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NEMA STANDARDS PUBLICATION

NEMA TC 2

ELECTRICAL POLYVINYL CHLORIDE (PVC) TUBING AND CONDUIT

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION

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NEMA Standards Publication TC 2

Electrical Polyvinyl Chloride (PVC) Tubing and Conduit

Published by:

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Rosslyn, Virginia 22209

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FOREWORD

The purpose of this Standards Publication for electrical polyvinyl chloride (PVC) tubing (EPT) and conduit (EPC) for above-ground and below-ground use is:

a. To list dimensions and other significant requirements.
b. To set forth some of the properties of these products and to assist in selecting and obtaining the proper product for a particular need.

User needs have been considered throughout the development and revision of these standards. The Polymer Raceway Products Section of NEMA, through its members, has worked (and continues to work) closely with such organizations as the American Society for Testing and Materials, the Plastic Pipe Institute, Plastic Pipe and Fittings Association, appropriate government agencies, Underwriters Laboratories, Inc., and others in the periodic review and revision of these standards for any changes necessary to keep them up-to-date with advancing technology. Proposed or recommended revisions should be submitted to:

Vice President, Engineering
National Electrical Manufacturers Association
1300 North 17th Street, Suite 1847
Rosslyn, Virginia 22209

Publication No. TC 2 1996 revises and supersedes the NEMA Standards Publication for Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80), Publication No. TC 2 1990. Prior to publication, the NEMA Standards, Suggested Standards for Future Design, and Authorized Engineering Information that appear in this publication unchanged since their appearance in TC 2 1990 were reaffirmed.

This Standards Publication was developed by the Polymer Raceway Products Section. Section approval of the standard does not necessarily imply that all section members voted for its approval or participated in its development. At the time it was approved, the Group/Section was composed of the following members:

CANTEX, Inc.—Mineral Wells, TX
Lamson & Sessions—Cleveland, OH
Pacific Western Extruded Plastics Co.—Eugene, OR

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Section 1
GENERAL

1.1 SCOPE

These standards cover the following types of electrical polyvinyl chloride (PVC) tubing (EPT) and conduit (EPC-40 and EPC-80). The designations "40" and "80" refer to Schedules 40 and 80, respectively, of iron pipe dimensions.

EPT-A-PVC—Electrical PVC tubing designed to be encased in concrete when installed; used in trenches or encased in buildings, walls, floors, or ceilings.

EPC-40-PVC—Electrical PVC conduit designed for normal-duty applications above ground; also used for all concrete encased applications or direct burial.

EPC-80-PVC—Electrical PVC conduit designed for heavy-duty (areas of physical damage) applications above ground; also used for all concrete encased applications or direct burial.

NOTE—The values stated in U.S. customary units are to be regarded as the standard.

1.2 REFERENCED STANDARDS

In this publication, reference is made to the standards listed below. Copies are available from the indicated sources.

American Society for Testing and Materials
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959

D 618-90e	*Conditioning Plastics and Electrical Insulating Materials for Testing, Standard Methods of*
D 883-93	*Plastics, Definitions of Terms Relating to*
D 1600-94	*Plastics, Standard Abbreviations of Terms Relating to*
D 1784-92	*Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds, Specifications for*
D 2122-90	*Standard Test Method of Determining Dimensions of Thermoplastic Pipe and Fittings*
D 2564-93	*Solvent Cements for Poly (Vinyl Chloride), PVC Plastic Pipe and Fittings, Specifications for*
D 2855-93	*Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe & Fittings*
D 4396-92	*Rigid Poly (Vinyl Chloride) (PVC) and Related Plastics Compounds for Non-Pressure Piping Products*
F 402-93	*Recommended Practice for Safe Handling of Solvent Cements Used for Joining Thermoplastic Pipe and Fittings*

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F 412-94 *Standard Definitions of Terms Relating to Plastic Piping Systems*

F 656-93 *Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings*

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TC 3 1996 *PVC Fittings for Use with Rigid PVC Conduit and Tubing*

National Fire Protection Association
Batterymarch Park
Quincy, MA 02669

NFPA 30 1996 *Flammable and Combustible Liquids Code*

NFPA 70 1996 *National Electrical Code*

NFPA 325M 1994 *Fire Hazard Properties of Flammable Liquids, Gases and Volatile Solids*

