

COMMUNICATION CONDUITS

FULLY PROTECTED CABLES



ALROWAD

INDUSTRIAL COMPLEX

COMMUNICATION CONDUITS



ALROWAD
INDUSTRIAL COMPLEX

Head Quarter

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Ramadan City, Egypt.

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Local Sales

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C O N T E N T

C O M P A N Y P R O F I L E

DUCTS & CONDUITS

02 THE COMPANY

02 CONDUIT STANDARDS

02 COLORS AND DIMENSIONS

02 SMOOTH WALL CONDUIT

02 GROOVED WALL CONDUIT

02 BUNDLED CONDUIT

QUALITY CONTROL

02 QUALITY ASSURED

ACCESSORIES

02 BASE AND SPACERS / END CAPS

Alrowad company is one of the leading Egyptian companies working in plastic industry specialized in designing and manufacturing HDPE pipes and fitting by using the best raw material and developing the highest technology and quality applied in this field, as It's production capacity reach to 6000 tons per month.

Alrowad company is specialized in manufacturing HDPE pipes from 32mm till 1200mm diameter with different pressure classes, It also offering welding and complementary items for polyethylene networks and supplies its machines and also train on its usage.

Our company also develops our products from pipes and

Fitting to serve many sectors such as potable water networks, sewage water networks, infrastructure projects , natural gas, firefighting lines... etc.

We are providing technical support for all stages of the projects

Our vision

to be the leading regional manufacturers of HDPE PIPES and one of the largest manufacturers
As well as contribute in increasing the treatments of potable ,sewage and waste water in Egypt for better living

Our mission

to achieve our vision by providing our customers with Distinctive products ,reliable services ,excellence in quality
through complying with both Egyptian and International standards,



01

HDPE
CONDUITS
HIGH-DENSITY POLYETHYLENE
(HDPE) CONDUITS

ADVANTAGES

CONDUIT STANDARDS

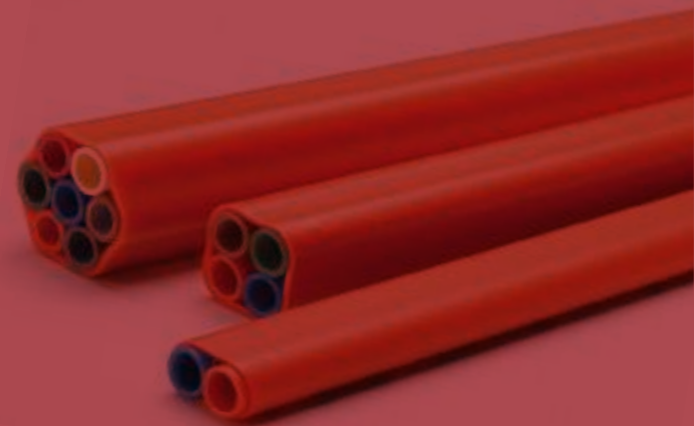
ALROWAD PLASTIC PIPES ARE UNDER INTERNATIONAL STANDARD.



Telecommunication conduits provide necessary security and protection for telecommunication and electrical cables against harsh and high-pressured environments.

The company also produces customized ducts in coils which provide convenience in installation and for meeting specific construction needs. Alrowad Plastic pipes even provides sequential foot markings for ease of installation.

- High tensile strength to endure heavy external loads.
- Long-term strength for increased life and performance
- Lower installation cost
- Resistance to corrosive chemicals and aggressive soils
- Moisture proof and watertight when fusion welded
- No biological growth
- Low resistance to pulled-in cable
- Color coding for easy identification



- **HDPE Pipe:** ISO, ASTM, EN
- **Sizes:** Manufactured up to 630 mm sizes at various standard dimension ratio (SDR).
- **Pipes color:** The color of the PE pipe is black mainly to provide high protection to degradation due to the UV radiation and so there is no limitation on the external use of the PE pipe as they are designed to withstand continuous solar heat for at least 50 years.
- **Pipes Length:** Up to OD 125mm the PE pipes are available in coils of 100 meters standard length. Large diameters supplied in straight rods 12 meters long.
- **Available Customization upon request :** Length, Color, SDR Classes and Variations
- **Thermal Expansion and Contraction:** The coefficient of thermal expansion/contraction for PE Pipe is approximately 0.0002mm/mm/°C
- **Raw Materials:** Alrowad Plastic pipes Polyethylene pipes are manufactured using:
- **HDPE - High density polyethylene**

The above materials contain high-class chosen polymer and high-quality Carbon-Black to get long life under every working and weather conditions.

Each material has its application field, attractions and particular benefits depending on working and installation condition, equipment available and personal preference.

The raw materials used by Alrowad Plastic pipes are carefully selected among the best available on the market. Produced by the polymerization of ethylene they are the outcome of long exhaustive research carried out by polymer manufacturers in company labs and specialized institutes.

The average system lifetime of polymers is up to 50 years. Carrying out various pressure tests on pipe specimens examines the polymer strength.

In compliance with ISO/EN/ASTM Standards tests are performed at a fixed wall hoop stress s and temperature T and their duration recorded on logarithmic graphs (stress s , lifetime t , temperature T) obtaining a series of lines called regression curves. From such curves, which are different for each material, it is possible to predict a pipe lifetime or, after fixing the working period t and temperature T , trace back to the wall stress and therefore calculate a pipe wall thickness.

