Technical Manual

PE PIPES

POLYETHYLENE PIPES

Streaming Water.
Streaming Life!

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ELYSÉE

HISTORY

Founded in 1969, Elysée was initially dedicated to the cultivation of flowers. This gave the founders firsthand experience and a full understanding of the diversity of irrigation needs. With such knowledge and experience, the natural next step in the business was to start designing and developing irrigation systems. This was a stepping-stone to further expansion, this time into the field of water supply and piping systems.
Elysée manufactures and supplies piping systems & fittings for Building & Infrastructure, Irrigation, Landscape, and Industry.

Based in Cyprus, a key location at the crossroads of three continents, Elysée serves more than 65 destinations in Europe, the Middle East, South Africa, Japan, Australia, and New Zealand.

OUR VISION

"To be a green leader worldwide through Innovative, Smart, Easy to use Piping Systems."

A GREEN COMPANY

Elysée acknowledges that businesses have a tremendous impact on climate change and can help in the fight against it. For this reason, we are setting a strategic approach to help us ultimately lead the way to a circular economy model, testimony of our commitment to quality, towards the fulfilment of our goals for sustainability. Generally, a company's minimized carbon footprint is what leads to carbon neutrality. We are dedicated to our dream of guiding Life on a green path. Our goal is to continue striving to become a leading sustainable world supplier in piping systems, thus, keep offering the public a wide selection of the most trustworthy products of the highest standards. At the same time, we are taking all the necessary steps to ultimately become a Green Leader and an exemplary model for other Cypriot & European businesses.

STREAMING WATER. STREAMING LIFE.

Our love for water led to Elysée's conception. Of all the resources on the planet, we consider water to be the most valuable. Water is a living cycle. It moves, transforms, and makes life possible. Our respect for the value of natural resources and our commitment to preserve them has always been Elysée 's primary concern.

WHY ELYSÉE

- **A green company.** Elysée acknowledges that businesses have a tremendous impact on climate change and can help in the fight against it. For this reason, we have set a strategic approach to help us ultimately lead the way to a circular economy model.
- **Easy to use.** Elysée products are developed in close collaboration with end users. Designed for durability, simplicity of installation, and long-term performance.
- **Know-how.** Elysée has a strong position in the Plastic Piping Systems market due to its 40 years of expertise.
- **Truly international.** Presence in more than 65 countries in all 5 continents through an ever-increasing family of distributors.
- **Reliability & Quality Assurance.** Elysée is certified by the most reputable international standardization organizations such as DVGW, OVGW, WRAS, and KIWA among others.

RESEARCH AND DEVELOPMENT

Since 2005, Elysée has made significant investments in Research and Development (R&D) activities. The company established an in-house R&D department to conduct significant research and innovation activities, increasing the company's competitive edge over the competitors. Indeed, R&D is critical to the company's business brand and performance both locally and worldwide.

Several patents and industrial designs have been granted, with others pending.

The R&D team is made up of highly-qualified mechanical engineers and product designers who work on many projects with the goal of designing and developing breakthrough product solutions as well as re-engineering the current ones.

3D printing and CNC machines are used for prototyping new parts and testing methods to ensure quality requirements are met. 3D scanners and smart measuring devices are assigned for reverse engineering, improving, and inspecting current products. Moreover, the R&D team contributes to the enhancement of all production stages, assuring productivity, procedure implementation, and operational efficiency.

Furthermore, Elysée focuses on Research, Technology, and Innovation research through innovative actions and funding programs.

QUALITY A MATTER OF PRINCIPLE AND PRACTICE

Quality has been a primary element guiding Elysée activities from its beginnings. By introducing and implementing a quality management system, we monitor our operations and efficiency, to enhance our overall performance. Today, Elysée Irrigation Ltd is delighted to have globally recognized pipe system accreditation, demonstrating its dedication to excellence. Elysée has kept quality as the key foundation of all its operations, hence becoming reputable for its high-quality products in all aspects.

Our Quality Control (QC) team is composed of gifted mechanical and technical engineers, along with highly trained inspectors who pay attention to detail according to the standards followed. Through carefully constructed Quality Control Guidelines, the team daily monitors the production lines and ensures the best quality of products, according to international standards to ensure customer satisfaction.

With advanced technology at hand, we perform daily quality inspections using smart measuring devices, specialized testing machines, and an upgraded database. Furthermore, having our own state-of-the-art 3D scanner gives a lead on constant failure-point detection, generating reports, and proceeding with corrective actions for further improvements when required.

From raw material to end-product and into the hands of the customer, our goal has always been to deliver the most optimum quality possible. All products undergo in-house laboratory tests and at external accredited labs, in compliance with current relevant standards. This ensures and guarantees our products, as they are thoroughly checked and approved by professional bodies.

WARRANTY

Our warranty includes the repair or replacement of defective parts at our production plant or at the after-sale service location. Replacement or repair of parts under this warranty will not extend the warranty period of the original product. No warranties are given regarding normal wear and tear due to use of the products. The expenses for the return and shipment of defective materials shall be paid by the buyer.

This warranty does not cover those cases in which the product:

- Has been incorrectly handled.
- Has been repaired, maintained, or modified by an unauthorized person.
- Has been repaired or maintained with other than original pieces.
- Has been installed or placed in operation incorrectly.

CERTIFICATIONS

Elysée's products are designed to meet the general standards and are subjected to a variety of tests to verify that they meet the product requirements. Elysée holds more than 30 notable International Product Certifications, including DVGW, KIWA, SII, WRAS, SAI, OVGW and SVGW.

ISO9001, ISO 14001, ISO 45001, and EMAS certifications demonstrate Elysée's dedication to quality, environmental preservation, and employee safety at all phases of manufacturing, from raw materials to sales.

SCAN ME

PE PIPES
POLYETHYLENE PIPES

GENERAL INFO

POLYETHYLENE MATERIAL
Polyethylene (PE) was discovered back in 1933 and since then its consumption has grown to become one of the world's most widely used and recognized thermoplastic materials. As the most common plastic material it is used globally for production of approximately 80 million tones annually. Today's modern PE resins are engineered for rigorous applications such as pressure-rated gas, recycled water, sanitary and drinking water systems, irrigation purposes, sustainable energy systems, landfill membranes, automotive fuel tanks and other demanding applications.

POLYETHYLENE IN THE PIPING INDUSTRY
Since polyethylene was discovered, extensive research was made on the use of polyethylene materials to manufacture pipes with longer pipeline life expectancy, greater pipeline integrity and durability, lower total installation costs and environmental advantages over traditional pipe materials. The results were outstanding and polyethylene has been successfully used in the piping industry for more than 50 years now. PE pipes are designed for a long lifetime (in excess of 100 years) in underground infrastructures. Since installing the pipe in the ground is the most expensive part of operation (typically 85 – 90% of the project costs), the last thing an engineer wants to do is to replace the pipes within their working lifetime. Compared to traditional materials, PE pipe installations are more competitive by combining key advantages and benefits such as:

BENEFITS OF POLYETHYLENE PIPES

LONG LIFE
Polyethylene pipes have a proven high reliability record across a wide range of industries and applications, over a period of 50 years. PE also provides a long maintenance-free lifetime with low lifecycle costs, compared to many other materials and a life prediction in excess of 100 years before major rehabilitation is required.