Underwriters Laboratories Inc.
333 Pfingsten Road
Northbrook, IL 60062

UL 514B 1992 *Fittings for Conduit and Outlet Boxes*

UL 514C 1988 *Non-Metallic Outlet Boxes, Flush-Device Boxes and Covers*

UL 651 1995 (6th Edition) *Schedule 40 and 80 Rigid PVC Non-metallic Conduit*

UL 651A 1995 (3rd Edition) *Type EB and A Rigid PVC Conduit & HDPE Conduit*

* Also available from the American National Standards Institute, 1430 Broadway, New York, NY 10018

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Section 2
DEFINITIONS AND ABBREVIATIONS

2.1 DEFINITIONS

Definitions of terms used in this standard shall be in accordance with ASTM F 412 or ASTM D 883, or both. Abbreviations shall be in accordance with ASTM D 1600, unless otherwise specified. The abbreviation for electrical polyvinyl chloride (PVC) tubing is EPT and for electrical plastic conduit is EPC.

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Section 3
GENERAL REQUIREMENTS

3.1 MATERIALS

3.1.1 Electrical Conduit and Tubing

Electrical plastic conduit and tubing shall be made from polyvinyl chloride (PVC) plastic compound which meets the dimensional and physical requirements of this standard.

Clean, reworked material, and recognized recycled material may be used, provided that the conduit produced meets the requirements of this standard.

3.1.2 Solvent Cements

PVC solvent cements shall be in accordance with ASTM D 2564 or as specified by the manufacturer. PVC primers shall be in accordance with ASTM F 656 or as specified by the manufacturer. ASTM F 402 is referenced as recommended practice for safe handling of solvent cements.

3.2 COLOR

EPT-A-PVC, EPC-40-PVC, and EPC-80-PVC shall be gray in color.

3.3 DIMENSIONS AND LENGTHS

Dimensions of EPC and EPT shall meet the requirements of Table 3-1 when determined in accordance with 5.2. Lengths shall be in accordance with 3.3.4.

3.3.1 Average Outside Diameter

The average diameter of the conduit shall be determined by use of a vernier circumferential wrap tape as defined in ASTM D 2122.

3.3.2 Out-of-Roundness

Out-of-roundness of the conduit shall be measured with out-of-roundness gauges specified in Table A-1 and A-2.

Out-of-roundness tolerance shall apply only at the time of manufacture, not to conduit that has been packaged and placed in yard storage.

3.3.3 Wall Thickness

The minimum wall thickness shall be measured at one end of the conduit with a micrometer as defined in ASTM D 2122.

3.3.4 Conduit Length

The overall length, including the integral bell or coupling, is commonly 10 ft ± 3/4 inch (3.05 m ± 0.02 m) or 20 ft ± 1 inch (6.10 m ± 0.03 m). A tape measure accurate to ± 1/16 inch (± 1 mm) shall be permitted to be used to measure the length. Other lengths are acceptable if agreed to by the parties involved.

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3.3.5 Integral Belled Ends

EPT and EPC may have integral belled ends. The belled ends shall be in accordance with the dimensions shown in Table 3-2.

Belled ends shall be centered to provide a visible shoulder around the entire circumference of the conduit.

3.3.6 Minimum Inside Diameter

The minimum inside diameter shall be measured at one end of the conduit per section 5.2.4 of this standard.

3.4 JOINTS

3.4.1 EPC-40-PVC Couplings May be Supplied with Conduit

NOTE—EPC-40-PVC couplings may be used to join EPC-80-PVC.

3.4.2 Integral Couplings

Plastic conduit may have belled ends. The wall thickness of an integral bell shall be considered satisfactory if formed from conduit meeting the requirements of this standard. The integral bell shall be considered satisfactory if it accepts the go/no-go gauges as specified in Table 3-3.

The length of the bell shall be measured with an instrument accurate to ± 1/16 inch (± 1 mm). A tape measure or steel rule is adequate.