GROOVED WALL CONDUIT

HDPE CONDUITS

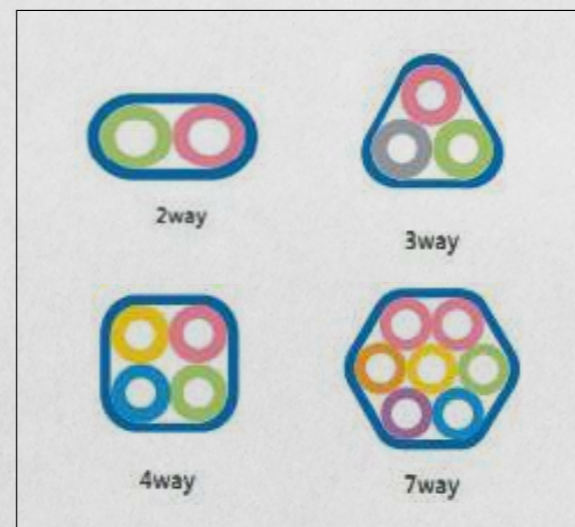
PRODUCT FEATURES :

- Cables pre-installed in HDPE
- Standard wall thickness
- Pre-lubricated during assembly process
- Inside diameter groove; available in sizes as per request
- Sizes: 50-16 mm
- Low-sliding friction to aid in the pulling and jetting of Micro-Guard and micro-cables
- High tensile strength material for longer pulling distances
- Variety of colors/ stripes for identification - paralleling available
- Sequential-marked meters
- UV-formulated material for outside storage
- Complete line of fittings and accessories



BUNDLED CONDUIT

CONDUIT-IN-CONDUIT



Material Specifications				
1	Ducts are manufactured with High Grade 100% Virgin HDPE			
2	Melt Flow Index	ASTM D 238-10 ASTM F2160	< 0.35 g/10min	Per Batch
3	Density	ASTM D792-08 ASTM F2160	0.940 -0.958 g/cm ³	Per Batch

PRODUCT FEATURES :

- Cables pre-installed in HDPE
- Eliminating the need to pull cables
- Standard wall thickness
- Available in sizes
- Pre-lubricated during assembly process
- Inner conduit Sizes: 32-13 mm
- UV-formulated material for outside storage

Note: Custom options and other dimensions or specifications can be produced upon request

Item	Row x Column	Size Outside/Inside Dimension (mm)	Outer Jacket wt. (mm)
1	Hex Array 7 Pipes	20/15	1.00-1.4
2	1x2	12/08	1.00-1.4
3	1x2	10/06	1.00-1.4
4	2x2	25/20	1.00-1.4
	2x2	20/16	1.00-1.4
	2x2	10/6	1.00-1.4
	2x2	28/24	1.00-1.4
5	Triangle array 3 pipes	28/24	1.00-1.4

ALROWAD PLASTIC PIPES

TELECOMMUNICATION PIPES

Alrowad Plastic Pipes has emerged as a renowned name in the piping industry in Egypt and MENA region by offering a range of high-density polyethylene (HDPE) pipes. The company has over thirty years of experience in the manufacturing sector of HDPE products.

The company exports wide range of HDPE Pipes mainly used not only for telecommunication lines but also for irrigations, potable water, drainages, and gas infrastructure. Designed in compliance with ISO and DIN standards, our range finds application in varied industries like Agricultural, Water Sanitation, Firefighting, and chemical industries.

Alrowad Plastic pipes are also widely appreciated for high chemical resistance and better flow characteristic. The company also offers customized telecom pipes, fittings, and accessories.



02

SELECTING & SPECIFYING HDPE CONDUIT FOR POWER AND COMMUNICATIONS APPLICATIONS

HDPE MATERIAL FOR CONDUIT APPLICATIONS

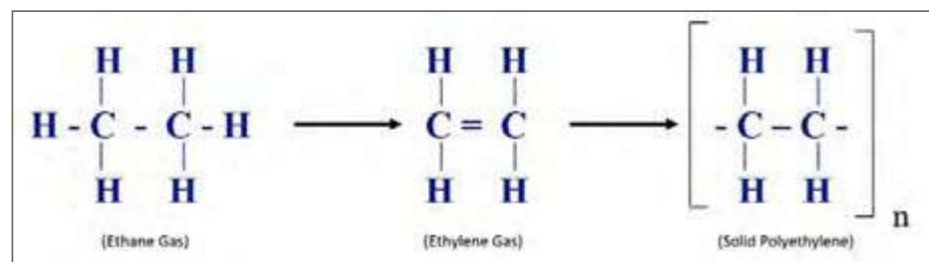
INTRODUCTION TO HIGH DENSITY POLYETHYLENE (HDPE)

PRODUCT FEATURES:

- Pipe for many applications
- Water and sewer
- Gas distribution
- Oil and gas production
- Industrial
- Drainage
- Conduit
- Sheet
- Bottles
- Fuel Tanks
- Cable insulation



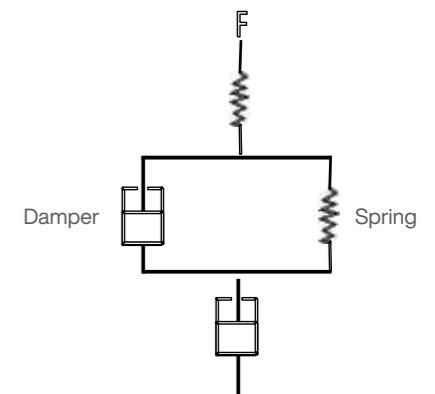
WHAT IS PE?



