

HDPE Pipe

High-Density Polyethylene Pipe

High density polyethylene (HDPE) pipe is an exceptional piping product well-suited for a broad range of demanding applications. Tough, resilient HDPE piping is widely used in municipal water and sewer applications, natural gas distribution, industrial process piping, fire water loops, mining/slurry handling systems and many more types of systems. With its strong, butt-fused joints and long-term ductility, HDPE pipe can be installed in numerous ways such as direct burial, slip-lining, pipe-bursting, and directional drilling. As a leading global distributor of HDPE piping systems and fusion equipment, along with fusion and fabrication services, ISCO Industries is your primary resource for all of your HDPE piping needs.

Consider some of these characteristics of HDPE Pipe:

- Economical
- Chemical/Corrosion Resistant
- Zero Leak-Rate
- Hydraulically Smooth
- Fatigue and Surge Resistant
- Long Design Life
- Tappable
- Easily Installed
- Small to Large Diameters
- Non-Toxic, Non-Tasting
- Lightweight
- Reliable
- Long-term strength and ductility
- Flexible and Coilable
- Heat Fused
- Mechanically Joined (As Needed)
- Compatible with other systems
- Weather Resistant
- Impact Resistant
- Freeze Resistant
- Durable
- Abrasion Resistant
- Inert
- Self Restrained Pipe (Monolithic)
- Listed and Approved

Important Standards for High Density Polyethylene (HDPE) Pipe

As with any engineering material, there are numerous standards and codes by which HDPE pipe and fittings are produced, designed and installed. Principle among these are the applicable standards published by ASTM International (formerly known as the American Society for Testing and Materials). Other additional standards and/or codes such as AWWA, DOT, API or others may apply to specific installations or uses of HDPE pipe as well. What follows is a partial listing of some of the principle standards pertaining to HDPE piping within the North American market area.

PIPE RESIN REQUIREMENTS:

ASTM D3350 “Standard Specification for Polyethylene Plastics Pipe and Fitting Materials”. The quality of HDPE pipe starts with the resin from which it is produced. ASTM D3350 defines the basic physical property requirements of the polyethylene compound that is used to make the pipe or fittings.

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PIPE DIMENSIONS AND MANUFACTURING REQUIREMENTS:

ASTM F 714 “Standard Specification for Polyethylene (PE) Pipe (SDR-PR) Based on Outside Diameter”. This standard is used for most large diameter HDPE pipe (4” to 63”) applications other than gas pipe.

ASTM D 2513 “Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings”. Polyethylene pipe and other plastics for natural gas distribution are described in great detail in this standard.

ASTM D 3035 “Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter”. Most HDPE water tubing (1/2 inch to 3”) is made to the dimensions in this standard. While pipe sizes up to 24” are provided, very little large diameter pipe is made to this standard.

ASTM F 2619 “Standard Specification for High Density Polyethylene (PE) Line Pipe”. This standard includes HDPE pipe in sizes from 1/2” to 65” for various oil and gas producing applications such as oil, dry or wet gas, multiphase fluids and non-potable oil field water.

INSTALLATION STANDARDS:

ASTM D 2321 “Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications”

ASTM D 2774 “Standard Practice for Underground Installation of Thermoplastic Pressure Piping”

ASTM F 585 “Standard Practice for Insertion of Flexible Polyethylene Pipe into Existing Sewers”

ASTM F 1668 “Standard Guide for Construction Practices for Buried Plastic Pipe”

ASTM F 1962 “Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacles, Including River Crossings”

ASTM F 2164 “Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems using Hydrostatic Pressure”.

AMERICAN WATER WORKS ASSOCIATION STANDARDS:

ANSI/AWWA C 901-2005 “Polyethylene Pressure Pipe and Tubing, .5 in (13 mm) Through 3 in. (76 mm) for Water Services”

ANSI/AWWA C 906-2006 “Polyethylene Pipe and Fittings, 4 in (100 mm) Through 63 In (1,575 mm) for Water Distribution”

PIPE JOINING STANDARDS:

ASTM F 2620 – “Standard Practice for Heat Fusion of Polyethylene Pipe and Fittings”

ASTM D 2657 – “Standard Practice of Heat Fusion Joining of Polyolefin Pipe and Fittings”

ASTM F 1290 – “Standard Practice for Electrofusion Joining Polyolefin Pipe and Fittings”

FITTING STANDARDS:

ASTM D 3261 – “Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Butt Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing”

ASTM F 1055 – “Standard Specification for Electrofusion Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing”

ASTM F 1759 – “Standard Practice for Design of High Density Polyethylene (HDPE) Manholes for Subsurface Applications”

ASTM F 2206 – “Standard Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE) Plastic Pipe, Fittings, Sheet Stock, Plate Stock or Block Stock”

CANADIAN STANDARDS ASSOCIATION:

CAN/CSA 137 – “Thermoplastic Pressure Piping Compendium”