3.5 INSPECTIONS

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

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Table 3-1

SIZES AND DIMENSIONS OF PVC CONDUIT AND TUBING

U.S. CUSTOMARY UNITS

TRADE SIZE	METRIC DESIGNATORS	OUTSIDE DIAMETERS			WALL THICKNESS			INSIDE DIAMETERS		
		AVERAGE	MAXIMUM	MINIMUM	EPT-A-PVC MINIMUM	EPC-40-PVC MINIMUM	EPC-80-PVC MINIMUM	EPT-A-PVC MINIMUM	EPC-40-PVC MINIMUM	EPC-80-PVC MINIMUM
1/2	16	0.840 ± 0.004	0.848	0.832	0.060	0.109	0.147	0.676	0.578	0.502
3/4	21	1.050 ± 0.004	1.060	1.040	0.060	0.113	0.154	0.886	0.780	0.698
1	27	1.315 ± 0.005	1.325	1.305	0.060	0.133	0.179	1.150	1.004	0.910
1 1/4	35	1.660 ± 0.005	1.672	1.648	0.070	0.140	0.191	1.475	1.335	1.227
1 1/2	41	1.900 ± 0.006	1.912	1.888	0.080	0.145	0.200	1.694	1.564	1.446
2	53	2.375 ± 0.006	2.387	2.363	0.100	0.154	0.218	2.129	2.021	1.881
2 1/2	63	2.875 ± 0.007	2.890	2.860	0.110	0.203	0.276	2.608	2.414	2.250
3	78	3.500 ± 0.008	3.515	3.485	0.125	0.216	0.300	3.202	3.008	2.820
3 1/2	91	4.000 ± 0.008	4.050	3.950	0.145	0.226	0.318	3.662	3.486	3.280
4	103	4.500 ± 0.009	4.550	4.450	0.150	0.237	0.337	4.151	3.961	3.737
5	129	5.563 ± 0.010	5.613	5.513	--	0.258	0.375	--	4.975	4.713
6	155	6.625 ± 0.011	6.675	6.575	--	0.280	0.432	--	5.986	5.646
8	200	8.625 ± 0.015	8.675	8.575	--	0.322	0.500	--	7.853	7.455

METRIC UNITS

TRADE SIZE	METRIC DESIGNATORS	OUTSIDE DIAMETERS			WALL THICKNESS			INSIDE DIAMETERS		
		AVERAGE	MAXIMUM	MINIMUM	EPT-A-PVC MINIMUM	EPC-40-PVC MINIMUM	EPC-80-PVC MINIMUM	EPT-A-PVC MINIMUM	EPC-40-PVC MINIMUM	EPC-80-PVC MINIMUM
1/2	16	21.34 ± 0.10	21.54	21.13	1.52	2.77	3.73	17.17	14.68	12.75
3/4	21	26.67 ± 0.10	26.92	26.42	1.52	2.87	3.91	22.50	19.81	17.72
1	27	33.40 ± 0.31	33.66	33.15	1.52	3.38	4.55	29.21	25.50	23.11
1 1/4	35	42.16 ± 0.13	42.47	41.86	1.78	3.56	4.85	37.46	33.90	31.16
1 1/2	41	48.26 ± 0.15	48.56	47.96	2.03	3.68	5.08	43.02	39.72	36.72
2	53	60.32 ± 0.15	60.63	60.02	2.54	3.91	5.54	54.07	51.33	47.77
2 1/2	63	73.02 ± 0.18	73.41	72.64	2.79	5.16	7.01	66.24	61.31	57.15
3	78	88.90 ± 0.20	89.28	88.52	3.18	5.49	7.62	81.33	76.40	71.62
3 1/2	91	101.60 ± 0.20	102.87	100.33	3.68	5.74	8.08	93.01	88.54	83.31
4	103	114.30 ± 0.23	115.57	113.03	3.81	6.02	8.56	105.43	100.60	94.91
5	129	141.30 ± 0.25	142.57	140.03	--	6.55	9.52	--	126.36	119.71
6	155	168.28 ± 0.28	169.54	167.00	--	7.11	10.97	--	152.04	143.40
8	200	219.00 ± 0.38	220.36	217.62	--	8.18	12.70	--	199.39	189.48

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Table 3-2
DIMENSIONS OF INTEGRAL COUPLINGS