EASE OF INSTALLATION AND LIGHTWEIGHT
PE pipes are easy to install due to their light weight and long lengths. Polyethylene coiled pipes are widely used in applications such as stock watering, irrigation systems, communication, gas and reticulated water mains due to rapid installations, cost-saving in transport and handling and easy and less frequent jointing.

HIGH FLOW CAPACITY AND SMOOTH INTERNAL WALL
PE pipes have lower friction factors due to smooth internal wall than most non-plastics materials. The surface energy characteristics of PE ensure that material deposition is inhibited and the smooth bore characteristic is maintained over the working life of the pipeline. There is also low blockage risk due to low deposit/residue effects.

WEATHERING RESISTANCE AND UV RESISTANT
PE pipes are stabilised against ultra violet (UV) light degradation by the inclusion of carbon black in the raw material. Black PE pipes are, therefore, suitable for installations where the pipes are exposed to direct sunlight.

IMPACT-RESISTANT AND STRONG
PE Pipes are unbreakable at temperatures > 5 ºC. The high impact strength of PE pipes compared with other materials ensures a greater resistance to the rigours of pipe laying conditions.

CHEMICAL RESISTANCE
Outstanding resistance to a wide range of chemical reagents allows the use of polyethylene systems in applications such as: transport of polluted waste water, tailings pipelines and chemical treatment applications.

ABRASION RESISTANCE
PE pipes have excellent abrasion resistance providing long life in abrasive slurry applications. In most of these applications PE pipe outlasts other pipe materials such as mild steel and rubber lined steel.

ELASTIC AND FLEXIBLE
PE pipes are flexible and can be bent to a bending radius of minimum 30 times the pipe's outside diameter for HDPE and 20 times the pipe's outside diameter for MDPE. This inherent resiliency and flexibility allows the pipe to absorb surge pressures, vibration and stresses caused by soil movement.

DAMAGE RESISTANCE
Damage Resistance PE has low notch sensitivity, providing a high level of resistance to the effects of external damage, especially important for pipe bursting operations and others where there is a likelihood of such damage.

RESISTANCE AGAINST WATER HAMMER
When designing PE pressure pipe systems, limitations due to pressure surges are normally not needed to be considered. The reason is that a PE pipe has a relatively high short-term strength compared to its long-term strength. Frequent pressure surges up to 1.5 times the nominal pressure of the pipe has been found not to influence the long-term strength of the pipes.

HIGHLY SUITABLE FOR JOINING
There are a large number of joint types for Polyethylene pipes available depending on the size and type of application required. The pipes are easily installed by using both non-permanent and permanent techniques such as mechanical fittings and fusion fittings.

NON-TOXIC
PE pipe material is environmental friendly, non-toxic and tasteless. Through strict health and safety monitoring, it belongs to green building materials. PE pipes do not have a scaling problem, which can effectively improve the water transport quality.

QUALITY MANAGEMENT

Our Quality management system ensures top-class products in terms of performance, reliability and durability. This is a crucial parameter to ensure customer satisfaction and loyalty. Elysee quality system, ISO 9001, is approved by CCC and IQNet.

Since Quality is subjective and it is a matter of personal opinion and what constitutes an acceptable level of quality will vary from one individual to another, a process was adopted to classify the quality levels. This process called "product certification", which verifies that products conform to applicable standard, results in the issuing of a statement or certificate of conformity and approval to apply the relevant standard to the product.

Our production facilities are inspected regularly, where random products are tested to ensure their continued compliance with the relevant standards. Once the products are determined to meet such standards, the certification body reissues the product certification documents. High Density polyethylene pipes of Elysee have been tested and approved by the leading European Laboratory of this field. Furthermore, Elysee HDPE pipes are honored with product certifications for the related standard EN 12201.

EFFECT ON WATER

Water is essential to health and to the preservation of the environment. Water quality is commonly defined by its physical, chemical, biological and aesthetical (appearance and smell) characteristics. A healthy environment is one in which the water quality supports a rich and varied community of organisms and protects public health. Unsuitable non-metallic materials can cause changes in the quality of the water that they are in contact with. These changes can affect the flavor and appearance of the water, as well as introducing toxic substances and promoting microbial growth.

Over thirty years ago some specific methods were developed to study how materials could affect water quality. The methods developed then were used to develop the current Standards for testing non-metallic materials in contact with drinking water. All fittings intended to be used for potable water supply systems or agricultural practices should be manufactured according the requirements of the relevant standards. All fittings that are intended to be used for potable water supply systems or agricultural practices should be manufactured according to the requirements of the relevant standards. Elysee pipes fully conform to international hygiene and sanitary requirements that are indicated by the standard BS6920 (UK).

APPLICATIONS AND USAGE AREAS

APPLICATIONS OF POLYETHYLENE PIPES

URBAN TAP WATER PIPE NETWORK SYSTEM
Large diameter PE pipe are suitable for urban water supply main conduits and buried tubes since they are non-toxic, not fouling, hygienic and easy to install.

REPLACEMENT FOR CEMENT TUBES, IRON PIPE AND STEEL TUBE
Used for old network renovation projects at a low cost since it doesn't need large area of excavation. They can be widely used in old towns' pipe network reconstruction.

INDUSTRIAL MATERIALS DUCT
Chemical industry, chemical fiber, food, forestry, pharmacy, light industry and papermaking, metallurgical and other industrial raw material conveying pipe.

LANDSCAPING WATER SUPPLY NETWORK
Landscaping need lots of water pipe, PE pipe toughness and low cost, make it become the best choice.

SEWAGE DISCHARGE PIPES
PE pipe have unique corrosion resistance, can be used in industrial wastewater, sewage discharged pipe, low costs and maintenance costs.

ORE, MUD TRANSFERS
PE pipe has high resistance to stress and wear resistance, can be widely applied in conveying ore, coal ash and river bait-casting mud.

AGRICULTURAL IRRIGATION PIPE
PE pipe inside sleek, great flow, cross road construction, good impact resistance, it is the ideal tool for agricultural irrigation.

PE PIPES USAGE AREA

Since Polyethylene has a variety of grades and categories, the appropriate material should be selected to fit the necessary application. For each application there are several grades to choose from, so the selection of the suitable grade is done by experts based on the requirements of the system. Some informal proposals can be found on the table below.

Application	PE-32 LDPE	PE-63 HDPE	PE-80 MDPE	PE-80 HDPE	PE-100 HDPE
Potable Water Pipe Lines		•	•	•	•
Pressure Irrigation Pipe Lines		•	•	•	•
Non-Pressure Irrigation Pipe Lines	•				
Gas Pipe Lines			•	•	•
Main Supply Link Practices	•		•	•	•
Potable Water Treatment Equipment			•	•	•
Cooling Water Pipe Lines			•	•	•
Compressed Air Lines	•	•	•	•	•
Sediment Carriage Lines		•	•	•	•
Pipe Lines for Chemicals			•	•	•
Covered Geothermal Heating Pipe Lines			•	•	•
Cable Protection Pipes			•		
Sediments, Detergents, Coal Gas			•	•	•
Sea Discharge Practices			•	•	•
Fish Farm Practices		•		•	•

MATERIALS SPECIFICATIONS

POLYETHYLENE GRADES
Polyethylene pipes are classified into several categories based mostly on its density and polymer branching. The most important polyethylene grades are HDPE, MDPE and LDPE.

