



conEdison

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**DISTRIBUTION ENGINEERING DEPARTMENT
OVERHEAD STANDARDS & PLANNING SECTION**

**SPECIFICATION EO-4379
REVISION 3
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SEPTEMBER 1, 2018**

**PURCHASE REQUIREMENTS FOR
POLYETHYLENE (HDPE) CONDUITS**

**FILE: PURCHASE & TEST,
MANUAL NO. 6, SECTION NO. 8
FIELD MANUAL NO. 22, SECTION NO. 11**

TARGET AUDIENCE	SUPPLY CHAIN CONSTRUCTION MANAGEMENT UNDERGROUND CONSTRUCTION URD SERVICES
NESC REFERENCE	None

TABLE OF CONTENTS

1.0	PURPOSE	3
2.0	APPLICATION	3
3.0	GENERAL	3
4.0	MATERIAL, APPLICATION, AND DIMENSIONS	3
5.0	PERFORMANCE TESTS	5
6.0	THERMAL PROPERTIES	5
7.0	CONDUIT COLOR	5
8.0	CHEMICAL RESISTANCE	6
9.0	CONDUIT BENDS	6
10.0	JOINING METHODS	6
11.0	CONDUIT MARKINGS	6
12.0	CONDUIT DIMENSIONAL ACCEPTANCE CHECK	7
13.0	HDPE CONDUIT PACKAGING	7
14.0	REFERENCE SPECIFICATIONS	7

Specification	Revision	Rev Date	Effective Date	Copyright Information	Page 2/8
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1.0 **PURPOSE**

This specification lists performance requirements for High Density Polyethylene (HDPE) conduits and bends (elbows) for **Electric Distribution**.

2.0 **APPLICATION**

This specification applies to all **Electric Distribution** regions.

3.0 **GENERAL**

HDPE conduits and bends are used to house primary, secondary, service, and street light cables installed on the Underground Residential Distribution (URD) system, and for other approved limited applications on the radial and/or secondary network systems as indicated in specification [EO-3039](#). For installation requirements for both direct buried and trenchless construction, follow specification [EO-3036](#).

4.0 **MATERIAL, APPLICATION, AND DIMENSIONS**

- 4.1 HDPE conduits and bends shall be made from virgin grade polyethylene compounds conforming to ASTM D 3350 Type III, Class B or C, Category 5, Grade P34. Up to 10% of clean, rework material, of the same type and grade generated from the manufacturer's own conduit production, may be used by the same manufacturer, as long as the conduit produced meets all the requirements of this specification.

Specification	Revision	Rev Date	Effective Date	Copyright Information	Page 3/8
EO – 4379	Rev 3	AUG 2018	9/1/2018	1998-2018 Consolidated Edison Co. of New York, Inc.	
Filing Information		Purchase and Test		Manual No. 6	
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- 4.2 HDPE conduits and bends shall have an acceptable cell classification as follows:

ASTM D 3350 Cell Classification Material Requirement for PE Conduit		
Properties	ASTM Test Method	Acceptable Cell
Density	D1505, D792, or D4883	3
Melt Index (190/2.16)	D1238	3 or 4
Flexural Modulus	D790	4 or 5
Tensile Strength	D638	4 or 5
Slow Crack Growth Resistance	D1693	3, 4, or 7*
Hydrostatic Design Basis	D2837	0,1,2,3, or 4
Color & UV Resistance	D3350	C or E
* An ECSR as per Test Method D1693, condition B, 10% Igepal requirement of F10> 96 hours is allowable provided that all other material requirements in the above table are met.		

- 4.3 HDPE conduits and bends shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions or other defects, which 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 as noted in ASTM F 2160 and/or NEMA TC-7.
- 4.4 HDPE conduits and bends should meet Outdoor Storage Stability as per ASTM F 2160.
- 4.5 Conduits and bends shall have a smooth bore and have a nominal diameter of either 2, 4, 5, or 6 inches and shall have a dimensional ratio (DR) of 13.5. Straight conduit sections shall be furnished in 20 ft. nominal lengths or longer if so requested by the specifying engineer. Required bend sections shall have standard 20'-0", 10'-0", or 5'-0" radii. For short distance service pulls, a 3'-0" or 2'-0" radius bend may be used.

Specification	Revision	Rev Date	Effective Date	Copyright Information	Page 4/8
EO – 4379	Rev 3	AUG 2018	9/1/2018	1998-2018 Consolidated Edison Co. of New York, Inc.	
Filing Information		Purchase and Test		Manual No. 6	
		Field Manual		Manual No. 22	

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5.0 PERFORMANCE TESTS

- 5.1 Pipe Stiffness shall be tested using ASTM D 2412. The specimens shall achieve minimum loads given in Table 4-1 at 5% deflection of NEMA TC-7. The conduit or bend shall not present any evidence of cracking, splitting, or any other physical defects after the test is complete.
- 5.2 All Requirements, Test Methods, and Retest and Rejection sections in ASTM F 2160 shall be followed.
- 5.3 Without lubricant in the conduit, the static coefficient of friction value of 0.35 or less is required between the inside surface of HDPE conduit and bends and XLP, PE or EPR jacketed electric cables.
- 5.4 With sufficient lubricant in the conduit, the static coefficient shall have a value of 0.20 or less as per Telecordia GR-356.

6.0 THERMAL PROPERTIES

- 6.1 The HDPE conduit and bends, when exposed to the normal temperature generated from a 90°C conductor cable, shall be capable of carrying at least an 8 psi overburdened soil pressure without undergoing diameter pipe deflection greater than 5%, or significantly decreasing the conduit's load-carrying capacity. In the event that a cable failure occurs in the conduit, the cable should be easily removable from the conduit by means of normal cable pulling operations.
- 6.2 HDPE conduit shall not burn, melt, support combustion, emit dense, toxic or noxious fumes or smoke when it is exposed to the normal or occasional operating temperature of 90°C conductor cable.