TRADE SIZE	METRIC DESIGNATOR	SOCKET INSIDE DIAMETERS						SOCKET DEPTH		MINIMUM ACCEPTABLE WALL THICKNESS AT ANY POINT OF SOCKET	
		AT ENTRANCE			AT BOTTOM						
		AVERAGE	MAXIMUM	MINIMUM	AVERAGE	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	EPC-40-PVC	EPC-80-PVC
U. S. CUSTOMARY UNITS											
1/2	16	0.852 ± 0.004	0.860	0.844	0.836 ± 0.004	0.844	0.828	1.500	0.652	0.095	0.129
3/4	21	1.064 ± 0.004	1.074	1.054	1.046 ± 0.004	1.056	1.036	1.500	0.719	0.095	0.136
1	27	1.330 ± 0.005	1.340	1.320	1.310 ± 0.005	1.320	1.300	1.875	0.875	0.100	0.158
1-1/4	35	1.677 ± 0.005	1.680	1.685	1.655 ± 0.005	1.667	1.643	2.000	0.938	0.120	0.168
1-1/2	41	1.918 ± 0.006	1.930	1.906	1.894 ± 0.006	1.906	1.882	2.000	1.062	0.120	0.168
2	53	2.393 ± 0.006	2.405	2.381	2.369 ± 0.006	2.381	2.357	2.000	1.125	0.130	0.181
2-1/2	63	2.890 ± 0.007	2.905	2.875	2.868 ± 0.007	2.883	2.853	3.000	1.469	0.165	0.229
3	78	3.515 ± 0.008	3.530	3.500	3.492 ± 0.008	3.507	3.477	3.125	1.594	0.179	0.249
3-1/2	91	4.015 ± 0.008	4.065	3.965	3.992 ± 0.008	4.007	3.977	3.250	1.687	0.188	0.264
4	103	4.515 ± 0.009	4.565	4.465	4.491 ± 0.009	4.506	4.476	3.375	1.750	0.197	0.280
5	129	5.593 ± 0.010	5.643	5.543	5.553 ± 0.010	5.583	5.523	3.625	1.937	0.214	0.311
6	155	6.658 ± 0.011	6.708	6.608	6.614 ± 0.011	6.644	6.584	3.750	2.125	0.232	0.359
8	200	8.670 ± 0.015	8.725	8.615	8.610 ± 0.015	8.665	8.570	8.500	4.875	0.240	0.360
METRIC UNITS											
1/2	16	21.64 ± 0.10	21.84	21.44	21.23 ± 0.10	21.44	21.03	38.10	16.56	2.41	3.28
3/4	21	27.03 ± 0.10	27.28	26.77	26.57 ± 0.10	26.82	26.31	38.10	18.26	2.41	3.45
1	27	33.78 ± 0.13	34.04	33.53	33.27 ± 0.13	33.53	33.02	47.62	22.22	2.54	4.01
1-1/4	35	42.60 ± 0.13	42.90	42.30	42.04 ± 0.13	42.34	41.73	50.80	23.83	3.05	4.28
1-1/2	41	48.72 ± 0.15	49.02	48.41	48.11 ± 0.15	48.41	47.80	50.80	26.97	3.05	4.22
2	53	60.78 ± 0.15	61.09	60.48	60.17 ± 0.15	60.48	59.87	50.80	28.58	3.30	4.60
2-1/2	63	73.41 ± 0.18	73.79	73.02	72.85 ± 0.18	73.23	72.47	76.20	37.31	4.19	5.82
3	78	89.28 ± 0.20	89.66	88.90	88.70 ± 0.20	89.08	88.32	79.38	40.49	4.55	6.32
3-1/2	91	101.96 ± 0.20	103.25	100.71	101.40 ± 0.20	101.78	101.02	82.55	42.85	4.78	6.71
4	103	114.88 ± 0.23	115.95	113.41	114.07 ± 0.23	114.45	113.70	85.72	44.45	5.00	7.11
5	129	142.06 ± 0.25	143.33	140.80	141.05 ± 0.25	141.80	140.38	92.06	49.20	5.44	7.90
6	155	169.11 ± 0.28	170.38	167.84	168.00 ± 0.28	168.76	167.23	95.25	53.96	5.89	9.12
8	200	220.22 ± 0.38	221.62	218.82	218.69 ± 0.38	220.09	217.68	165.10	123.83	6.10	9.14

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Table 3-3
DIMENSIONS OF INTEGRAL COUPLINGS