LDPE was the first grade of polyethylene available, and is still being manufactured by same method until today. Despite competition from more modern polymers, LDPE continues to be an important plastic grade used mainly in low pressure piping systems such as micro irrigation, low pressure drip irrigation, rural irrigation and stock watering applications. The major advantages of LDPE pipes are the high flexibility and retention of properties at low temperatures.

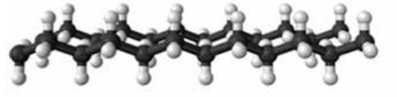
MDPE was launched as a second generation material attempting to come across with a higher performance material for water and natural gas networks. Until that time HDPE material (PE63) was widely used for such purposes but with some installation and operation drawbacks that the MDPE successfully resolved. With medium density the materials have good shock and drop resistance properties, are less notch-sensitive and have better stress cracking resistant than HDPE materials, but with lower hardness and rigidity. The flexibility of this material has been the main reason for the wide use in gas, water and industrial applications for many years.

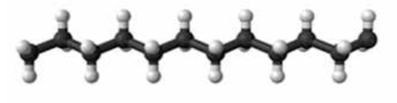
HDPE from the beginning was the most promising and challenging material for improvement and innovation. That is the reason why the HDPE was linked in all of the three generations of material improvement, starting as PE63, then as PE80 and nowadays as a PE100. HDPE materials have higher strength and toughness than other polyethylene materials. The major advantages of HDPE pipes are the exceptionally high resistance to stress cracking, higher resistance to rapid crack propagation while its long-term tensile strength and creep resistance, make the material suitable for high pressure piping applications.

'INSIDE' VIEW OF POLYETHYLENE

LDPE is composed of highly-branched polymer chains that do not pack closely together and are randomly oriented relative to one another, i.e. LDPE is amorphous. The large distance between adjacent polymers weakens the intermolecular forces between polymers which are easily overcome.

HDPE polymers have a low degree of branching that pack closely together in highly ordered or crystalline arrays. HDPE has a greater density than LDPE and stronger intermolecular forces, thus is harder, more rigid and has a higher melting point.



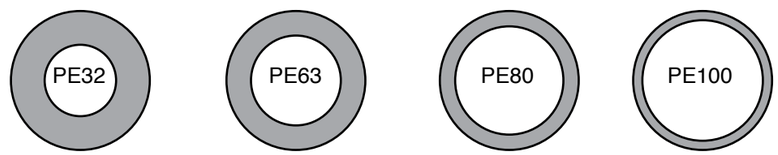


MRS CLASSIFICATION

Polyethylene can also be classified with the Minimum Required Strength (MRS) which indicates the strength that the material has against continues inner pressure for 50 years of operation at 20 °C.

Designation of material	MRS at 50 years and 20 °C MPa (bar)	Maximum allowable hydrostatic design stress, σ – MPa	Density Classification	Relevant Standards	Generation
PE 100	10 (100)	8	HDPE	EN12201	3rd
PE 80	8 (80)	6.3	HDPE / MDPE	EN12201	2nd
PE 63	6.3 (63)	5	HDPE	EN12201	1st
PE 40	4 (40)	3.2	LDPE	CYS106 / ISO8779	1st
PE 32	3.2 (32)		LDPE	CYS106 / ISO8779	1st

When pipes with the same operating pressure is manufactured from different classifications of raw materials then the thicknesses varies as follows. The below pipe sections have outside diameter 110 mm and pressure rating of 10 bar, manufactured by different grades of polyethylene.



	PE32	PE63	PE80	PE100
Thickness:	18.3 mm	10 mm	8.1 mm	6.6 mm
Weight:	5.09 Kg/m	3.14 Kg/m	2.62 Kg/m	2.17 Kg/m

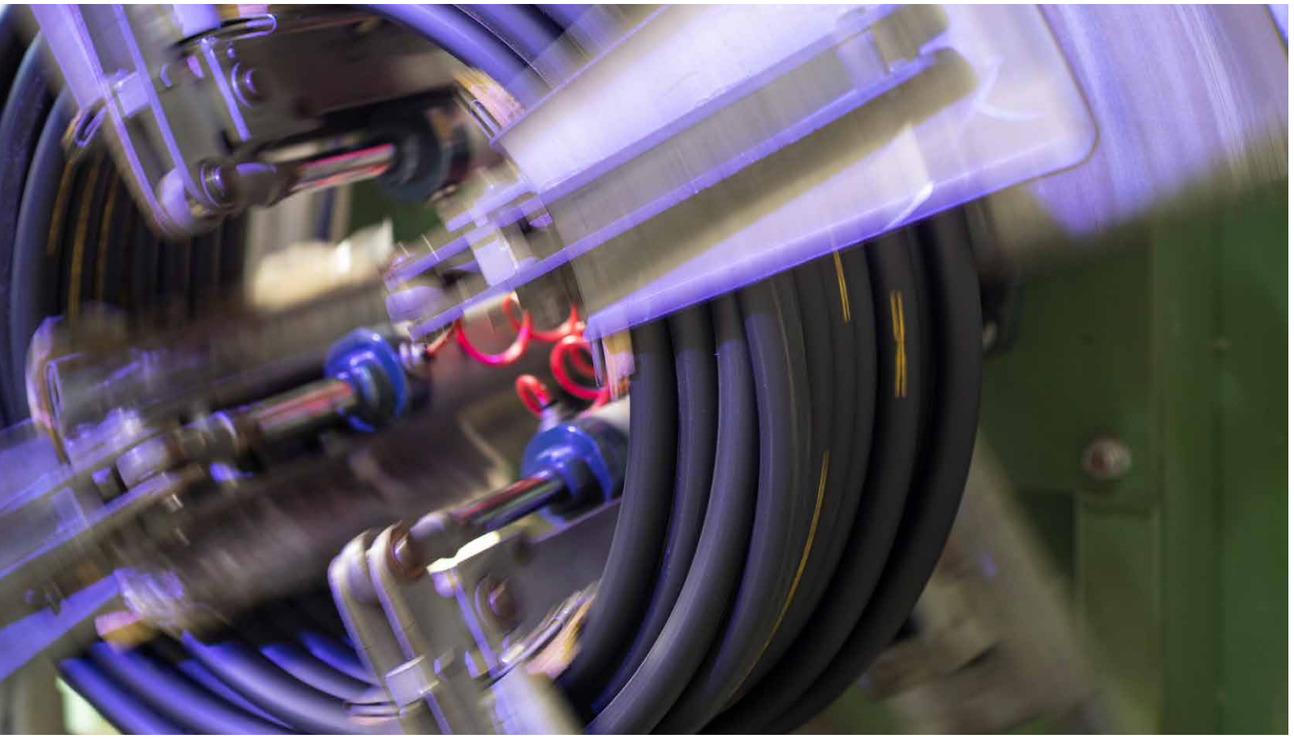
RAW MATERIALS

PROPERTIES

Selecting the appropriate raw material for the production of pipe is the first essential and necessary condition for compliance with the specified requirements of the finished product. Any resins used to produce polyethylene pipes must be sampled, tested and approved for use to assure compliance with the relevant standard. A resin vendor's certification stating compliance with all requirements is accompanying all raw material resins used in the manufacture of the pipes. The traceability of the manufactured pipes can easily specify the resin lot designations in a case of non conformities.