OTHER USEFUL REFERENCES:

[Handbook of Polyethylene Pipe](#), A publication of the Plastics Pipe Institute. www.plasticpipe.org

[AWWA M55, PE Pipe – Design and Installation](#), A Manual of Water Supply Practices published by the American Water Works Association



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Specifications for HDPE Pipe

Polyethylene piping systems are defined or specified using two important criteria: the ASTM D 3350 cell classification and the ASTM F 412 thermoplastic piping material designation code. The ASTM D 3350 consists of a series of six digits followed by one letter. The six digits equate to the specified level of performance required in six separate physical properties defined within the standard. The final letter specifies the color or UV-resistance requirement. Taken together the D 3350 cell classification establishes a minimum range of technical performance for the PE compound used to produce the pipe.

The F 412 thermoplastic piping material designation code further defines the performance requirement of the pipe produced from a particular PE compound. This code consists of an abbreviation for the basic material as defined within the ASTM standards. The standardized abbreviation for polyethylene is the term "PE". This basic polymer designation is then followed by a series of four digits. The first two digits relate directly to specific physical properties for the compound as defined within ASTM D 3350. The last two digits are the long-term hydrostatic stress rating as recommended by the Hydrostatic Stress Board of the Plastic Pipe Institute in hundreds of psi. The long-term hydrostatic stress rating is the hydrostatic design basis (HDB) multiplied by the appropriate design factor (DF).

So the thermoplastic piping material designation code follows the form below.

PEXYZZ, the format of the thermoplastic material designation code for PE pipe

Where: **PE** indicates polyethylene
X is the characteristic density for the compound used to make the pipe as defined within ASTM D3350
Y is the characteristic slow crack growth resistance range for the compound used to make the pipe as defined within ASTM D3350
ZZ is the long-term hydrostatic stress at 23° F, expressed in hundreds of psi

Historically, the market for PE pipe was dominated by essentially two primary thermoplastic material designation codes. These were PE2406 and PE3408. In 2005, changes were made to ASTM D 3350 to allow for the identification and integration of much higher levels of technical performance in PE piping materials within the North American standards system. This resulted in a temporary proliferation of PE thermoplastic piping material designation codes. Today, we still have a fairly broad selection of material designation codes for PE piping systems throughout the marketplace. However, for all practical purposes, the market for PE pipe is characterized by the three common thermoplastics materials designation codes.

PE2708 – This piping product is produced from a medium density compound as defined in the current version of D3350 and is widely used in natural gas distribution and some specialty applications

PE3608 - This piping product is the legacy product resulting from the old PE3408 thermoplastic piping material designation code that was so widely specified and used prior to 2005. It is not uncommon today to see these piping products dual labeled PE3408/PE3608.

PE4710 - This piping product designation represents the culmination of years of technical research on polymer performance in PE piping and offers the designer or end-user exceptional levels of pipe system performance. For example, the PE4710 piping products support a higher long-term hydrostatic stress rating making the pressure rating for a given wall thickness of pipe 25% higher than a comparable PE3608 piping product. By the same token, these piping products exhibit a significantly higher resistance to slow crack growth. Given the exceedingly high technical performance of the PE4710 piping products it is no surprise that they meet or exceed all of the technical requirements of the PE3408 or PE3608 piping products. For this reason is not uncommon to see these piping product dual labeled as PE3408/PE4710 or even triple labeled as PE3408/PE3608/PE4710.

Table 1 provides a summary of the of the different ASTM D 3350 cell classification for each of these materials based on these three primary thermoplastic piping material designation codes.

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PE 4710 IPS HDPE Pipe Sizes

HDPE Pipe

- Items highlighted in Blue indicates standard stocking items that are more readily available.
- Pressures are based on using water at 23°C (73°F).
- Average inside diameter calculated using nominal OD and minimum wall plus 6% for use in estimating fluid flows. Actual ID will vary.
- Service factors should be utilized to compensate for the effect of liquids other than water, and for other temperatures.
- Other piping sizes or DR's may be available upon request.
- Standard Lengths:
40' for 2"-24"
50' for 26" and larger
Coils available for 3/4"-6"(8" by special order)