- Polyethylene (PE): A thermoplastic produced from polymerization of ethylene
- Ethylene is a derivative of ethane, a constituent within natural gas or derived from oil
- Ethane is a very clean molecule, energy efficient in production
- PE is non-polar, making it slippery (low surface polarity)
- Saturated bonds resist most chemical attack
- PE is environmentally-friendly

WHAT IS HDPE?

- This unique polymeric structure of HDPE yields a Visco-Elastic material
- Viscous: Requires time to deform and to recover deformation
- Elastic: Immediate recoverable deformation
- HDPE materials are blended or "tuned" for ideal combinations of material properties
- Typical Max. Operating Temp. is ~140F (~60C) for pressure pipe



HDPE PROPERTIES - CELL CLASSIFICATION
ACCORDING TO ASTM D3350

HDPE PROPERTIES - CELL CLASSIFICATION
ACCORDING TO ASTM D3350

- Minimum Cell Classification for HDPE conduit is PE100 or PE80
- This is what that means:

Property	Value/Range	Test Method
Density = 3	> 0.94 g/cm ³	ASTM D1505
Melt Index = 3	< 0.4 g/10 min.	ASTM D1238
Flexural Modulus = 4	≥ 80,000 psi (≥ 552 MPa)	ASTM D790
Tensile Strength, Yield = 4	≥ 3,000 psi (≥ 21 MPa)	ASTM D638
Slow Crack Growth Resistance = 8	F10 ≥ 96 hours (10% Igepal)	ASTM D1693
Hydrostatic Strength Classification = 0	N/A	ASTM D2837

C = Black using Carbon Black, whereas E = Colored with UV Stabilizer

TYPICAL CONDUIT GRADE

Property	Value/Range	Test Method
- Tensile Elongation to Break	> 400%	ASTM D638
- Brittleness Temperature	< -139°F (-95°C)	ASTM D746A
- Melt Temperature	~ 250°F (121°C)	ASTM D746A
- Auto-Ignition	> 650°F (340°C)	
- Dielectric Strength	500-600 Volts/mil (19 – 23 kV/mm)	
- Coefficient of Friction	0.29	

D3350 - 14

TABLE 1 Primary Properties^a —Cell Classification Limits

Property	Test Method	0	1	2	3	4	5	6	7	8
1. Density, g/cm ³	D1505	Unspecified	0.925 or lower	>0.925-0.940	>0.940-0.947	>0.947-0.955	>0.955			Specify Value
2. Melt index	D1238	Unspecified	>1.0	1.0 to 0.4	<0.4 to 0.15	<0.15 ^b				Specify Value
3. Flexural modulus, MPa (psi)	D790	Unspecified	<138 (<20 000)	138-276 (20 000 to <40 000)	276-552 (40 000 to 80 000)	552-758 (80 000 to 110 000)	758-1103 (110 000 to >160 000)	>1103 (>160 000)		Specify Value
4. Tensile strength at yield, MPa (psi)	D403	Unspecified	<15 (<2200)	15-18 (2200-2600)	18-21 (2600-3000)	21-24 (3000-3500)	24-28 (3500-4000)	>28 (>4000)		Specify Value
5. Slow Crack Growth Resistance										
I. ESCR	D1693	Unspecified	A	B	C	C				Specify Value
a. Test condition (100% Igepal) ^d										
b. Test duration, h			48	24	102	600				
c. Failure, max. %	F1473	Unspecified	50	50	20	20				
II. PENT (hours)										
Molded plaque, 80°C, 2.4 MPa		Unspecified			10	30	100	500		Specify Value
Notch depth, F1473, Table 1		Unspecified								
6. Hydrostatic Strength Classification										
I. Hydrostatic design basis, MPa (psi), (23°C)	D2837	NPR ^e	5.52 (800)	6.89 (1000)	9.62 (1250)	11.02 (1600)				
II. Minimum required strength, MPa (psi), (20°C)	ISO 12162						8 (1160)	10 (1450)		



- Cell classifications define if a material is low-, medium-, or high-density
- ASTM D3350: "Standard Specification for Polyethylene Plastics Pipe and Fitting Materials"

HDPE PROPERTIES - CONDUIT MATERIALS
ACCORDING TO ASTM /EN/ISO/DIN

PRODUCT STANDARDS SUCH AS ASTM F2160
DEFINE MATERIALS REQUIREMENTS

“STANDARD
SPECIFICATION FOR SOLID
WALL HDPE CONDUIT...”

4. Materials

4.1 PE compound shall meet Specification D3350 requirements and be classified in accordance with Specification D3350 with a minimum cell classification of PE334480C or PE334480E. Higher classification values for the first four cells and the sixth cell shall be acceptable. The classification value for the fifth cell shall be 8 in accordance with 4.2.

4.2 *Slow Crack Growth*—The minimum specified ESCR cell class 8 requirement is F10 > 96 h per Test Method D1693, condition B, 10 % Igepal. Alternatively, slow crack growth cell classification per Specification D3350 of 4 or higher is acceptable in meeting this requirement

4.4 *Aerial Applications*—PE material for black conduit in long-term above ground applications, such as aerial suspension, shall be stabilized with a minimum of 2–4 % by weight carbon black having an average particle size less than or equal to 20 nanometers.

HDPE PROPERTIES - CONDUIT PERFORMANCE
ACCORDING TO ASTM F2160

- PRODUCT STANDARDS SUCH AS ASTM F2160
DEFINE PERFORMANCE REQUIREMENTS
- EXCERPT FROM

ASTM F16-2160

“STANDARD SPECIFICATION FOR
SOLID WALL HDPE CONDUIT...”