LOW DENSITY POLYETHYLENE

PROPERTIES	UNIT	MATERIAL		
		LDPE	PE80	PE100
Melt Flow Rate @190°C & 5Kg Load	g/10min	/	0.85	0.3
Melt Flow Rate @190°C & 2,16Kg Load	g/10min	0.3	/	/
Density @ 23°C	kg/m³	922	950	960
Tensile Strength @ Yield	Mpa	11	19	23
Tensile Elongation @ Yield	%	/	10	10
Tensile Elongation @ Break	%	650	> 350	> 350
Tensile Modulus	MPa	425	750	1000
Hardness	Shore D	48	63	63
Vicat Softening Point @50N	°C	65	70	74
Thermal Stability @200°C	°C	/	> 20	> 20
Dielectric strength	kV/mm	/	47	22
Carbon Black Content	%	/	2 - 2,5	2 - 2,5
Coefficient of heat conductivity	W/m.K	0.35	0.36	0.4



CHEMICALS VS POLYETHYLENE MATERIALS

EFFECTS OF CHEMICALS ON POLYETHYLENE

Chemicals can affect the strength, flexibility, surface appearance, colour, dimensions or weight of polyethylene. The basic modes of interaction which cause these changes are:
Chemical attack on the polymer chain, which results in reduction of physical properties, including oxidation, reaction of functional groups in or on the chain and de-polymerisation.
Physical change, including absorption of solvents resulting in softening and swelling of the plastic, permeation of solvent through the plastic and dissolution in a solvent.
Stress cracking from the interaction of a "stress cracking agent" with internal or external stresses.
The Chemical Resistance Chart that follows is a general guide only. Because so many factors can affect the chemical resistance of a given product, you should test under your own conditions if required. If the inquired chemical is not included on the following one, a more detailed chart will be made upon request.

Chemical	Concetration	LDPE		HDPE		Chemical	Concentation	LDPE		HDPE	
		20 °C	60 °C	20 °C	60 °C			20 °C	60 °C	20 °C	60 °C
Acetone		B	C	B	C	Linseed Oil	100%	B	C	B	C
Acetic Acid	10%	A	A	A	A	Mercury		A	A	A	A
Acetic Acid	60%	A	B	A	B	Methyl Alcohol	100%	A	A	A	A
Acetic Anhydride		C	C	C	C	Milk		A	A	A	A
Alums	all types	A	A	A	A	Molasses		A	A	A	A
Ammonia	100% dry gas	A	A	A	A	Naphtha		B	C	B	C
Ammonium Sulphate	sat'd	A	A	A	A	Nitric Acid	0-30%	A	A	A	A
Aniline	100%	A	C	C	B	Nitric Acid	30-50%	A	B	A	B
Arsenic Acid	all conc	A	A	A	A	Nitric Acid	70%	A	B	A	B
Beer		A	A	A	A	Nitric Acid	95-98%	C	C	C	C
Benzene		C	C	C	C	Nitrobenzene	100%	C	C	C	C
Calcium Carbonate	sat'd	A	A	A	A	Phosphoric Acid	95%	A	B	A	A
Calcium Chlorate	sat'd	A	A	A	A	Potassium Bromide	sat'd	A	A	A	A
Carbon Dioxide	all conc	A	A	A	A	Potassium Hydroxide	conc	A	A	A	A
Carbon Monoxide		A	A	A	A	Sea Water		A	A	A	A
Carbon Tetrachloride		C	C	B	C	Soap Solutions	any conc	A	A	A	A
Carbonic Acid		A	A	A	A	Sodium Carbonate	conc	A	A	A	A
Chlorine	100% dry gas	B	C	C	C	Sodium Chlorate	sat'd	A	A	A	A
Chlorine Water	2% sat'd sol	A	A	A	A	Sodium Chloride	sat'd	A	A	A	A
Chloroform		C	C	B	C	Sodium Hydroxide	conc	A	A	A	A
Chromic Acid	80%	-	-	-	-	Sodium Hypochlorite		A	A	A	A
Chromic Acid	50%	A	B	A	B	Sodium Sulphate		A	A	A	A
Chromic Acid	10%	A	A	A	A	Sodium Sulphide	sat'd	A	A	A	A
Corn 0il		A	A	A	A	Sodium Sulphite	sat'd	A	A	A	A
Ethyl Alcohol	100%	A	A	A	A	Starch Solution	sat'd	A	A	A	A
Ethyl Alcohol	35%	A	A	A	A	Stearic Acid	100%	A	A	A	A
Ethyl Ether		C	C	C	C	Sulphuric Acid	0-50%	A	A	A	A
Ethylene Glycol		A	A	A	A	Sulphuric Acid	70%	A	B	A	B
Fatty Acids		A	A	A	A	Sulphuric Acid	80%	A	C	A	C
Formic Acid	all conc	A	A	A	A	Sulphuric Acid	96%	B	C	B	C
Fruit Pulp		A	A	A	A	Sulphuric Acid	98-conc	B	C	B	C
Gasoline		C	C	B	B	Sulphuric Acid	fuming	C	C	C	C
Glucose		A	A	A	A	Tannic Acid	sat'd	A	A	A	A
Glycerine		A	A	A	A	Tartaric Acid		A	A	A	A
Hydrochloric Acid	all conc	A	A	A	A	Toluene		C	C	B	B
Hydrogen	100%	A	A	A	A	Trichloroethylene		C	C	C	C
Hydrogen Peroxide	30%	A	A	A	A	Turpentine		C	C	B	B
Hydrogen Peroxide	10%	A	A	A	A	Urea	0-30%	A	A	A	A
Hydrogen Sulphide		A	A	A	A	Urine		A	A	A	A
Hypochlorous Acid	conc.	A	A	A	A	Vinegar		A	A	A	A
Iodine	in KI sol'n	B	C	B	-	Water		A	A	A	A
Lead Acetate	sat'd	A	A	A	A	Wines		A	A	A	A

Notes of Table: A **Resistant:** no indication that serviceability would be impaired. B **Variable resistance:** depending on conditions of use. C **Not resistant:** not recommended for service applications under any conditions.