Pressure Rating	Nominal Size	1"	1 1/4"	1 1/2"	2"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"
	Actual O.D.	1.32"	1.660"	1.90"	2.38"	3.500"	4.50"	5.563"	6.625"	8.625"	10.750"	12.75"	14.00"	16.00"	18.00"
DR 7 (333psi)	Min. wall	0.188"	0.237"	0.271"	0.339"	0.500"	0.643"	0.795"	0.946"	1.232"	1.536"	1.821"	2.000"	2.286"	2.571"
	Average I.D.	0.917"	1.157"	1.325"	1.656"	2.440"	3.137"	3.878"	4.619"	6.013"	7.494"	8.889"	9.760"	11.154"	12.549"
	Weight lb/lf	0.291	0.463	0.607	0.950	2.060	3.402	5.200	7.374	12.498	19.416	27.312	32.930	43.010	54.435
DR 7.3 (312psi)	Min. wall	0.180"	0.227"	0.260"	0.325"	0.479"	0.616"	0.762"	0.908"	1.182"	1.473"	1.747"	1.918"	2.192"	2.466"
	Average I.D.	0.933"	1.178"	1.348"	1.685"	2.484"	3.193"	3.947"	4.701"	6.120"	7.628"	9.047"	9.934"	11.353"	12.773"
	Weight lb/lf	0.281	0.450	0.590	0.920	1.990	3.290	5.022	7.130	12.070	18.750	26.380	31.810	41.550	52.580
DR 9 (250psi)	Min. wall	0.146"	0.184"	0.211"	0.264"	0.389"	0.500"	0.618"	0.736"	0.958"	1.194"	1.417"	1.556"	1.778"	2.000"
	Average I.D.	1.005"	1.269"	1.452"	1.816"	2.676"	3.440"	4.253"	5.064"	6.593"	8.218"	9.747"	10.702"	12.231"	13.760"
	Weight lb/lf	0.235	0.374	0.490	0.770	1.664	2.751	4.204	5.963	10.110	15.700	22.085	26.630	34.780	44.020
DR 11 (200psi)	Min. wall	0.120"	0.151"	0.173"	0.216"	0.318"	0.409"	0.506"	0.602"	0.784"	0.977"	1.159"	1.273"	1.455"	1.636"
	Average I.D.	1.062"	1.340"	1.534"	1.917"	2.825"	3.633"	4.491"	5.348"	6.963"	8.678"	10.293"	11.302"	12.916"	14.531"
	Weight lb/lf	0.200	0.314	0.411	0.642	1.395	2.310	3.523	5.000	8.470	13.160	18.510	22.320	29.150	36.890
DR 13.5 (160psi)	Min. wall	---	---	---	0.176"	0.259"	0.333"	0.412"	0.491"	0.639"	0.796"	0.944"	1.037"	1.185"	1.333"
	Average I.D.	---	---	---	2.002"	2.950"	3.793"	4.689"	5.585"	7.271"	9.062"	10.748"	11.801"	13.487"	15.173"
	Weight lb/lf	---	---	---	0.534	1.160	1.920	2.928	4.152	7.040	10.932	15.380	18.540	24.220	30.651
DR 15.5 (138psi)	Min. wall	---	---	---	0.153"	0.226"	0.290"	0.359"	0.427"	0.556"	0.694"	0.823"	0.903"	1.032"	1.161"
	Average I.D.	---	---	---	2.050"	3.021"	3.885"	4.802"	5.719"	7.445"	9.280"	11.006"	12.085"	13.812"	15.538"
	Weight lb/lf	---	---	---	0.470	1.020	1.687	2.580	3.656	6.197	9.626	13.530	16.310	21.300	26.950
DR 17 (125psi)	Min. wall	---	---	---	0.140"	0.206"	0.265"	0.327"	0.390"	0.507"	0.632"	0.750"	0.824"	0.941"	1.059"
	Average I.D.	---	---	---	2.079"	3.064"	3.939"	4.869"	5.799"	7.549"	9.409"	11.160"	12.254"	14.005"	15.755"
	Weight lb/lf	---	---	---	0.431	0.940	1.550	2.360	3.360	5.690	8.834	12.430	14.983	19.570	24.770
DR 21 (100psi)	Min. wall	---	---	---	---	---	0.214"	0.265"	0.315"	0.411"	0.512"	0.607"	0.667"	0.762"	0.857"
	Average I.D.	---	---	---	---	---	4.046"	5.001"	5.956"	7.754"	9.665"	11.463"	12.587"	14.385"	16.183"
	Weight lb/lf	---	---	---	---	---	1.270	1.940	2.750	4.662	7.242	10.190	12.282	16.042	20.304
DR 26 (80psi)	Min. wall	---	---	---	---	---	0.173"	0.214"	0.255"	0.332"	0.413"	0.490"	0.538"	0.615"	0.692"
	Average I.D.	---	---	---	---	---	4.133"	5.109"	6.085"	7.922"	9.873"	11.710"	12.858"	14.695"	16.532"
	Weight lb/lf	---	---	---	---	---	1.035	1.582	2.250	3.800	5.910	8.312	10.022	13.090	16.570
DR 32.5 (63psi)	Min. wall	---	---	---	---	---	0.138"	0.171"	0.204"	0.265"	0.331"	0.392"	0.431"	0.492"	0.554"
	Average I.D.	---	---	---	---	---	4.206"	5.200"	6.193"	8.062"	10.049"	11.918"	13.087"	14.956"	16.826"
	Weight lb/lf	---	---	---	---	---	0.835	1.280	1.811	3.070	4.770	6.710	8.090	10.561	13.370

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