5.5 *Pipe Stiffness, Compression and Recovery*—Specimens shall achieve the minimum loads given in Table 5, Table 6, and Table 7 at 5% deflection when tested in accordance with 6.5. In addition, during compression and recovery testing specimens shall not split or crack, when tested in accordance with 6.6.

NOTE 4—The minimum values for Pipe Stiffness (PS) are calculated using the minimum allowable flexural modulus specified of 80,000 psi. The calculated values are derived as outlined in Appendix X2 of Test Method D2412. The minimum values shown for (LbsF) force are calculated based on the test requirements of 5% deflection of the average ID at a deflection rate of 0.5 in/minute on a sample six inches long from the minimum PS values.

5.3.1 *Elongation at Break*—When tested in accordance with 6.2, the minimum elongation at break shall be 400 %.

5.3.2 *Impact*—The conduit shall not fail when three specimens are tested at the low-temperature condition of -4°F (-20°C), in accordance with 6.3 – 6.3.2 or if one out of three specimen fails, then a retest of three additional specimen shall result in no failures.



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CONDUITS

HDPE CONDUIT INTRODUCTION

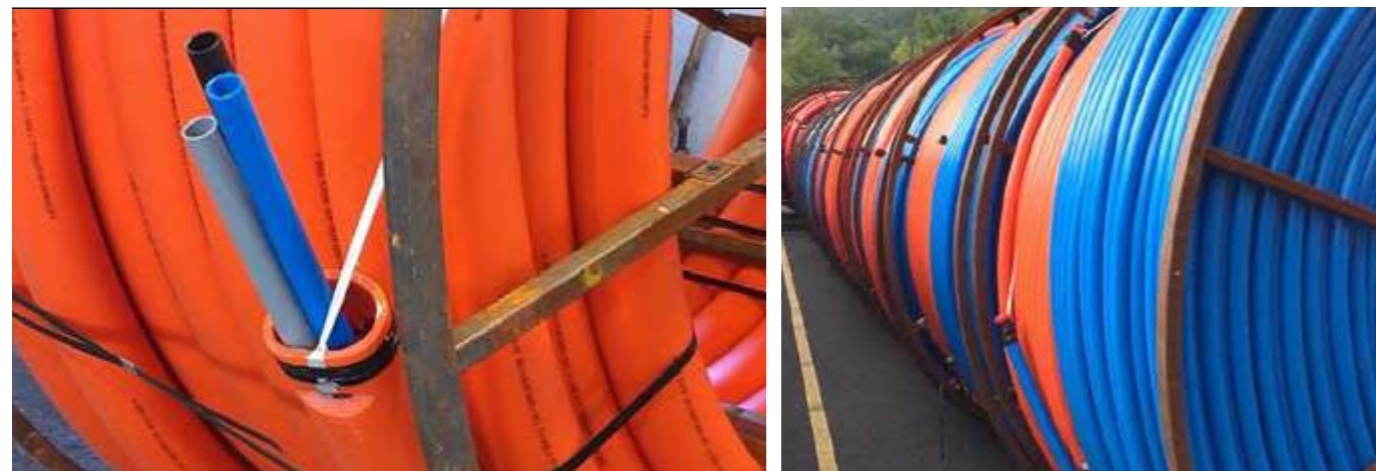
- High density polyethylene (HDPE) conduit is the preferred material to house and protect electrical power and telecommunications cables
- HDPE offers unmatched corrosion and chemical resistance, is flexible and durable, and is available in long reel lengths to reduce joints and installation time
- HDPE conduit is available in a variety of sizes, colors, dimensions and lengths

HDPE CONDUIT BENEFITS



- Not susceptible to corrosion
- Moisture-proof and watertight
- Can be installed around underground obstacles
- Resists brittleness due to aging or cold weather
- Eliminates maintenance common to aerial networks
- Easy installation due to long lengths and high pull strength
- Low coefficient of friction allows easier long-distance cable pulls
- Accommodates gradual changes in direction and elevation
- Bends and flexes without breakage, even with ground heaves or shifts, over a wide range of temperatures
- High ductility resists damage during transportation, handling, and installation and retains impact resistance

HDPE CONDUIT TYPES AND COLORS



- Example: Three-in-One HDPE conduit with inner duct
- Example: Multi-color reel of 2 inch IPS conduit
- Various solid colors and stripe combinations are available

HDPE CONDUIT OD/ID AND WALL OPTIONS

- OD sizing systems include IPS wall types SDR9, SDR11, SDR 13.5, DR 15.5, Schedule 40, and Schedule 80
- ID sizing systems include «True Sized» and SIDR
- Wall thickness is described by the Dimension Ratio (DR)* which typically ranges from SDR 9 to SDR 17 for diameters up to -12inch
- Standards such as ASTM F2160, NEMA TC 7, UL 651A specify exact dimensions

*RATIO OF OUTSIDE DIAMETER TO WALL THICKNESS. THE LOWER THE DR NUMBER, THE THICKER THE WALL, RELATIVE TO OTHER DIMENSION RATIOS. SOME DIMENSION RATIOS ARE NUMERICALLY “STANDARD” AND REFERRED TO AS “SDR”