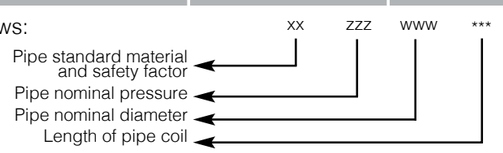
HDPE PIPE SIZES

EN 12201

Material	Safety Factory	PRESSURE RATING		PRESSURE RATING		PRESSURE RATING		PRESSURE RATING		PRESSURE RATING		PRESSURE RATING		PRESSURE RATING		PRESSURE RATING		Temperature in °C	Years of Service
		CODE	PN	CODE	PN	CODE	PN	CODE	PN	CODE	PN	CODE	PN	CODE	PN	CODE	PN		
PE80	1.25	33050---***	5.0	33060---***	6.0	33080---***	8.0	33100---***	10.0	33125---***	12.5	33160---***	16.0	33200---***	20.0	33250---***	25.0	20	50
PE80	1.6	34040---***	4.0	34050---***	5.0	34060---***	6.0	34080---***	8.0	34100---***	10.0	34125---***	12.5	34160---***	16.0	34200---***	20.0	20	50
PE100	1.25	41060---***	6.0	41080---***	8.0	41100---***	10.0	41125---***	12.5	41160---***	16.0	41200---***	20.0	41250---***	25.0			20	50
PE100	1.6	42050---***	5.0	42060---***	6.0	42080---***	8.0	42100---***	10.0	42125---***	12.5	42160---***	16.0	42200---***	20.0	42250---***	25.0	20	50

Nominal Diameter (mm)	S (mm)	Weight (kg/m)	Price (€)	S (mm)	Weight (kg/m)	Price (€)	S (mm)	Weight (kg/m)	Price (€)	S (mm)	Weight (kg/m)	Price (€)	S (mm)	Weight (kg/m)	Price (€)	S (mm)	Weight (kg/m)	Price (€)	S (mm)	Weight (kg/m)	Price (€)	S (mm)	Weight (kg/m)	Price (€)	Nominal Diameter (mm)
16																2.0	0.09	-	2.3	0.102	-	3.0	0.123	-	16
20													2.0	0.116	-	2.3	0.132	-	3.0	0.162	-	3.4	0.18	-	20
25										2.0	0.148	-	2.3	0.169	-	3.0	0.21	-	3.4	0.237	-	4.2	0.278	-	25
32							2.0	0.193	-	2.4	0.23	-	3.0	0.277	-	3.6	0.326	-	4.4	0.386	-	5.4	0.454	-	32
40				2.0	0.245	-	2.4	0.293	-	3.0	0.36	-	3.7	0.429	-	4.5	0.509	-	5.5	0.601	-	6.7	0.703	-	40
50	2.0	0.31	-	2.4	0.371	-	3.0	0.451	-	3.7	0.548	-	4.6	0.665	-	5.6	0.789	-	6.9	0.938	-	8.3	1.09	-	50
63	2.5	0.49	-	3.0	0.576	-	3.8	0.719	-	4.7	0.873	-	5.8	1.05	-	7.1	1.26	-	8.6	1.48	-	10.5	1.73	-	63
75	2.9	0.671	-	3.6	0.825	-	4.5	1.01	-	5.6	1.24	-	6.8	1.47	-	8.4	1.77	-	10.3	2.1	-	12.5	2.46	-	75
90	3.5	0.974	-	4.3	1.18	-	5.4	1.46	-	6.7	1.77	-	8.2	2.13	-	10.1	2.55	-	12.3	3.01	-	15.0	3.54	-	90
110	4.2	1.43	-	5.3	1.77	-	6.6	2.17	-	8.1	2.62	-	10.0	3.16	-	12.3	3.8	-	15.1	4.52	-	18.3	5.27	-	110
125	4.8	1.84	-	6.0	2.27	-	7.4	2.77	-	9.2	3.38	-	11.4	4.1	-	14.0	4.91	-	17.1	5.81	-	20.8	6.80	-	125
140	5.4	2.32	-	6.7	2.84	-	8.3	3.48	-	10.3	4.24	-	12.7	5.11	-	15.7	6.15	-	19.2	7.30	-				140
160	6.2	3.05	-	7.7	3.73	-	9.5	4.54	-	11.8	5.53	-	14.6	6.7	-	17.9	8.02	-							160
180	6.9	3.79	-	8.6	4.68	-	10.7	5.74	-	13.3	7.02	-	16.4	8.49	-	20.1	10.1	-							180
200	7.7	4.71	-	9.6	5.80	-	11.9	7.08	-	14.7	8.62	-	18.2	10.5	-	22.4	12.5	-							200
225	8.6	5.92	-	10.3	6.97		13.4	8.99		16.6	10.9		20.5	13.2		25.2	15.9								225
250	9.6	7.34	-	11.4	8.57	-	14.8	11.0	-	18.4	13.5	-	22.7	16.3	-										250
SDR	**26**			**21**			**17**			**13.6**			**11**			**9**			**7.4**			**6**			**SDR**

Code for PE Pipes: The code for PE pipes reads as follows:



Example:

Order code 33 125 075 100 stands for: 100m coil of PE 80 polyethylene pipe 75mm nominal diameter and 12,5 bar nominal pressure, which is manufactured according to EN 12201 standard, using safety factor 1,25.

HOW TO READ THE TABLE

SDR - the ratio of pipe diameter to wall thickness

SDR= D / s

D= pipe outside diameter (mm)

s= pipe wall thickness (mm)

S.F. - Is the safety factor of a pipe and has standard values of 1.25 and 1.6

SF = Short-Term Strength / Short-Term Load in Service

Step by Step Instructions

1. Select your pipe diameter from the first left row of the lower table and underline the data all along.
2. Choose from first row of the upper table the material of the pipe (PE80 or PE100).
3. Based on the design requirements of the system choose from the second column of the upper table, the optimum S.F. (1.25 or 1.6).
4. Underline your selection all along on the upper table.
5. Move on the line of the upper table until you find the pressure rating of your system.
6. Move vertically downwards until you find the drown line of the lower table.
7. On your left you can read out the thickness and weight of the selected pipe.
8. On the bottom of the lower table you can read out the related SDR value while you keep moving vertically downwards.

MDPE STANDARD

EN12201 - Plastics piping systems for water supply, Polyethylene (PE)PE80 is a medium-density polyethylene (MDPE) material used for pressure piping systems, particularly in water supply, gas distribution, and industrial applications. It is classified under EN 12201 for water applications. PE80 pipes with a blue colour are specifically designed for potable water supply systems. The blue colour coding follows industry standards to distinguish potable water pipes from other applications.

EN 12201

PN12.5 / SDR:11 / PE80			
Code	**Nominal Diameter (mm)**	**Min. Wall Thickness (mm)**	**Approximate Weight (Kg/m)**
21 125 020****	20	2.3	0.126
21 125 025***	25	2.3	0.161
21 125 032***	32	3.0	0.269
21 125 040***	40	3.7	0.421
21 125 050***	50	4.6	0.646
21 125 063***	63	5.8	1.020

HDPE STANDARDS

EN12201 - Plastics piping systems for water supply, Polyethylene (PE). Specifies the characteristics of pipes made from polyethylene (PE 100, PE 80 and PE 40) for buried and above ground applications intended for the conveyance of water for human consumption, raw water prior to treatment, drainage and sewerage under pressure, vacuum sewer systems and water for other purposes.