TRADE SIZE	METRIC DESIGNATOR	SOCKET INSIDE DIAMETERS AT ENTRANCE MAXIMUM	AT ENTRANCE MINIMUM	AT ENTRANCE AVERAGE	AT BOTTOM MAXIMUM	AT BOTTOM MINIMUM	AT BOTTOM AVERAGE	SOCKET DEPTH MAXIMUM	SOCKET DEPTH MINIMUM[A]	MINIMUM THICKNESS AT ANY POINT OF SOCKET SCHEDULE 40	MINIMUM THICKNESS AT ANY POINT OF SOCKET SCHEDULE 80
U. S. CUSTOMARY UNITS											
1/2	16	0.860	0.844	0.852 ± 0.004	0.844	0.828	0.836 ± 0.004	1.500	0.652	0.095	0.129
3/4	21	1.074	1.054	1.064 ± 0.004	1.056	1.036	1.046 ± 0.004	1.500	0.719	0.095	0.136
1	27	1.340	1.320	1.330 ± 0.005	1.320	1.300	1.310 ± 0.005	1.875	0.875	0.100	0.158
1-1/4	35	1.689	1.685	1.677 ± 0.005	1.667	1.643	1.655 ± 0.005	2.000	0.938	0.120	0.168
1-1/2	41	1.930	1.906	1.918 ± 0.006	1.906	1.882	1.894 ± 0.006	2.000	1.062	0.120	0.166
2	53	2.405	2.381	2.393 ± 0.006	2.381	2.357	2.369 ± 0.006	2.000	1.125	0.130	0.181
2-1/2	63	2.905	2.875	2.890 ± 0.007	2.883	2.853	2.868 ± 0.007	3.000	1.469	0.165	0.229
3	78	3.530	3.500	3.515 ± 0.008	3.507	3.477	3.492 ± 0.008	3.125	1.594	0.179	0.249
3-1/2	91	4.065	3.965	4.015 ± 0.008	4.007	3.977	3.992 ± 0.008	3.250	1.687	0.188	0.264
4	103	4.565	4.465	4.515 ± 0.009	4.506	4.476	4.491 ± 0.009	3.375	1.750	0.197	0.280
5	129	5.643	5.543	5.593 ± 0.010	5.583	5.523	5.553 ± 0.010	3.625	1.937	0.214	0.311
6	155	6.708	6.608	6.658 ± 0.011	6.644	6.584	6.614 ± 0.011	3.750	2.125	0.232	0.359
METRIC UNITS											
1/2	16	21.84	21.44	21.64 ± 0.10	21.44	21.03	21.23 ± 0.10	38.10	16.56	2.41	3.28
3/4	21	27.28	26.77	27.03 ± 0.10	26.82	26.31	26.57 ± 0.10	38.10	18.26	2.41	3.45
1	27	34.04	33.53	33.78 ± 0.13	33.53	33.02	33.27 ± 0.13	47.62	22.22	2.54	4.01
1-1/4	35	42.90	42.30	42.60 ± 0.13	42.34	41.73	42.04 ± 0.13	50.80	23.83	3.05	4.28
1-1/2	41	49.02	48.41	48.72 ± 0.15	48.41	47.80	48.11 ± 0.15	50.80	26.97	3.05	4.22
2	53	61.09	60.48	60.78 ± 0.15	60.48	59.87	60.17 ± 0.15	50.80	28.58	3.30	4.60
2-1/2	63	73.79	73.02	73.41 ± 0.18	73.23	72.47	72.85 ± 0.18	76.20	37.31	4.19	5.82
3	78	89.66	88.90	89.28 ± 0.20	89.08	88.32	88.70 ± 0.20	79.38	40.49	4.55	6.32
3-1/2	91	103.25	100.71	101.96 ± 0.20	101.78	101.02	101.40 ± 0.20	82.55	42.85	4.78	6.71
4	103	115.95	113.41	114.68 ± 0.23	114.45	113.70	114.07 ± 0.23	85.72	44.45	5.00	7.11
5	129	143.33	140.80	142.06 ± 0.25	141.80	140.28	141.05 ± 0.25	92.08	49.20	5.44	7.90
6	155	170.38	167.84	169.11 ± 0.28	168.76	167.23	168.00 ± 0.28	95.25	53.98	5.89	9.12

[A]tests are not needed on sockets complying with these minimums.

Section 4
PERFORMANCE REQUIREMENTS

4.1 QUALIFICATION TESTS

4.1.1 Definition

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

4.1.2 Deflection Resistance

Specimens of PVC tubing and conduit shall not deflect more than specified below under the load given in Table 4-1 when tested in accordance with 5.3. After loading, the minor axis measured inside of each loaded specimen shall not be less than 70 percent of the inside diameter of the specimen measured before loading. Since this value is a function of material modulus, it need only be run when a compound formulation change has been made.

4.1.3 Leakage at Joints

Joints between conduit or tubing and their respective fittings made by methods recommended by the product manufacturer should not leak when tested in accordance with 5.4. Note that this is a qualification requirement and not a quality control test.

4.2 QUALITY CONTROL TESTS

4.2.1 Definition

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

4.2.2 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.

4.2.3 Dimensions

Dimensions of PVC tubing and conduit shall meet the requirements of Table 3-1 when measured in accordance with 5.2.

4.2.4 Flattening

There shall be no evidence of splitting, cracking, or breaking when PVC conduit or tubing is tested in accordance with 5.5.

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4.2.5 Workmanship

Conduit and tubing shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other defects.

