Designation: D3485 – 22

An American National Standard

Standard Specification for Coilable High Density Polyethylene (HDPE) Cable in Conduit (CIC)[1]

This standard is issued under the fixed designation D3485; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This specification covers cable in conduit (CIC), which is a smooth-walled, coilable, high-density polyethylene (HDPE) conduit (duct) that contains preassembled wires and cables. The outside diameter of the conduit is controlled and the wire or cable encased within may be comprised of single or multiple configurations consisting of electrical/power wires or cables, fiber optic, traditional copper communication, coaxial cable, or any combination thereof. CIC configurations are preassembled into the conduit during the extrusion process and in industry-specific designs for use in commercial, industrial, transportation, government, and utility applications

1.2 This specification does not attempt to identify every possible preassembled conduit/cable configuration but is intended to identify material and minimum assembled product properties for optimizing reliability and service life.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

NOTE 1—UL 1990 and CSA C22.2 No.327 have a similar scope to D3485; however, there are differences in scope and requirements.

NOTE 2—End users may elect to field install single or multiple wire or cable configurations into field-installed conduit. In the case where polyethylene conduit is to have the wire or cable configurations field installed, then the more appropriate specifications to select for establishing the conduit's material, dimensional, workmanship, and property tests would be Specification F2160, UL 651A, CSA C22.2 No.327 or NEMA TC-7.

NOTE 3—Whenever two sets of values are presented, in different units, the imperial units are the standard, while those in the parentheses (metric units) are provided for informational purposes.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D618 Practice for Conditioning Plastics for Testing
D638 Test Method for Tensile Properties of Plastics
D790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
D792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
D1238 Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
D1505 Test Method for Density of Plastics by the Density-Gradient Technique
D1600 Terminology for Abbreviated Terms Relating to Plastics
D1693 Test Method for Environmental Stress-Cracking of Ethylene Plastics
D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
D2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
D2444 Practice for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)
D3350 Specification for Polyethylene Plastics Pipe and Fittings Materials
D4883 Test Method for Density of Polyethylene by the Ultrasound Technique
F2160 Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD)

[1] This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systemsand is the direct responsibility of Subcommittee F17.26 on Olefin Based Pipe.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard**

F412 Terminology Relating to Plastic Piping Systems

2.2 *Other References:*

NFPA 70 National Electrical Code[3]

NEMA TC 7 Smooth-Wall Coilable Electrical Polyethylene Conduit[4]

Underwriter Laboratories, Inc – UL 1990 , Nonmetallic Underground Conduit with Conductors.[5]

Underwriter Laboratories, Inc – UL 651A Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit[5]

IEEE Standard 1210 Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable[6]

CSA C22.2 No. 327 HDPE conduit, conductors-in-conduit, and fittings[7]

2.3 *Plastic Pipe Institute Standards:*[8]

Handbook of Polyethylene Pipe

TN-48 Guidelines for Choosing Wall Thickness for HDPE Conduit Based on "mini-HDD"

TR-47 Pipe Stiffness and Flattening Tests in Coilable HDPE conduit; and Its Relationship to burial Depth in Conduit Applications

3.1 *Definitions*—General terms used in this specification are as defined in Terminology F412 and abbreviations are in accordance with Terminology D1600, unless otherwise specified.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *continuous runs*—buried sections of coilable CIC comprised of long lengths having no joints between access structures as opposed to the assembling short sections such as 20 foot lengths of conduit and field installation of the cable or cables.

3.2.2 *delaminate, v*—coextruded layers such as, a color layer on the outside of the conduit, shall be permanently bonded and homogeneous to the conduit wall.

3.2.3 *obstructions, n*—Anything that crosses the path or interrupts a continuous run of conduit or power cable such as, other utilities and road crossings.

3.2.4 *termination points*—end points of continuous runs of CIC that provide access to the conduit and cable within structures such as vaults, hand holes and manholes for connecting cable to a device or splicing of the cable ends.

3.3 *Acronyms:*

CIC = Cable in Conduit
HDPE = High Density Polyethylene

4. Application and Installation

4.1 *General*—This specification covers conduit made from non-pressure rated HDPE resins available in five wall types that are outside diameter controlled with installed cables.

4.2 HDPE conduit for underground electrical distribution systems utilizing insulations suitable for use with power and electrical conductors not exceeding 194 °F (90 °C) for normal allowable cable operating temperature. The minimum recommended installation temperature for the HDPE conduit is -13 °F (-25 °C), but in no case should be lower than the minimum installation temperature of the cable.

4.3 CIC is ideally suited for underground or buried installations that allow it to be placed in continuous runs between termination points with a limited number of obstructions in the route. CIC can be installed using any of the following installation methods; in a trench, plowed or horizontal directionally drilled.

4.4 Concrete encasement of CIC made from HDPE for providing added mechanical protection is an acceptable option.

4.5 CIC may be required by local, state or federal agencies or other governing bodies or codes to be approved for use. For example, CIC with electrical cables may need to be installed in accordance with the NFPA 70 National Electric Code (NEC) and have third party testing, be properly labeled and listed by a certified testing laboratory.

5. Materials and Manufacture

5.1 *Polyethylene Plastics*—the high-density polyethylene (HDPE) materials used to make the conduit under this specification shall meet or exceed the following requirements:

5.1.1 *Compound*—PE resin compounds shall be classified in accordance with Specification D3350 and Table 1.

5.1.2 *Rework Material*—Clean polyethylene compound from the manufacturer's internal production may be compounded into the conduit, either alone or blended with virgin compound. Conduit containing the rework material must meet all the material and property requirements of this specification. Where rework material is known to contain cadmium, lead, mercury and/or hexavalent chromium, the loading of rework shall be limited such that the final conduit product shall not

TABLE 1 Minimum Compound Requirements Based on Cell Classification per Specification D3350

Properties	ASTM Test Method	Minimum Acceptable Cell / Value
Density	D1505, D792, or D4883	≥3 / > 0.940 grams/cm^3
Melt Index, (190/2.16)	D1238	≥3 / <0.40 or 2[A]
Flexural Modulus	D790	≥4 / ≥ 80 000 psi
Tensile Strength	D638	≥4 / ≥ 3 000 psi
Slow Crack Growth Resistance	D1693	≥4, or 8 as defined in 5.1.4.3
Hydrostatic Design Basis	No test required	≥0 Pressure rated compounds are not required
Color and UV resistance	D3350	C or E as defined in 5.4.1

[A] Cell class 2 allows for a higher melt index up to 1.00 but for this standard the maximum allowed is 0.55 provided all of the conditions of 5.1.4.2 are met.

[3] Available from the National Fire Protection Assn., 470 Atlantic Ave., Boston, MA 02210.

[4] Available from National Electrical Manufacturers Association (NEMA), 1300 N. 17th St., Suite 1752, Rosslyn, VA 22209, http://www.nema.org.

[5] Available from Underwriters Laboratories (UL), 2600 N.W. Lake Rd., Camas, WA 98607-8542, http://www.ul.com.

[6] Available from Institute of Electrical and Electronics Engineers, Inc. (IEEE), 445 Hoes Ln., Piscataway, NJ 08854, http://www.ieee.org.

[7] Available from Canadian Standards Association (CSA), 178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3, https://www.csagroup.org/store/

[8] Available from Plastics Pipe Institute (PPI), 105 Decker Court, Suite 825, Irving, TX 75062, http://www.plasticpipe.org.