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

Nominal Size	DR 15.5		SDR 13.5		SDR 11		SDR 9		Schedule 40		Schedule 80	
	Min.	Tol.	Min.	Tol.	Min.	Tol.	Min.	Tol.	Min.	Tol.	Min.	Tol.
	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)
½	0.062 (1.60)	+0.020 (+0.51)	0.062 (1.57)	+0.020 (+0.51)	0.076 (1.93)	+0.020 (+0.51)	0.093 (2.36)	+0.020 (+0.51)	0.109 (2.77)	+0.020 (+0.51)	0.147 (3.73)	+0.020 (+0.51)
¾	0.068 (1.73)	+0.020 (+0.51)	0.078 (1.98)	+0.020 (+0.51)	0.085 (2.17)	+0.020 (+0.51)	0.117 (2.97)	+0.020 (+0.51)	0.113 (2.87)	+0.020 (+0.51)	0.154 (3.91)	+0.020 (+0.51)
1	0.084 (2.13)	+0.020 (+0.51)	0.097 (2.46)	+0.020 (+0.51)	0.120 (3.05)	+0.020 (+0.51)	0.146 (3.71)	+0.020 (+0.51)	0.133 (3.38)	+0.020 (+0.51)	0.179 (4.55)	+0.021 (+0.53)
1¼	0.107 (2.72)	+0.020 (+0.51)	0.123 (3.12)	+0.020 (+0.51)	0.151 (3.84)	+0.020 (+0.51)	0.184 (4.67)	+0.022 (+0.56)	0.140 (3.56)	+0.020 (+0.51)	0.191 (4.85)	+0.023 (+0.58)
1½	0.123 (3.12)	+0.020 (+0.51)	0.141 (3.58)	+0.020 (+0.51)	0.173 (4.39)	+0.021 (+0.53)	0.211 (5.36)	+0.025 (+0.64)	0.145 (3.68)	+0.020 (+0.51)	0.200 (5.08)	+0.024 (+0.61)
2	0.153 (3.89)	+0.020 (+0.51)	0.176 (4.47)	+0.020 (+0.51)	0.216 (5.49)	+0.026 (+0.66)	0.264 (6.71)	+0.032 (+0.81)	0.154 (3.91)	+0.020 (+0.51)	0.218 (5.54)	+0.026 (+0.66)
2½	0.185 (4.70)	+0.022 (+0.56)	0.213 (5.41)	+0.020 (+0.51)	0.261 (6.64)	+0.031 (+0.80)	0.319 (8.11)	+0.038 (+0.97)	0.203 (5.16)	+0.024 (+0.61)	0.276 (7.01)	+0.033 (+0.84)
3	0.226 (5.74)	+0.027 (+0.69)	0.259 (6.58)	+0.031 (+0.79)	0.318 (8.08)	+0.038 (+0.97)	0.389 (9.88)	+0.047 (+1.19)	0.216 (5.49)	+0.026 (+0.66)	0.300 (7.62)	+0.036 (+0.91)

Excerpt from ASTM F16-2160 shows wide range of wall types

SUMMARY

- HDPE's physical properties make it ideally-suited for a wide range of installation applications protecting both power and communications cables
- HDPE Conduit is available in a variety of diameters, wall types, colors, configurations
- HDPE Conduit can be supplied with special features including color & stripes, added UV protection for aerial, pull tapes, lubrication and/or cables which are factory-installed



03

SUITABILITY FOR POWER APPLICATIONS

HDPE Conduit is resistant to typical heat experienced in power applications
Capable of protecting 90 degree C rated power cables

COMMON APPLICATIONS FOR HDPE CONDUIT

APPLICATIONS ADDRESSED BY HDPE CONDUIT



COMMON APPLICATIONS INCLUDE:

- Power:
 - Low-voltage and medium-voltage
 - Site Lighting
 - Signal and Control
 - Fiber Optic and Communications
- Renewable Energy
- ITS (Intelligent Transportation Systems)
- SCADA (Supervisory Control and Data Acquisition)
- Sensing, IOT (internet of things), Security, Healthcare
- 5G wireless

POWER



- HDPE conduit is used to protect underground power lines
 - Low voltage: 600 V
 - Medium voltage: 15kV to 35kV
- Underground installation of power distribution cables using HDPE conduit is a reliable, sustainable and economical solution
- Buried power lines are not as susceptible to storm damage and other events as compared to aerial cables
- Underground cables require less maintenance than aerial cables (e.g. tree trimming)
- The resiliency and reliability of utilities is typically improved when buried underground

HDPE CONDUIT BENEFITS



- CIC is HDPE conduit extruded over cable in the controlled environment of the manufacturing facility
- Reduces installation time, improves productivity
- CIC is less susceptible to damage than installing power cables in the field



- HDPE conduit is used to protect fiber optic installations connecting data centers to neighborhoods, schools, industry, and government with high-speed data
- Protecting the Information Superhighway

FIBER OPTIC AND COMMUNICATIONS



- HDPE conduit is used to protect fiber optic installations serving neighborhoods, schools, industry and government with high-speed data



- When new roads are constructed or rebuilt, HDPE conduit is one of the first utilities to be installed, often for future fiber optic cable ("Dig once")

RENEWABLE ENERGY



- Solar and wind power projects utilize HDPE conduit for command & control

ITS - INTELLIGENT TRANSPORTATION SYSTEMS



- HDPE conduit protects fiber optic & copper communication cables and power cables

SCADA - SUPERVISORY CONTROL AND
DATA ACQUISITION



- Examples are command/control systems for water treatment plants, oil and gas pipelines, factories, control of solar farm panels, control of wind power propellers, etc.