4.2.6 Impact Resistance

No crack or tear penetrating the conduit shall appear in seven out of ten specimens of conduit and tubing when tested in accordance with 5.6, using the values given in Table 4-2.

Impact resistance tests are quality control tests intended to verify that the conduit has been properly extruded. The tests are not intended to represent field conditions.

The test criteria, when applied to the conduit within 48 hours of manufacture, have been found by experience to be adequate for handling, transport, and installation. The actual impact resistance strength is generally higher, but varies because it is dependent on specific formulation, specific extruder, and specific extrusion procedures. Changes in formulation to obtain maximum impact resistance may result in lesser values in other parameters, such as deflection resistance.

Exposure of PVC conduit to ultraviolet (UV) radiation will result in a measurable decrease in impact resistance. Therefore, impact resistance values are applicable only at time of manufacture and are not applicable for yard-aged conduit. However, initial impact values set by the standard are higher than necessary for normal handling.

Table 4-1
LOAD FOR DEFLECTION RESISTANCE

Trade Size	Metric Designator	EPT-A-PVC Load N	EPT-A-PVC Load (lbs)	EPC-40-PVC Load N	EPC-40-PVC Load (lbs)	EPC-80-PVC Load N	EPC-80-PVC Load (lbs)
1/2	16	1334	300	4448	1000	8896	2000
3/4	21	1334	300	4448	1000	8896	2000
1	27	1334	300	4448	1000	8896	2000
1 1/4	35	1334	300	4448	1000	8896	2000
1 1/2	41	1557	350	3336	750	8896	2000
2	53	2002	450	3114	700	8896	2000
2 1/2	63	1890	425	4448	1000	8896	2000
3	78	2002	450	4448	1000	8896	2000
3 1/2	91	2446	550	4448	1000	8896	2000
4	103	525	525	4003	900	8896	2000
5	129	--	--	3781	850	8896	2000
6	155	--	--	3781	850	8896	2000
8	200	--	--	3781	850	8896	2000

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Table 4-2
LOAD FOR IMPACT RESISTANCE

Height of the Space Between the Bottom of the Weight and the Top of the Specimen Before the Weight is Released

Trade Size	Metric Designator	EPT-A-PVC m	EPT-A-PVC ft.	EPC-40-PVC m	EPC-40-PVC ft.	EPC-80-PVC m	EPC-80-PVC ft.
1/2	16	0.46	1 1/2	0.77	2 1/2	0.38	1 1/4
3/4	21	0.61	2	1.22	4	0.38	1 1/4
1	27	1.22	4	1.53	5	0.61	2
1 1/4	35	1.83	6	1.83	6	0.69	2 1/4
1 1/2	41	2.29	7 1/2	2.29	7 1/2	0.77	2 1/2
2	53	2.90	9 1/2	2.90	9 1/2	1.22	4
2 1/2	63	3.20	10 1/2	3.20	10 1/2	1.68	5 1/2
3-8	78-200	3.35	11	3.35	11	2.14	7

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Section 5
TEST METHODS

5.1 CONDITIONING, TEST CONDITIONS, AND SAMPLING

5.1.1 Conditioning Test Specimens

When conditioning is required, the test specimens shall be conditioned in accordance with Procedure A in ASTM D 618 at 73.4 ± 3.6 °F (23 ± 2 °C). Shorter time periods shall be permitted for quality control testing if it can be shown that specimens have reached equilibrium.

5.1.2 Test Conditions

Tests shall be conducted at 73.4 ± 3.6 °F (23 ± 2 °C), unless otherwise specified.

5.1.3 Sampling

Samples shall be selected at random.

5.2 DIMENSIONS

5.2.1 Maximum and Minimum Outside Diameter (Out-of-Roundness)

The outside diameter of conduit and tubing shall be measured in accordance with Section 9 of ASTM D 2122. Out-of-roundness tolerances shall apply only at the point of manufacture. Out-of-roundness is not a requirement applicable for conduit that has been packaged and placed in yard storage.

5.2.2 Outside Diameter (Average)

The average outside diameter at any cross section on the length of conduit or tubing shall be as measured by the use of a vernier circumferential tape in accordance with Section 9 of ASTM D 2122.

5.2.3 Wall Thickness

The minimum wall thickness shall be measured with a micrometer at an end of conduit and tubing to the nearest 0.001 inch (0.02 mm) in accordance with Section 6 of ASTM D 2122.

5.2.4 Minimum Inside Diameter

Vernier Calipers or a functional measuring device shall be used to locate and measure the minimum diameter to the nearest 0.001 inch (0.02 mm). Measurements shall be taken at the end of the conduit.