7.0 CONDUIT COLOR

- 7.1 HDPE conduit and bends shall be red or black provided that red stripes, each about ¼" wide and at 120 degrees or less from one another, are coextruded into the black conduit.

Specification	Revision	Rev Date	Effective Date	Copyright Information	Page 5/8
EO – 4379	Rev 3	AUG 2018	9/1/2018	1998-2018 Consolidated Edison Co. of New York, Inc.	
Filing Information		Purchase and Test		Manual No. 6	
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8.0 CHEMICAL RESISTANCE

- 8.1 The conduit material shall not be damaged by: fuel oil, transformer oil, gasoline, fresh and salt water, cable oil and lubricant, solvents, ozone/oxidation, biological attacks, rodent attack, corrosion, etc. The conduit material shall not degrade due to biological effects.

9.0 CONDUIT BENDS

- 9.1 Conduit bends shall be constructed of 4ft to 6ft straight pipe, bent to a 22.5 degree or 45 degree angle. Conduit bends shall be joined to straight conduit using the Joining Methods described in section 10.0 below. Each conduit bend shall be marked as per section 11.0 below.

10.0 JOINING METHODS

- 10.1 Mechanical couplings shall be used to join HDPE conduits and bends. The couplings or adaptors shall permit easy cable passage in both directions and be tight to prevent entry of water. They shall provide a flush continuous inside diameter at the joint. The travel distance inside each half of a mechanical coupling body must be sufficient to accommodate the potential maximum thermal lineal expansion of each conduit section attached. (About 1 in./100 ft./10°F).
- 10.2 Fusion bonding (joints) shall be done as per HDPE conduit manufacturer's instructions. The fused joints shall develop a tensile strength equal to that of the conduit itself.

11.0 CONDUIT MARKINGS

- 11.1 Each section of conduit and fitting shall be prominently and permanently identified with the year of manufacture, manufacturer's name, type of duct, Con Edison and "Electric Conduit" Logo, and production run code at intervals of not more than 2 feet. Other marking requirements listed in ASTM F 2160 must be adhered to. Exceptions to these marking requirements must be approved by the Overhead Standards and Planning Engineers.

Specification	Revision	Rev Date	Effective Date	Copyright Information	Page 6/8
EO – 4379	Rev 3	AUG 2018	9/1/2018	1998-2018 Consolidated Edison Co. of New York, Inc.	
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12.0 CONDUIT DIMENSIONAL ACCEPTANCE CHECK

12.1 Con Edison reserves the right to accept or reject conduits, bends, and couplings which do not meet the dimensional requirements in Table 4 - *Minimum Wall Thickness and Tolerance for IPS SDR 9, SDR 11, SDR 13.5, DR 15.5, Schedule 40 and Schedule 80 PE Conduit* and ovality limits indicated in ASTM F 2160.

13.0 HDPE CONDUIT PACKAGING

13.1 Straight conduit and bends shall be packaged, bundled or racked in such a way as to prevent damage or cause excessive ovality during shipment. Conduit shall be packaged in units no greater than four feet in width and two feet in height. Packaged units shall be capable of supporting no less than ten feet in height of packaged units without damaging the packaged conduit. Packaged conduit units shall have provisions for fork lifting.

14.0 REFERENCE SPECIFICATIONS

14.1 HDPE conduits and bends shall meet or exceed requirements listed in the following specifications/standards:

ASTM D 638	Standard Test Method for Tensile Properties of Plastics
ASTM D 1693	Environmental Stress Crack Resistance
ASTM F 2160	Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter
ASTM D 2412	Test for External Loading Properties of Plastics Pipe by Parallel - Plate Loading
ASTM D 2444	Test for Impact Resistance of Thermoplastic Pipe and Bends by Means of a Tup
ASTM D 3350	Standard Specification for Polyethylene Plastics Pipe and Bends Materials
TELCORDIA GR-356-CORE	General Requirements for Optical Cable Innerduct, Associated Conduit, and Accessories
NEMA STANDARD TC-7	Smooth-Wall Coilable Polyethylene Electrical Plastic Duct

Specification	Revision	Rev Date	Effective Date	Copyright Information	Page 7/8
EO – 4379	Rev 3	AUG 2018	9/1/2018	1998-2018 Consolidated Edison Co. of New York, Inc.	
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14.2 The following Company specifications are referenced:

EO-3036	Installation of Direct Buried HDPE Conduits
EO-3039	General guidelines for the Installation of Direct Buried High Density Polyethylene (HDPE) Conduits in Primary Underground Cable Systems, Excluding Underground Residential Distribution Systems
EO-6224	Trenching Requirements for Installing URD Cables in Conduit or Direct Buried and Joint Trenching

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<p>REVISION 3:</p> <p>Specified usage for Electric Distribution.</p> <p>Removed Trenchless digging and Coilable HDPE reference.</p> <p>Removed recommendation on E-Loc Mechanical Connectors.</p> <p>Removed Thermal Testing references of ASTM D 696 and ASTM C 177.</p> <p>Added references of Telcordia GR-356 and EO-3039.</p>	<p>FILE:</p> <p>Purchase & Test, Manual No. 6, Section No. 8 - <u>Conduit, Tubing and Accessories</u></p> <p>Field Manual No. 22, U.R.D., Section No. 11 - <u>Conduits</u></p>
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Specification	Revision	Rev Date	Effective Date	Copyright Information	Page 8/8
EO – 4379	Rev 3	AUG 2018	9/1/2018	1998-2018 Consolidated Edison Co. of New York, Inc.	
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