SUMMARY

COMMON APPLICATIONS INCLUDE:

- Power
 - Low-voltage and medium-voltage
 - Site Lighting
 - Signal and Control
- Fiber Optic and Communications
- Renewable Energy
- ITS (Intelligent Transportation Systems)
- SCADA (Supervisory Control and Data Acquisition)
- Sensing, IOT (internet of things), Security, Healthcare
- 5G wireless



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04

HDPE CONDUIT
INSTALLATION TECHNIQUES

INSTALLATION TYPES



HDPE CONDUIT IS INSTALLED
VIA THREE PRIMARY METHODS:

- Open Cut : Trenching, backhoe
- Plowing : Chute plow, pull plow
- Boring : Horizontal Directional Drilling
- Pneumatic stitch boring

OPEN CUT
TRENCHING, BACKHOE



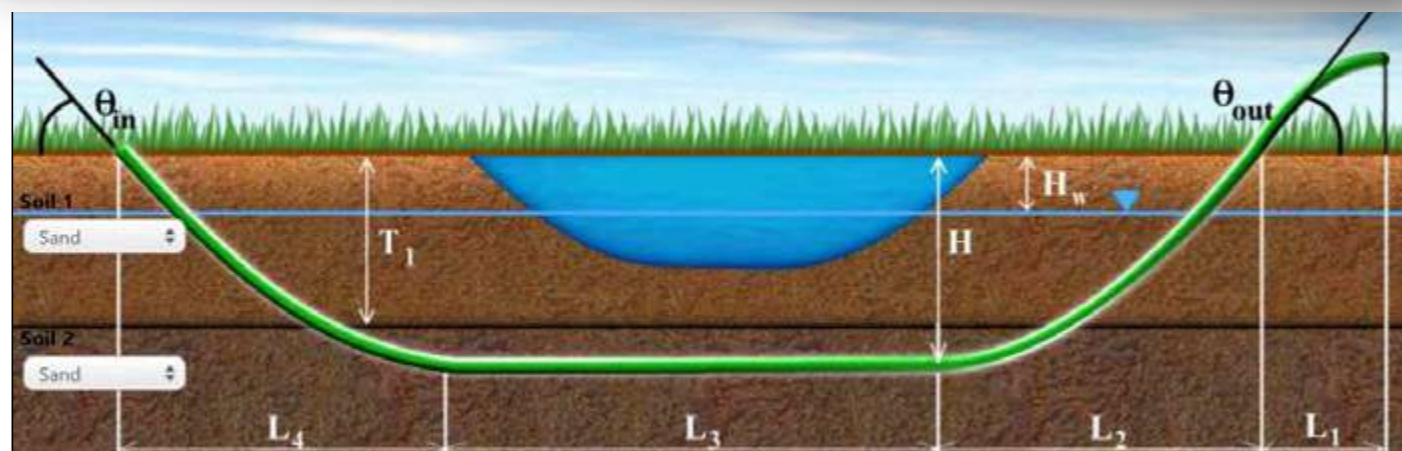
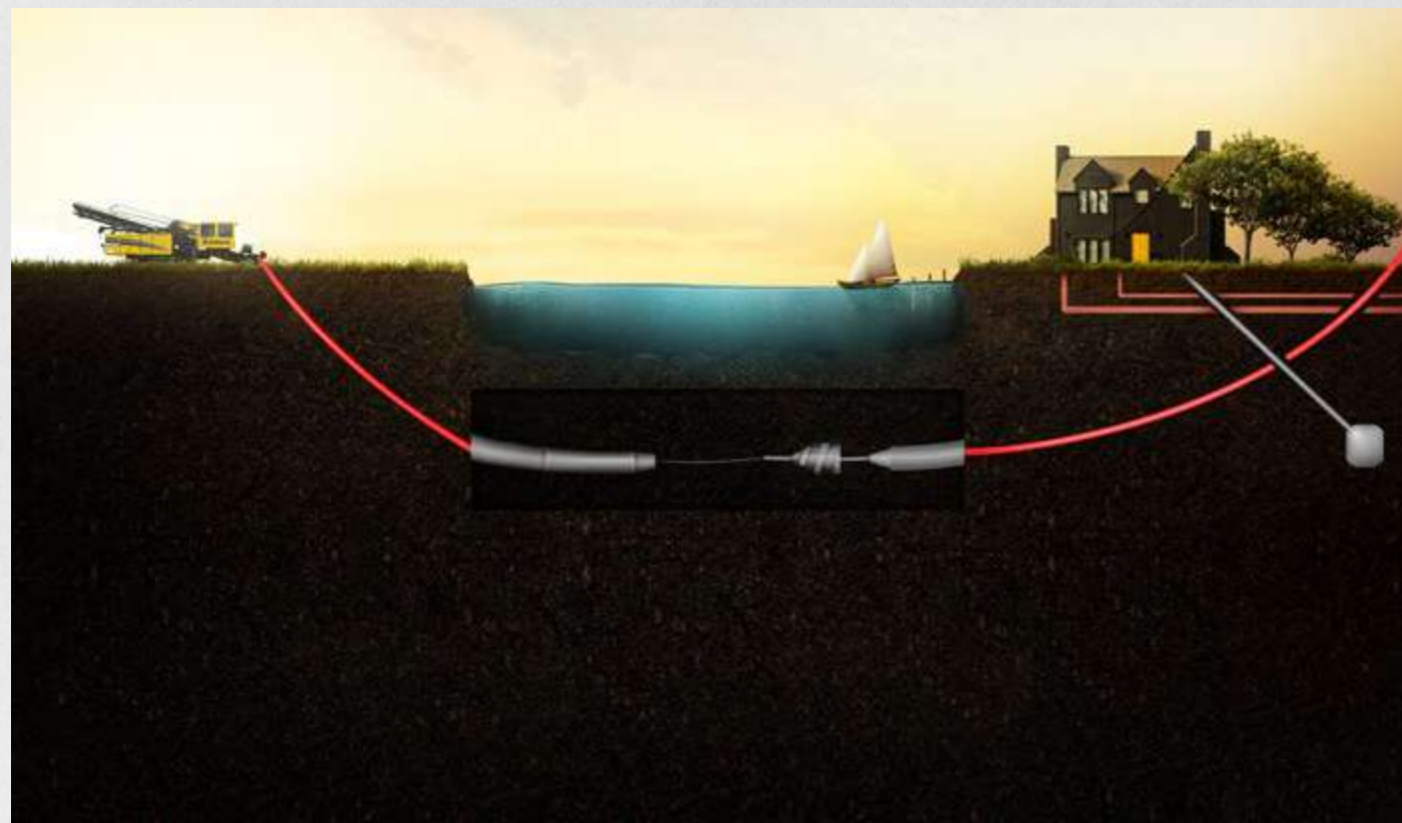
PLOWING
CHUTE PLOW, PULL PLOW