5.3 DEFLECTION RESISTANCE

Three 6-inch (152-mm) long specimens shall be cut from lengths of each size of EPC and EPT. The inside diameter of each specimen shall be measured. Each specimen shall then be placed between a pair of 6-inch (152-mm) or longer rigid flat steel plates that are horizontal and parallel to one another. One plate

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shall be moved toward the other at the rate of 1/2 inch (13 mm) per minute until the load specified in Table 4-1 is applied to the specimen.

5.4 LEAKAGE OF JOINTS

Two pieces of EPC or EPT shall be joined together by a method recommended by the manufacturer. Solvent cemented joints shall be allowed to stand for 24 hours at room temperature prior to testing. The specimen shall be subjected to an internal or external pressure of 25 psi (172.4 kPa), using water as the medium, for one hour.

5.5 FLATTENING

A specimen, with a 2-inch minimum length, shall be flattened between parallel plates in a suitable press until the distance between the plates is 40 percent of the outside diameter of the product. The rate of loading shall be uniform and such that the compression is completed before 2 minutes. On removal of the load, the specimen shall be examined for evidence of splitting or breaking. Failure is defined as breakage of the specimen or as a tear that penetrates through the conduit wall.

NOTE—At the manufacturer's option, the manufacturer may use a longer sample or flatten the sample more than specified, as this would provide a more severe test.

5.6 IMPACT RESISTANCE

Impact specimens shall be 6 ± 1/8 inches in length. Impact specimens shall be tested separately while resting on a solid flat steel plate with a shallow positioning groove (approximately 1/8 inch in depth with the edges rounded to a radius of approximately 1/16 inch).

NOTE— A flat plate with no groove may be used.

For EPT and EPC-40 conduit, a 2-inch radius nose, Tup B, as defined in ASTM D 2444, shall be used. The weight of the tup shall be 20 pounds ± 4 ounces. The tup shall strike the center of the specimen. For EPC-80, a tup in the form of a solid right-circular cylinder having a diameter of 6 inches shall be used. The weight of the tup shall be 75 pounds ± 12 ounces. The minimum impact resistance values are given in Table 4-2.

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Section 6
MARKINGS

6.1 GENERAL

Each of the markings required in the following paragraphs shall be clearly legible and shall comply with the following location and other requirements:

6.1.1 Long Elbows and Other Bends

For long elbows and other bends (long is defined here as more than 24 inch or 610 mm in overall axial length) and for all straight lengths of conduit, the markings shall be on the product and shall comply with the permanence requirements in paragraphs 19.1–19.7 of UL 651.

6.1.2 Short Elbows and Other Bends

For short elbows and other bends (short is defined here as not more than 24 inch or 610 mm in overall axial length), the markings need not be on the product but shall appear on the smallest unit packaging used for the product. In the absence of any packaging, the markings shall appear on a permanent adhesive label affixed to each piece.

6.1.3 Additional Markings

Additional markings are acceptable if they do not conflict with and cannot be confused with the markings covered in the following.

6.2 REQUIREMENTS FOR MARKINGS

The product, package, or label marking shall include:

a. rigid PVC conduit.
b. the trade size of the conduit product.
c. the name or trademark of the manufacturer of these conduit products. If the organization that is responsible for the conduit product is different from the actual manufacturer, both the responsible organization and the actual manufacturer shall be identified by name or by acceptable coding, such as by trade name or trademark. A private labeler may also be identified.
d. Type: schedule 40 or schedule 80.

These markings shall be repeated at uniform intervals and shall appear at least every 10 feet or 3 meters, but not less than once, on each straight length of PVC conduit.

The markings of a product that is intended for use with 90 degree C (194 degree F) wiring shall include the designation "maximum 90 degree C wire " or "max 90 degree C wire."

If the manufacturer produces conduit or elbows and other bends at more than one factory, markings shall include a distinctive designation which may be in code by means of which the conduit or fitting can be identified as the product of a particular factory.

The marking in the previous paragraph shall be in letters at least 1 inch or 6 mm high for conduit products of the 1/2 through 1 1/2 trade sizes and shall be in letters at least 1/2 inch or 13 mm high for conduit products of the 2 through 6 trade sizes.

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APPENDIX A

Table A-1
OUT OF ROUNDNESS GAUGES FOR SCHEDULE 40 AND SCHEDULE 80 CONDUIT

A rigid plate, about 1/4 inch thick, bored with a circulate hole to the maximum permitted diameter allowed for out-of-roundness, accurate to ± 0.002 inches (0.05 mm).

