + Maximum\ OD)}\ X\ 200$$

5.3 Pipe Stiffness

Three specimens that are 6 ±1/8 in. (150 ±3 mm) in length shall be cut from lengths from the EPEC conduit to be tested. The inside diameter of each specimen shall be calculated using the following formula:

$$ID = OD - 2t$$

Where:
ID = Calculated Inside Diameter, in. (mm)
OD = Measured Outside Diameter, in. (mm)
t = Measured Average Wall Thickness, in. (mm)

After the specimens are prepared, each one shall be tested as defined in ASTM D2412 by being placed between a pair of rigid flat steel plates that are of equal or greater length than the specimen length. The plates shall be parallel and in contact with the specimen OD. One plate shall be moved toward the other at the rate of 0.50 ±0.02 in. (12.5 ±0.5 mm) per minute until the distance between the parallel plates has been decreased by 5% of the original calculated inside diameter of the specimen. The highest load shall be recorded and noted and shall be greater than the value provided in Table 4-1 for the trade size and respective type being tested.

5.4 Compression and Recovery

Three specimens 6 ±1/8 in. (150 mm) in length shall be cut from lengths of the appropriate EPEC. The inside diameter of each specimen shall be calculated using the same formula provided in 5.3.

Each specimen shall then be placed between a pair of rigid flat steel plates that are a minimum of the sample length or longer, are parallel, and are in contact with the specimen OD. One plate shall be moved toward the other at the rate of 2.00 ±0.08 in. (50.0 ±2.0 mm) per minute until the distance between the parallel plates has been decreased by 30% of the original calculated inside diameter of the specimen. The specimens shall be removed and immediately inspected and there shall be no evidence of splitting, crazing, or cracking.

Section 6
Markings

6.1 Marking Requirements

The markings on the conduit shall be legible and spaced at intervals of not more than 5 ft. (1.5 m). The following marks are required:

a. Manufacturer's name or trademark.
b. The trade size.
c. Wall type (e.g., EPEC-40).
d. Date code or month and year of manufacture.
e. "HDPE."
f. NEMA TC 7.

6.2 Optional Markings

Optional markings are acceptable if they do not conflict with and cannot be confused with the marking requirements in 6.1.

a. Markings such as a lightning bolt symbol may be used to indicate this conduit is a carrier of electrical conductors.
b. Sequential length numbering.
c. Color in accordance with the methods of 3.1.2.
d. Other markings as agreed upon between manufacturer and customer.

Annex A
Recommended Minimum Drum Diameters

Table A1
Recommended Minimum Drum Diameters

Trade Size	Metric Trade Size	Drum Diameter	
		in.	cm
1/2	13	18	48
3/4	19	18	48
1	25	24	61
1 1/4	32	30	76
1 1/2	38	30	76
2	51	36	92
2 1/2	64	42	107
3	76	48	122
4	102	68	173
5	127	84	214
6	152	84	214

Note: Smaller drum diameters may be utilized as agreed upon between the customer and manufacturer. Conduit above trade size 6 in diameter is available only as straight sticks.

Ovality is a packaging condition that may occur when roundable conduit is wound into a coil. Larger diameter conduit may have increased ovality. For example, the inner coil layers of trade size 6 in. (152 mm) coiled conduit may have 20% or more ovality. Ovality is corrected when joining equipment is applied to roundable conduit, or by field processing roundable conduit through re-rounding and straightening equipment during installation.

Ovality measurements of coiled conduit shall be made on a sample cut from the coil. In case of disagreement, condition the test specimens at test temperature for not less than 40 hours prior to the test in accordance with procedure A of ASTM D618, then retest. Requirements for humidity are excluded.

If ovality greater than 10% for coiled conduit larger than trade size 3 in. (76 mm) is unsuitable for a particular application, the coiled conduit shall be processed by the installer through re-rounding equipment that corrects ovality to 10% or less.

Note: See the Plastics Pipe Institute (PPI) publications Technical Note 61 *Coilable HDPE Conduit Ovality and Coil-Set* for more information on ovality considerations and Technical Note 58 *HDPE Conduit & Duct Handling Guide* for more information on safe handling of HDPE conduit.

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