PLOWING
CONTINUOUS LENGTHS +1000 FT



HORIZONTAL DIRECTIONAL DRILLING (HDD)
BORING UNDER ROADWAYS OR WATERWAYS AND PULLING THE CONDUIT
UNDERGROUND CAN ALSO BE DONE AS SLIP LINING OR PIPE BURSTING



EXAMPLE: TWENTY 2" DUCTS INSTALLED UNDER A FIELD, A RIVER AND A GOLF COURSE – 800 FT



EXAMPLE: TWENTY 2" DUCTS INSTALLED UNDER A FIELD, A RIVER AND A GOLF COURSE – 800 FT



HDPE CONDUIT INSTALLATION TECHNIQUES



- Conduit Installation
- This section reviews various underground installation methods, above ground installation methods (aerial) and installation of inner ducts within existing ducts or casing pipes. Considerations related to the mechanical stresses and limits for each of the methods are discussed. The next section provides information on the installation of cables within ducts. PE conduit can be wound onto reels with conduit lengths several thousand feet long. The length and flexibility allow navigation around unexpected obstructions below ground or within existing ducts and casings. Therefore, manufactured bends or elbows can be virtually eliminated. The few joints that are required can be made reliably through a number of options. HDPE conduit is suitable for all methods of duct and cable installation, including trenching, direct plow and installation into existing populated larger conduits and casing pipes. Also, the flexible nature of HDPE conduit facilitates directional bore installations to traverse under obstacles like rivers or highways. Special HDPE products and accessories are also available for above ground or aerial applications.
- Below Ground
- Installation Generally, the three primary underground installation (or "OSP/Outside Plant") methods are trenching, plowing and boring, described in general terms below.
- Duct and Conduit Conduits intended for buried applications are commonly differentiated into two classes, rigid and flexible, depending on their capacity to deform in service without cracking, or otherwise failing. HDPE conduit can safely withstand considerable deformation without fracturing and is, therefore, classified as a flexible conduit. Flexible conduits deform vertically under earth load and expand laterally into the surrounding soil. The lateral movement mobilizes the soil's passive resistance forces, which limit deformation of the conduit.

The accompanying vertical deflection permits soil-arching action to create a more uniform and reduced soil pressure acting on the conduit. HDPE stress relaxes over time to decrease the bending moment in the conduit wall and accommodates local deformation (strain) due to imperfections in the embedment material, both in the ring and longitudinal directions. The relationship between pipe stiffness, soil modulus

- The pipe stiffness
- , as measured by ASTM D2412, and Spangler's Iowa formula provide a basis for prediction of conduit deflection as related to dimension ratio and resin modulus. It should be noted, however, the duration of loading affects the pipe stiffness, so the long term modulus should be used.
- Backfilling
- It is best to place the select soil, free of large rocks or clumps and that is easily compacted, directly on and around the conduit to a height of 6 inches over the conduit crown. DO NOT place large rocks directly on the conduit. Allow at least 6 inches (15.3 cm) of clean, uniform soil above the conduit crown, after which the natural backfill can be returned to the trench. The apparent change in soil condition also provides warning as any digging nears the conduit structure. This should not replace the practice of placing warning tape, but rather should serve as a supplement. Fill the trench and compact as required to provide compaction and prevent the trench backfill from settling. During backfill, warning tape should be placed typically 1 to 3 feet above the conduit.
- Direct Plow
- Plowing is the preferred installation for long continuous runs where soil conditions, space and an unobstructed route permit (e.g. in rural areas) plowing installations use a plow blade (pulled by a tractor or mounted to a railroad car) to cut a furrow in the earth and place the conduit at the required depth through the plow's chute.