Trade Size	Metric Designator	Circular Hole Dimension mm	Circular Hole Dimension (inches)	Reference Dimension for Gauge mm	Reference Dimension for Gauge (inches)
1/2	16	21.54	(0.848)	21.34 ± 0.20	(0.840 ± 0.008)
3/4	21	26.92	(1.060)	26.67 ± 0.25	(1.050 ± 0.010)
1	27	33.66	(1.325)	33.40 ± 0.25	(1.315 ± 0.010)
1 1/4	35	42.47	(1.672)	42.16 ± 0.30	(1.660 ± 0.012)
1 1/2	41	48.56	(1.912)	48.26 ± 0.30	(1.900 ± 0.012)
2	53	60.63	(2.387)	60.32 ± 0.30	(2.375 ± 0.012)
2 1/2	63	73.41	(2.890)	73.02 ± 0.38	(2.875 ± 0.015)
3	78	89.28	(3.515)	88.90 ± 0.38	(3.500 ± 0.015)
3 1/2	91	102.87	(4.050)	101.60 ± 1.27	(4.000 ± 0.050)
4	103	115.57	(4.550)	114.30 ± 1.27	(4.500 ± 0.050)
5	129	142.57	(5.613)	141.30 ± 1.27	(5.563 ± 0.050)
6	155	169.55	(6.675)	168.28 ± 1.27	(6.625 ± 0.050)
8	200	200.98	(8.700)	219.08 ± 1.91	(8.625 ± 0.075)

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Table A-2
GO/NO-GO GAUGES
FOR SCHEDULE 40 AND SCHEDULE 80 CONDUIT

Tolerance ± 0.05 mm (± 0.002 inches)

		Socket Entrance				Socket Bottom			
Trade Size	Metric Designator	Go Gauge mm	Go Gauge (inches)	No-Go Gauge mm	No-Go Gauge (inches)	Go Gauge mm	Go Gauge (inches)	No-Go Gauge mm	No-Go Gauge (inches)
1/2	16	21.54	(0.848)	21.77	(0.857)	21.13	(0.832)	21.36	(0.841)
3/4	21	26.92	(1.060)	27.15	(1.069)	26.47	(1.042)	26.70	(1.051)
1	27	33.66	(1.325)	33.93	(1.336)	33.15	(1.305)	33.43	(1.316)
1 1/4	35	42.47	(1.672)	42.75	(1.683)	41.91	(1.650)	42.19	(1.661)
1 1/2	41	48.56	(1.912)	48.90	(1.925)	47.96	(1.888)	48.29	(1.901)
2	53	60.63	(2.387)	60.96	(2.400)	60.02	(2.363)	60.35	(2.376)
2 1/2	63	73.23	(2.883)	73.61	(2.898)	72.67	(2.861)	73.05	(2.876)
3	78	89.08	(3.507)	89.51	(3.524)	88.49	(3.484)	88.93	(3.501)
4	103	114.45	(4.506)	114.94	(4.525)	113.84	(4.482)	114.33	(4.501)
5	129	141.81	(5.583)	142.34	(5.604)	140.79	(5.543)	141.33	(5.564)
6	144	168.83	(6.647)	169.42	(6.670)	167.72	(6.603)	168.30	(6.626)
8	200	219.84	(8.655)	220.60	(8.685)	218.31	(8.595)	219.08	(8.625)

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APPENDIX B
EXPANSION CHARACTERISTICS OF RIGID PVC NONMETALLIC CONDUIT

Table B-1 shows the change in length, per 100 feet of conduit, for a given temperature change.

Table B-1
EXPANSION CHARACTERISTICS OF RIGID PVC NONMETALLIC CONDUIT
COEFFICIENT OF THERMAL EXPANSION = 3.38 x 10^{-5} IN-IN/°F

Temperature Change (°F)	Length Change of PVC Conduit (inches/100 feet)
5	0.2
10	0.4
15	0.6
20	0.8
25	1.0
30	1.2
35	1.4
40	1.6
45	1.8
50	2.0
55	2.2
60	2.4
65	2.6
70	2.8
75	3.0
80	3.2
85	3.4
90	3.6
95	3.8
100	4.1
105	4.2
110	4.5
115	4.7
120	4.9
125	5.1
130	5.3
135	5.5
140	5.7
145	5.9
150	6.1
155	6.3
160	6.5
165	6.7
170	6.9
175	7.1
180	7.3
185	7.5
190	7.7
195	7.9
200	8.1

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