

1. Scope

This specification covers the minimum acceptable requirements for smooth-wall, coilable, high-density polyethylene (HDPE) conduit for use in providing a protective raceway for electrical cables. The conduit shall be suitable for above ground and below ground use by direct burial, concrete encasement and trenchless installation in wet and dry locations. The conduit shall be suitable for outdoor storage in direct sunlight in Snohomish County, Washington for up to 12 months.

2. Reference Standards

Except as modified herein, the HDPE conduit shall meet all the applicable provisions of the latest revisions of the following standards:

NEMA TC 7 Smooth-Wall Coilable Electrical Polyethylene Conduit

ASTM D 3035 Standard Specification for Polyethylene (PE) and Plastic Pipe (DR-PR) Based on Controlled Outside Diameter

ASTM D 3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

3. Abbreviations and Definitions

3.1 EPEC - Electrical Polyethylene Conduit.

3.2 HDPE - High-Density Polyethylene comprised of those linear polyethylene plastics having a standard density of 0.941 g/cm³ or greater.

3.3 Ovality - A conduit's deviation from roundness as a consequence of coiling, handling or installation.

3.4 SDR - Standard Dimension Ratio is a specific ratio of the average specified duct outside diameter to the duct minimum specified wall thickness (Do/t) for outside diameter-controlled plastic conduit.

4. Applicable Conduit Sizes

This specification applies to the following conduit trade sizes: 1" 2" 2-1/2" 3" 4" 6"

5. Materials

5.1 The electrical polyethylene conduit (EPEC) shall be made from HDPE in accordance with the requirements of NEMA TC 7, Section 3.1.1.

5.2 Color Requirements

The EPEC shall conform to any one of the following three color alternatives. In the event that the cost and availability of the alternatives are equal, then the order of the District's preference is 5.2.1., 5.2.2, and 5.2.3.

5.2.1 Solid black compound, which is UV stabilized for outdoor use per ASTM D 3350, with three continuous red stripes co-extruded longitudinally into the black compound. The red stripes shall be a minimum of 1/4" wide and spaced approximately 120° apart. The red color compound shall be compatible with the black compound, and shall also be UV stabilized.

5.2.2 Solid red compound, which is UV stabilized for outdoor use per ASTM D 3350.

5.2.3 Solid gray compound, which is UV stabilized for outdoor use per ASTM D 3350.

6. Design Requirements

6.1 All conduit shall be manufactured to the dimensions specified in Table 1 of this specification.

6.2 The conduit design shall have either smooth walls inside and outside, or a ribbed inside wall with a smooth outside wall. If the conduit has internal ribs, they shall be in accordance with NEMA TC 7, Section 3.5.

6.3 In accordance with NEMA TC 7 Section 4.1.3, the ovality of 1" - 2" conduit shall not exceed 7%; the ovality of 2-1/2" - 3" conduit shall not exceed 10%; and the ovality for straight lengths of conduit shall not exceed 5%. Due to shipping and resultant coil limitations the ovality of conduit larger than 3" may exceed 10%. Ovality shall be calculated as follows: % Ovality = $[(\text{Max. OD} - \text{Min. OD}) / \text{Avg. OD}] \times 100$. If ovality greater than 10% for coiled conduit larger than trade size 3" is unsuitable for a particular application, the coiled conduit shall be suitable for processing by the installer through re-rounding equipment that corrects ovality to 10% or less. (Note: Reference NEMA TC 7, Annex A for further information regarding ovality measurement and reduction.)

6.4 The outside surface of conduit shall be smooth without any foreign particles or polyethylene compound particles embedded in it that are visible to the unaided eye. There shall not be any holes, cracks or folds in the conduit wall that are visible to the unaided eye.

6.5 Conduit shall pay off the reel and lay on the ground without excessive kinking, snaking or bending. The District shall be the sole judge of what is considered excessive.

6.6 Conduit shall pass the performance tests listed in NEMA TC 7, Section 4.

| Conduit Size (inches) | Average OD (inches) | Type | Min. Wall Thickness (inches) | Max Wall Thickness (inches) | Reference Standard |
|-----------------------|---------------------|--------------|------------------------------|-----------------------------|----------------------|
| 1 | 1.315 +/- 0.007 | EPEC-40-HDPE | 0.133 | 0.153 | NEMA TC 7, Table 3-2 |
| 2 | 2.375 +/- 0.012 | EPEC-40-HDPE | 0.154 | 0.174 | NEMA TC 7, Table 3-2 |
| 2-1/2 | 2.875 +/- 0.014 | EPEC-40-HDPE | 0.23 | 0.227 | NEMA TC 7, Table 3-2 |
| 3 | 3.500 +/- 0.018 | EPEC-40-HDPE | 0.216 | 0.242 | NEMA TC 7, Table 3-2 |

| Conduit Size (inches) | Average OD (inches) | Type | Min. Wall Thickness (inches) | Max Wall Thickness (inches) | Reference Standard |
|-----------------------|---------------------|----------|------------------------------|-----------------------------|---------------------------|
| 4 | 4.500 +/- 0.009 | SDR 13.5 | 0.333 | 0.373 | ASTM D 3035, Tables 1 & 2 |
| 6 | 6.625 +/- 0.011 | SDR 13.5 | 0.491 | 0.550 | ASTM D 3035, Tables 1 & 2 |

Table 1 - Standard Dimensions for Conduit Sizes & Types

7. Identification Markings

Identification markings (except for co-extruded red stripes) shall be indent-printed or inked on the outside surface of the conduit and spaced at intervals of not more than 5 feet. All markings shall be legible for the service life of the conduit.

7.1 Required Markings

The following markings are required. The information may be listed in the order preferred by the manufacturer.

7.1.1 Manufacturer's name or trademark

7.1.2 Trade size (in inches)

7.1.3 Wall thickness, schedule or standard dimension ratio (SDR)

7.1.4 Date code or month and year of manufacture

7.1.5 HDPE

7.1.6 NEMA TC 7 for 1" - 3" EPEC-40-HDPE conduit

7.1.7 ASTM D 3035 for 4" - 6" SDR 13.5 HDPE conduit

7.2 Optional Markings

The following markings are optional. They are acceptable if they do not conflict with and cannot be confused with the marking requirements specified in Section 7.1.

7.2.1 Markings such as lightning bolt symbol may be used to indicate this conduit is a carrier of electrical conductors.

7.2.2 Sequential length numbering (footage markings)

7.2.3 Type of HDPE conduit, e.g., EPEC-40 or SDR 13.5

7.2.4 Three co-extruded red stripes as described in Section 5.2 of this specification may be used to indicate this conduit is a carrier of electrical conductors.

7.2.5 Other markings as agreed upon between the manufacturer and the District

8. Sealing

Conduit ends shall be cut square and plugged or sealed to prevent water and dirt from entering the conduit.