EN 12201

PN6 / SDR:21 / PE80			
Code	**Nominal Diameter (mm)**	**Min. Wall Thickness (mm)**	**Approximate Weight (Kg/m)**
33 060 040***	40	2.0	0.245
33 060 050***	50	2.4	0.371
33 060 063***	63	3.0	0.576
33 060 075***	75	3.6	0.825
33 060 090***	90	4.3	1.18
33 060 110***	110	5.3	1.77
33 060 125***	125	6.0	2.27

EN 12201

PN10 / SDR:13.6 / PE80			
Code	**Nominal Diameter (mm)**	**Min. Wall Thickness (mm)**	**Approximate Weight (Kg/m)**
33 100 025***	25	2.0	0.148
33 100 032***	32	2.4	0.230
33 100 040***	40	3.0	0.360
33 100 050***	50	3.7	0.548
33 100 063***	63	4.7	0.873
33 100 075***	75	5.6	1.24
33 100 090***	90	6.7	1.77
33 100 110***	110	8.1	2.62
33 100 125***	125	9.2	3.38

EN 12201

PN10 / SDR:17 / PE100			
Code	**Nominal Diameter (mm)**	**Min. Wall Thickness (mm)**	**Approximate Weight (Kg/m)**
41 100 032***	32	2.0	0.193
41 100 040***	40	2.4	0.293
41 100 050***	50	3.0	0.451
41 100 063***	63	3.8	0.719
41 100 075***	75	4.5	1.01
41 100 090***	90	5.4	1.46
41 100 110***	110	6.6	2.17

EN 12201

PN16 / SDR:11 / PE100			
Code	**Nominal Diameter (mm)**	**Min. Wall Thickness (mm)**	**Approximate Weight (Kg/m)**
41 160 020***	20	2.0	0.116
41 160 025***	25	2.3	0.169
41 160 032***	32	3.0	0.277
41 160 040***	40	3.7	0.429
41 160 050***	50	4.6	0.665
41 160 063***	63	5.8	1.05
41 160 075***	75	6.8	1.47
41 160 090***	90	8.2	2.13
41 160 110***	110	10.0	3.16

LDPE AND MDPE PIPE SIZES

LDPE STANDARDS

CYS 106 – Low Density Polyethylene (LDPE) for agricultural applications. This standard specifies the characteristics of preferable black LDPE pipes intended to be used for conveyance of water for agricultural applications. This standard covers pipes with nominal outside diameters from 16 mm to 40 mm and nominal pressures of 4 bar and 6 bar. It also specifies the test parameters for the test methods referred to in this standard.

CYS 106

PN4 / SDR:13.6 / PE32			
Code	**Nominal Diameter (mm)**	**Min. Wall Thickness (mm)**	**Approximate Weight (Kg/m)**
12 040 016***	16	1.5	0.077
12 040 020***	20	1.6	0.099
12 040 025***	25	1.9	0.139
12 040 032***	32	2.4	0.225
12 040 040***	40	3.0	0.345

ISO 8779 – Plastics piping systems, Polyethylene (PE) pipes for irrigation, Specifications. This International Standard specifies the pipes (mains, sub-mains and laterals) with nominal outside diameters from 12 mm up to and including 63 mm made from polyethylene (PE) intended to be used for the conveyance of water for irrigation. It also specifies the general properties of PE and the test parameters for the pipes designated.

ISO 8779

PN4 / SDR:13.6 / PE32			
Code	**Nominal Diameter (mm)**	**Min. Wall Thickness (mm)**	**Approximate Weight (Kg/m)**
13 040 016***	16	1.4	0.067
13 040 020***	20	1.5	0.090

PHYSICAL, MECHANICAL AND MATERIAL REQUIREMENTS

QUALITY INSPECTIONS AND TESTING

Several tests are carried out to verify the compliance of our polyethylene pipes with the relevant standards through in-house testing as well as tests in external accredited laboratories. Furthermore, all quality procedures and practices are checked from the entry of raw material, until the delivery of the pipes to the customers. Out of the regular inspections of appearance, color, marking and geometric characteristics, several mechanical and material tests are carried out as mentioned below.

LOW DENSITY POLYETHYLENE

Test Description	Conditions		Duration	Method	Requirements	Applied Standard
	Temp.	Env.				
Hydrostatic Strength	20°C	Water	1h	ISO 1167-½	No failure during test period of any test piece	CYS 106 / ISO 8779
Hydrostatic Strength	80°C	Water	165h	ISO 1167-½	No failure during test period of any test piece	ISO 8779
Hydrostatic Strength	80°C	Water	1000h	ISO 1167-½	No failure during test period of any test piece	CYS 106 / ISO 8779
Ultimate Tensile Strength	23±2°C	Air	/	EN ISO 6259-3	> 11 N/mm^2	CYS 106
Elongation At Break	23±2°C	Air	/	EN ISO 6259-3	≥ 350%	CYS 106
Longitudinal Reversion	100±3°C	Air	1h	ISO 2505	≤ 3% / No effect on surface	CYS 106 / ISO 8779
Oxidation Induction Time	200±3°C	Nitrogen	/	ISO 11357-6	20 min	ISO 8779
Susceptibility to Env. Stress Cracking	70±2°C	RS	1h	ISO 8796	No visible cracks at the area of the folds (≤10% failures)	CYS 106 / ISO 8779
Melt Flow Index	190°C	Air	/	ISO 1133	0.2-0.55g/10min (max 20% deviation from Supplier value)	CYS 106 / ISO 8779
Carbon Black Content and Dispersion	190°C	Air	/	BS 2782-8 ISO6964 ISO 18553	Uniformity of appearance and Rating of dispersion should comply with relevant standards	CYS 106 / ISO 8779
Effect On Water Quality	Certificates supplied by External Laboratory				Updated Certificate requested per 2 years	

HIGH DENSITY POLYETHYLENE

Test Description	Conditions		Duration	Method	Requirements	Applied Standard
	Temp.	Env.				
Hydrostatic Strength	80°C	Water	165	EN ISO 1167	No failure during test period of any test pieces	EN 12201
Hydrostatic Strength	80°C	Water	1000	EN ISO 1167	No failure during test period of any test pieces	EN 12201
Elongation At Break	23±2°C	Air	/	EN ISO 6259	≥350%	EN 12201
Melt Mass-Flow Rate (MFR)	/	/	/	EN ISO 1133-1	Deviation From Supplier ±10% & Change By Processing ±20%	EN 12201
Oxidation Induction Time	200°C	/	/	ISO 11357-6	≥ 20 min	EN 12201
Effect On Water Quality	Certificates supplied by External Laboratory				Updated Certificate requested per 2 years	EN 12201

HANDLING AND STORAGE

GENERAL

Polyethylene is a resilient material, lightweight and easy to handle. Nonetheless, care should be taken not to cause excessive scuffing or gouging of the surface.

