Δ ***TABLE 352.44(A)*** *Expansion Characteristics of PVC Rigid Nonmetallic Conduit Coefficient of Thermal Expansion = 6.084 × 10^{-5} mm/mm/°C (3.38 × 10^{-5} in./in./°F)*

Temperature Change (°C)	Length Change of PVC Conduit (mm/m)	Temperature Change (°F)	Length Change of PVC Conduit (in./100 ft)	Temperature Change (°F)	Length Change of PVC Conduit (in./100 ft)
5	0.30	5	0.20	105	4.26
10	0.61	10	0.41	110	4.46
15	0.91	15	0.61	115	4.66
20	1.22	20	0.81	120	4.87
25	1.52	25	1.01	125	5.07
30	1.83	30	1.22	130	5.27
35	2.13	35	1.42	135	5.48
40	2.43	40	1.62	140	5.68
45	2.74	45	1.83	145	5.88
50	3.04	50	2.03	150	6.08
55	3.35	55	2.23	155	6.29
60	3.65	60	2.43	160	6.49
65	3.95	65	2.64	165	6.69
70	4.26	70	2.84	170	6.90
75	4.56	75	3.04	175	7.10
80	4.87	80	3.24	180	7.30
85	5.17	85	3.45	185	7.50
90	5.48	90	3.65	190	7.71
95	5.78	95	3.85	195	7.91
100	6.08	100	4.06	200	8.11

250.134, Exception No. 1, for separately run equipment grounding conductors.

Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.

Part III. Construction Specifications

352.100 Construction. PVC conduit shall be made of rigid (nonplasticized) polyvinyl chloride (PVC). PVC conduit and fittings shall be composed of suitable nonmetallic material that is resistant to moisture and chemical atmospheres. For use aboveground, it shall also be flame retardant, resistant to impact and crushing, resistant to distortion from heat under conditions likely to be encountered in service, and resistant to low temperature and sunlight effects. For use underground, the material shall be acceptably resistant to moisture and corrosive agents and shall be of sufficient strength to withstand abuse, such as by impact and crushing, in handling and during installation. Where intended for direct burial, without encasement in concrete, the material shall also be capable of withstanding continued loading that is likely to be encountered after installation.

352.120 Marking. Each length of PVC conduit shall be clearly and durably marked at least every 3 m (10 ft) as required in the first sentence of 110.21(A). The type of material shall also be included in the marking unless it is visually identifiable. For conduit recognized for use aboveground, these markings shall be permanent. For conduit limited to underground use only, these markings shall be sufficiently durable to remain legible until the material is installed. Conduit shall be permitted to be surface marked to indicate special characteristics of the material.

Informational Note: Examples of these markings include but are not limited to "limited smoke" and "sunlight resistant."

ARTICLE 353

High Density Polyethylene Conduit: (HDPE Conduit)

Part I. General

Δ **353.1 Scope.** This article covers the use, installation, and construction specifications for high density polyethylene (HDPE) conduit and associated fittings.

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353.6 Listing Requirements. HDPE conduit and associated fittings shall be listed.

Part II. Installation

353.10 Uses Permitted. The use of HDPE conduit shall be permitted under the following conditions:

(1) In discrete lengths or in continuous lengths from a reel

(2) In locations subject to severe corrosive influences as covered in 300.6 and where subject to chemicals for which the conduit is listed
(3) In cinder fill
(4) In direct burial installations in earth or concrete

Informational Note to (4): See 300.5 and 305.15 for underground installations.

(5) Above ground, except as prohibited in 353.12, where encased in not less than 50 mm (2 in.) of concrete.
(6) Conductors or cables rated at a temperature higher than the listed temperature rating of HDPE conduit shall be permitted to be installed in HDPE conduit, provided the conductors or cables are not operated at a temperature higher than the listed temperature rating of the HDPE conduit.

Conductors marked with a rated temperature higher than that of the raceway can be used if the conductors are to be operated within the raceway temperature rating.

An example of 353.10(6) is the use of 105°C-rated medium-voltage cables, Type MV, where the cable ampacity at the 105°C rating is reduced to the cable ampacity at 75°C or 90°C to match the listed operating temperature rating of HDPE (75°C or 90°C).

353.12 Uses Not Permitted. HDPE conduit shall not be used under the following conditions:

(1) Where exposed
(2) Within a building
(3) In any hazardous (classified) location, except as permitted by other articles in this *Code*
(4) Where subject to ambient temperatures in excess of 50°C (122°F) unless listed otherwise

353.20 Size.

(A) Minimum. HDPE conduit smaller than metric designator 16 (trade size ½) shall not be used.

Δ **(B) Maximum.** HDPE conduit larger than metric designator 155 (trade size 6) shall not be used.

Informational Note: See 300.1(C) for the trade sizes and metric designators that are for identification purposes only and do not relate to actual dimensions.

353.22 Number of Conductors. The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9.

Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

Table 4 of Chapter 9 provides the usable area within the selected conduit or tubing, and Table 5 provides the required area for each conductor. Examples using these tables to calculate a conduit or tubing size are provided in the commentary following Chapter 9, Notes to Tables, Note 6.

To select the proper trade size of HDPE, see the appropriate sub-tables for Articles 352 and 353, Rigid PVC Conduit (PVC), Schedule 40, and HDPE Conduit (HDPE) in Table 4 of Chapter 9. If the conductors are of the same wire size and insulation type, Tables C.11 and C.11(A) in Informative Annex C can be used instead of performing the calculations.

Δ **353.24 Bends.**

N **(A) How Made.** Bends shall be so made that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Bends shall be permitted to be made manually without auxiliary equipment, and the radius of the curve to the centerline of such bends shall not be less than shown in Table 354.24(A). For conduits of metric designators 129 and 155 (trade sizes 5 and 6), the allowable radii of bends shall be in accordance with specifications provided by the manufacturer.

N **(B) Number in One Run.** The total degrees of bends in a conduit run shall not exceed 360 degrees between pull points.

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353.28 Trimming. All cut ends shall be trimmed inside and outside to remove rough edges.

353.46 Bushings. Where a conduit enters a box, fitting, or other enclosure, a bushing or adapter shall be provided to protect the wire from abrasion unless the box, fitting, or enclosure design provides equivalent protection.

Informational Note: See 300.4(G) for the protection of conductors 4 AWG and larger at bushings.

Δ **353.48 Joints.** All joints between lengths of conduit and between conduit and couplings, fittings, and boxes shall be made by an approved method.

Informational Note: HDPE conduit can be joined using either heat fusion, electrofusion, or mechanical fittings.

353.56 Splices and Taps. Splices and taps shall be made in accordance with 300.15.

Δ **353.60 Grounding.** Where equipment grounding is required, a separate grounding conductor shall be installed in the conduit.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the conduit where used for grounding dc circuits as permitted in 250.134, Exception No. 2.

Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.

Part III. Construction Specifications

353.100 Construction. HDPE conduit shall be composed of high density polyethylene that is resistant to moisture and chemical atmospheres. The material shall be resistant to moisture and corrosive agents and shall be of sufficient strength