SUMMARY



COMMON APPLICATIONS INCLUDE:

- HDPE conduit is installed via three primary methods
 - Trenching
 - Plowing
 - HDD
- Installation "tools" available



05

INDUSTRY STANDARDS FOR HDPE CONDUIT

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CURRENT HDPE CONDUIT STANDARDS



- The first ASTM standard specification written and approved for HDPE conduit was ASTM F2160 “Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD)”
- F2160 was originally approved in 2001, then revised in 2008, and again in 2010
- In 2016, a significant revision of F2160 expanded the Scope, consolidated 11 dimensional tables into four, clarified test procedures, added pipe stiffness requirements, and revised requirements, such as resistance to slow crack growth
- Revision was published as F16-2160 in December 2016

AASHTO R2017) 2013-63): STANDARD PRACTICE FOR SOLID WALL HIGH- DENSITY POLYETHYLENE (HDPE) CONDUIT FOR NON-PRESSURE APPLICATIONS USED FOR THE PROTECTION OF POWER AND TELECOMMUNICATIONS CABLES

“This standard practice provides guidance to engineers in the specification of HDPE conduit used in buried applications for the protection of power cables for use in highways, airport lighting, traffic control, and fiber optic data and command and control applications in State Transportation Projects.”

“This standard practice does not include guidelines for installation of HDPE conduit. Typical installation methods include trenching, plowing, and Horizontal Directional Drilling (HDD). Consult the PPI (Plastics Pipe Institute) Handbook of Polyethylene Pipe and TN (Technical Notes) on the PPI website, <http://plasticpipe.org>, for further information and guidance on installation methods.”

ASTM F16-2160: STANDARD SPECIFICATION FOR SOLID WALL HIGH DENSITY POLYETHYLENE (HDPE) CONDUIT BASED ON CONTROLLED OUTSIDE DIAMETER (OD)

“This specification covers material, dimensional, workmanship and performance requirements for polyethylene conduit, duct and innerduct manufactured for use in non- pressure applications for the protection of fiber optic and power cables. Applications include telecom, SCADA command and control, highway lighting, ITS (Intelligent Transportation Systems) and Underground Utilities with PE conduit installed using methods such as Horizontal Directional Drilling (HDD), plowing and open trench.”



ASTM D15-3485: STANDARD SPECIFICATION FOR COILABLE HIGH DENSITY POLYETHYLENE (HDPE) CABLE IN CONDUIT

“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.”

- Includes trade sizes from 1/2 to 3
- Originally approved 1976
- Current edition approved in 2015



HDPE CONDUIT FULLY PROTECTED CABLES

CSA C22.2 NO. 327: HDPE CONDUIT, CONDUCTORS IN CONDUIT, AND FITTINGS

“This Standard applies to high density polyethylene (HDPE) conduit, HDPE conduit with conductors, and fittings, intended for use at a continuous operating temperature of °75C or °90C, for installation in accordance with the Rules of the Canadian Electrical Code, Part I, for direct burial or encasement in concrete or masonry in ordinary (non- hazardous) locations..”

UL 1990: STANDARD FOR NONMETALLIC UNDERGROUND CONDUIT WITH CONDUCTORS

“These requirements cover nonmetallic underground conduit with conductors. These products consist of a factory assembly of conductors or cables inside a coilable, smooth- wall, continuous length conduit with a circular cross section. The conduit is Schedule40-, Schedule80-, EPEC-A or EPEC-B High Density Polyethylene (HDPE) in trade sizes 2/1 (103) 4 - (16). This product is intended for installation in accordance with the National Electrical Code, NFPA 70.”



NEMA TCB 16-4: GUIDELINES FOR THE SELECTION AND INSTALLATION OF SMOOTH-WALL COILABLE HIGH-DENSITY POLYETHYLENE (HDPE) CONDUIT

“NEMA TCB 2016-4 Guidelines for the Selection and Installation of Smooth-Wall Coilable High-Density Polyethylene (HDPE) Conduit provides recommendations for the selection, handling, and installation of underground HDPE conduit or raceway for power, lighting, signaling, and communications applications. It applies to both direct burial and encased burial installations, and covers topics such as handling, joining methods, separation and mandrelling.”

PPI TN50-: GUIDE TO SPECIFYING HDPE CONDUIT

- “The purpose of this technical note is to provide general information about the history of the development of high-density polyethylene (HDPE) conduit and the various standards which apply to these products. The technical note may also be used as a guide for selecting appropriate standard specifications for users and specifiers.”

- Maintained annually by industry through PPI

PPI TN50-: GUIDE TO SPECIFYING HDPE CONDUIT

Wall Type	HDPE Conduit Standards with Available Diameters				
	ASTM D3485	ASTM F2160	NEMA TC 7	UL 651A	UL 1990
Schedule 40	1/2" to 3"	1/2" to 12"	1/2" to 8"	1/2" to 6"	1/2" to 6"
Schedule 80	1/2" to 3"	1/2" to 6"	1/2" to 6"	1/2" to 6"	1/2" to 6"
SDR 17	N/A	N/A	1/2" to 2"	1/2" to 6"	1/2" to 6"
DR 15.5	1/2" to 3"	1/2" to 12"	1/2" to 6"	N/A	N/A
SDR 13.5	1/2" to 3"	1/2" to 12"	1/2" to 8"	1/2" to 6"	1/2" to 6"
SDR 11	1/2" to 3"	1/2" to 12"	1/2" to 8"	N/A	N/A
SDR 9	N/A	1/2" to 12"	N/A	N/A	N/A
SIDR	N/A	1" to 5"	N/A	N/A	N/A
True-size 9	N/A	13 mm to 2"	N/A	N/A	N/A
True-size 11	N/A	13 mm to 2"	N/A	N/A	N/A

Table 1: HDPE Conduit Diameters Available per Wall Type and Standard Specification



ALROWAD
INDUSTRIAL COMPLEX

COMMUNICATION CONDUITS

FULLY PROTECTED CABLES