HANDLING OF PE COILS

- Coiled pipe should be stored flat, especially during periods of warm weather, and on firm level ground which has suitable protection for the bottom coil.
- Where space is limited and coils are to be stacked, the height of stacked coils should be such that the stack is stable and the uppermost coil can be safely handled. Under no circumstances should the stack exceed 3 meters in height.
- The use of wooden battens below the bottom coil and as spacers between each layer will facilitate easy access for slinging when the need for transportation is required.
- Batches of coils delivered on pallets must remain secured to the pallet and only be broken at the time of use.
- Securing bands should only be broken at the time of use. Pipe held in coils, is under tension and is strapped accordingly. Coils may be hazardous if released in the incorrect manner.
- If a pallet is wrapped with film, take only sufficient coils for immediate use from the pallet and keep the rest of coils wrapped.
- Coils should not come in contact with harmful aggressive materials.
- Avoid intense heat when are stored especially for thin layer coils.

HANDLING OF PE IN LENGTHS

- Pipes should not be dropped onto hard surfaces and should not be dragged along the ground.
- If mechanical lifting equipment is used, no metallic slings, hooks or chains should be used in direct contact with the pipe. Rope or web slings are preferred, which will not gouge or cut the pipe wall. Gouges and cuts in the pipe wall can affect the pressure resisting capabilities of the pipe.
- Pipe lengths stored individually should be stacked in a pyramid not more than 1.5 meter high and 1 meter during high temperatures, with the bottom layer fully restrained by wedges.
- Where possible, the bottom layer of pipes should be laid on timber battens each one-meter along the length of the pipe.
- If the pipe is to be transported the vehicles used should have a flat bed free from sharp projections of any kind.
- Stacks should be protected from the entry of any foreign parts (e.g. dust, small animals, etc) by placing around them plastic sheets, securely fixed to the timber support posts.
- Never place pipes in contact with lubricating or hydraulic oils, gasoline, solvents or other aggressive materials.
- Keep pipes away from intense heat when are stored.

JOINTING POLYETHYLENE PIPES

PERMANENT AND NON-PERMANENT JOINTS

A large number of different joints are available to join Polyethylene pipes depending on the size and type of application. The first common type of joints is non-permanent fittings which comprise of Compression fittings, Stub Flange and Victaulic systems. The other way to join PE pipes is using permanent joints which comprises the Butt Fusion Welding and Electrofusion Welding.

MECHANICAL COMPRESSION JOINTS

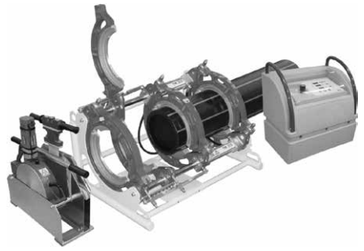
PE pipes 16mm to 160mm outside diameters may be joined by mechanical compression fittings. Elysee offers a complete range of mechanical compression fittings designed for conveyance of fluids, gaseous fuels, compressed air, chemical solutions and slurries under high pressure. Our mechanical compression fittings comply with all relevant international standards in terms of dimensions and mechanical properties.
They are also ideal for the conveyance of potable water and fluids for human Consumption, since they are produced in accordance with national and international standards and regulations for health and safety. To ensure that all requirements of standards and regulations are fulfilled, our fittings are tested regularly and approved worldwide by the main testing institutes and certification bodies applicable for all grades of PE.

STUB FLANGES AND BACKING PLATES

Flange type is another type of conventional mechanical jointing. The PE Flange adaptor (Stub end) is butt welded to the pipe with the loose steel backing flange inserted behind the stub end. The pipe with the flange adaptor can be connected and disconnected to another pipe with the same flange. A sealing gasket is also inserted to provide a demountable joint or to match up with pumps, valves etc.

BUTT WELDING

HDPE pipe systems can be joined by butt welding to provide homogeneous joints. Butt welding or Butt Fusion is a simple and space-saving jointing method to connect the pipe of HDPE. The process starts by cutting the pipe ends straight and square to the axis and cleaned carefully by an electric planer. The pipes and fittings are held tight and pressed against a coated heating plate. When the required heating time and temperature is reached, the heating plate is quickly withdrawn. When the heating plate is removed, the pipes are free to move axially. By attaching and keep pressing the sections together is formed a permanent joint.



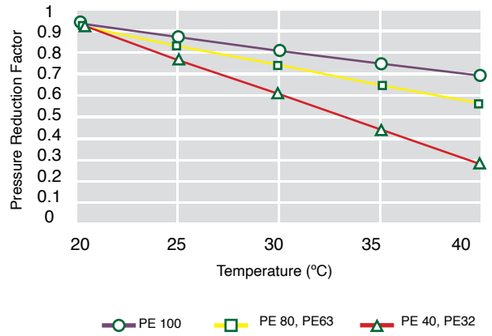
ELECTROFUSION

Welding of HDPE pipes by electrofusion couplings provides a homogeneous joint with end load bearing capabilities and the same corrosion resistance as the parent pipe. Pre-installed resistance wires are embedded in the inside surface of the electro fusion coupling. When the pipes or fittings are inserted in the coupling and the wires are connected to the welding unit, the contact surfaces become warm and consequently melt into each other until it forms a rigid and durable joint. A welding unit is available for this procedure which operates the timing automatically. This makes the whole operation very easy and practical especially in narrow and tight installation environments.

DESIGN CONSIDERATIONS

PRESSURE REDUCTION DEPENDENT TO TEMPERATURE

PE pipes are designed and manufactured to operate based on the indicated pressure rating at 20°C. However, in a case of operation exceeding 20°C, a pressure reduction factor can be determined using the following table. For any other temperatures referring to HDPE pipes, the table below can be applied as well.



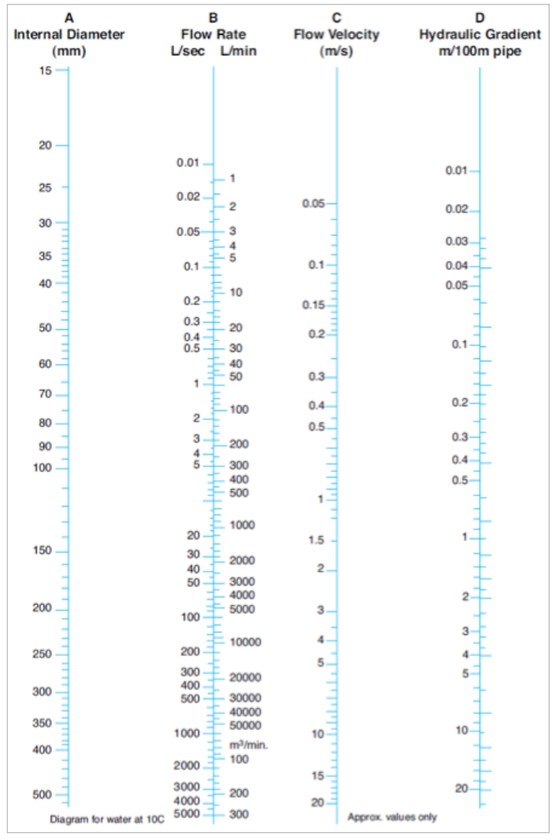
Temperature	Working Pressure Multiplier
0 - 20°C	1.00
20 - 25°C	0.80
25 - 30°C	0.63
30 - 35°C	0.50
35 - 40°C	0.40
40 - 45°C	0.32
45 - 50°C	0.25

FLOW NOMOGRAM

Pressure drop due to friction can be determined for practical purposes using the flow nomogram.
A bigger scale nomogram is available on request.

The pressure drop at a given flow rate can be determined as follows:

- Mark the internal diameter (ID) of the pipe to be used.
- Mark the required flow rate on Flow Rate Scale.
- Draw a straight line connecting these two points and extend it through the graph.
- The intersection with the Flow Velocity Scale and the frictional head loss in metres per 100 metres of pipe can then be determined by the intersected lines.



INSTALLATION OF PE PIPES

TEMPERATURE EFFECT ON DIMENSIONS

Due to the relatively high expansion and contraction co-efficient of PE pipes, it is necessary to make allowance for any design and installation which is exposed to wide temperature variations. HDPE pipes will expand or contract by 0.2 mm per meter per °C rise or fall in temperature. A 30°C temperature rise will therefore cause a 36 mm expansion of a 6 meter pipe.

BENDING

One of the important features of using HDPE pipes is its flexibility. However it is important to remember that the bending radius at any point should never be less than 20 times the pipe outside diameter at an ambient temperature of 20°C. When lower temperatures are encountered it is necessary to progressively increase the minimum bending radius by a factor of up to 2.5 times at 0°C.

ADDITIONAL DESIGN CONSIDERATIONS

Depending on the application of the piping system, there might also be other properties of the pipes needed to be taken into consideration when designing a piping system.

Some of the properties have been analyzed during the previous texts. Further information on the following topics is available on request:

- Correct PE pipe selection
- Hydrostatic Design Stress
- Temperature Influence
- E-Modulus
- Wall thickness for special operations
- Hazen-Williams and Colebrook-White flow formulas
- Flow variations
- Head Loss
- Surge and fatigue
- Celerity
- Slurry flow
- External pressure resistance
- Thrust velocity and block size
- Electrical conductivity, vibration and heat sources
- Soil and Traffic loads
- Water hammer

PE pipes are tough, flexible and lightweight and can offer huge cost savings in both above ground and below ground installations. Whilst they are robust and resistant to site damage, normal care and sensible handling practices are necessary to ensure trouble free installations.

UNDERGROUND INSTALLATION

The design engineer must evaluate the site conditions, the subsurface conditions, and the application objectives to determine the extent of support the pipe may need from the surrounding soil. Where the pipe burial depth is relatively deep, the subsurface soil conditions are not supportive of pipe or the surface loads or live loads are present, the engineer will generally prepare a specific installation specification. The specific engineered installation instructions must be followed.

Trench Construction - Main considerations in trench construction are trench width, length, and depth, soil stability and groundwater accumulation in the trench. Unstable soils or wet conditions should be controlled by sloping or bracing the trench walls, drainage of the trench bottom, and/or other measures. The trench width should allow sufficient room for joining the pipe, if required, snaking small diameter from side to side along the bottom of trench for thermal affects, and filling and compacting the side fills.

Trench walls - Walls of trenches below the elevation of the crown of the pipe should be maintained as vertical as possible.

Trench floor - The trench floor must be stable in order to support the bedding material. Generally, if the trench floor can be walked on without showing foot prints it is considered stable. The trench bottom may undulate but must support the pipe smoothly and be free of ridges, hollows, and lumps. The trench bottom should be relatively smooth and free of rock. Rocks, boulders, or large stones that can cause point loading on the pipe must be removed.

Drainage - The groundwater in the trench should be kept below the pipe invert, using deep wells, well points or sump pumps placed in the trench.

Pipe Laying - Place PE pressure pipe up to 200mm in diameter in the trench by hand. Use equipment to lift, move, and lower larger diameter pipe into the trench. Pipe must not be dumped, dropped, pushed, or rolled into the trench.

Pipe Embedment - The embedment materials should be sufficiently granular for hunching under the pipe and compacting. Typical soils include coarse grained soil, such as gravel or sand, or coarse grained soil containing fines, such as silty sand or clayey sand.

Backfilling and Compaction - Backfilling should follow pipe placement and assembly as closely as possible to prevent the pipe from being shifted out of line by cave-ins, protect the pipe from external damage, eliminate pipe lifting due to flooding of open trench and lessen the possibility of backfill material becoming frozen in cold weather. The final backfill may consist of the excavated material, provided it is free from unsuitable matter such as large lumps of clay, organic material, boulders or stones, or construction debris. The final backfill may be placed in the trench by machines.

Sunlight Exposure - During Installation, placing a pipe that has been in direct sunlight in a cooler trench will result in thermal contraction of the pipe's length. This contraction can generate force which could result in pull-out at mechanical couplings or other buried structures. Allow pipe to cool before making connections to an anchored joint, flange, or a fitting that requires protection against excessive pull-out forces. Covering the pipe with embedment will facilitate cooling.

Deflection - Small diameter pressure pipes usually have adequate stiffness and are usually installed in such shallow depths that it is unnecessary to make an internal inspection of the pipe for deflection.

ABOVE GROUND INSTALLATION

For exposed above-ground pipework proper anchorage and support is essential. It must cater for thermal stresses and movements over the ambient temperature range to which the pipe system will be exposed. Above-ground HDPE systems should preferably be installed at or near maximum operating temperature. This will ensure that the pipe is thermally expanded when clamps or supports are bolted into position and the pipe will be prevented from contracting. Tensile stress will develop as the pipework cools, and the pipeline will therefore remain straight between supports.

When reheated to installation temperature, any sagging will be minimized. When suspending HDPE pipes the recommended centre distance between supports at various temperatures is available on request.

Pipe clamps used for anchorage and support should have flat, non-abrasive contact faces, or be lined with rubber sheeting and should not be over-tightened. The width of support brackets and hangers should normally be either 100 mm or half the nominal pipe diameter, whichever is the greater. Support brackets should allow free axial movement.

COILS INSTALLATION

The benefits of using pipes in coils are achieved during the installation process. Installing long lengths of coiled pipe takes a fraction of the labour force that would be required for installing the same pipeline using the traditional 'stick' lengths. The numbers of joints are reduced, increasing the pipeline's integrity whilst lowering maintenance costs.

Since the coiled pipes have tensions like a spring that can unwind dangerously if not controlled, safe de-coiling is essential. To avoid any serious injuries, secure the pipe coil - especially the end points of the pipe - on stationary points before cutting the straps. The internal endpoint should be secured together with the coil while the external endpoint on a controlled point for installation, cutting one strap at the time while uncoiling.

Specialised uncoiling systems have been marketed that maximises the amount and size of pipe that can be efficiently de-coiled with safety. Pipe rolls can be de-coiled with the traditional way using a supported axial shaft, but always keep in mind the local safety regulations and practices when handling large coils of pipes.

FEEDBACK

Please scan the QR code on the right side of this page to help us understand more about your experience with us.

We strive to provide the best service to our customers, and your feedback is highly valuable to us.

SCAN ME

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