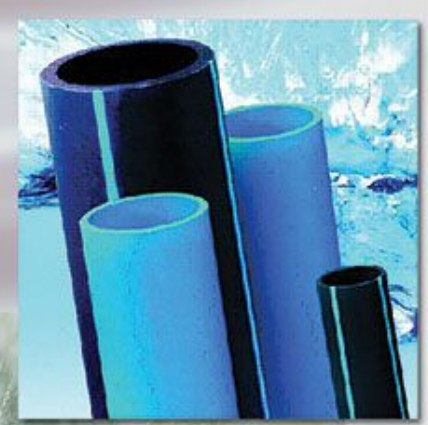




SARKIS CO.



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POLYETHYLENE PIPES

INTRODUCTION

Sarkis Company is an industrial lebanese company established in 1970 located in the industrial area of Ain Saade, in Mount Lebanon.

Sarkis Co. produces many kinds of plastic products, water hoses, gardening articles, brooms and brushes since more than 40 years...

Because success is in our continuity, best quality is our aim, customer services satisfaction is our commitment, **Sarkis Co.**, "the leader in plastic extrusion lines", has launched, and as usual in each period, a new variety of products, in order to meet market needs and requirements in terms of everything related to polyethylene pipes to be implemented, as it is shown in the following catalog's index.



INDEX

PART 1

Pressurised water systems:

- Potable water supply and distribution lines
- Long distance pressurised pipes systems
- Fire fighting high pressure networks
- Sprinkler and compression irrigation systems
- Plumbing, drainage and sewerage
- Underwater piping system
- Gas distribution
- Laboratories

PART 2

Electrical conduits and fiber-optic ducts

PART 3

Drip irrigation systems

ADVANTAGES:

Polyethylene pipes having proved its efficiency in all these applications since more than four decades based on the following advantages:

1. Easy of handling due to light weight
2. Flexibility allowing resistance against soil movement
3. Leak-tight installation due to excellent fusion-welding possibility
4. Long life with low operational costs
5. Tasteless, odorless, bacteriologically neutral
6. Chemical resistant
7. U.V. resistant
8. Low thermal conductivity
9. Excellent flow characteristics
10. Excellent water hammer characteristics

ISO 9001 : 2008

BUREAU VERITAS
Certification

N° IND12.4068



008

PART 1

SELECTION OF RAW MATERIAL APPLIED FOR PE PRESSURE PIPE FOR WATER SUPPLY

CLASSIFICATION AND DESIGNATION

The basic polyethylene (PE) material types used for HDPE pipe production are PE 63, PE 80 and PE 100.

The classification number of PE is to identify the pressure that the plastic materials can resist. Referring to ISO/TR 9080, it is based on the minimum required strength (MRS), which has to be applied for designing long-term loaded PE pipes operating at a temperature of 20°C for a designed life of at least 50 years.

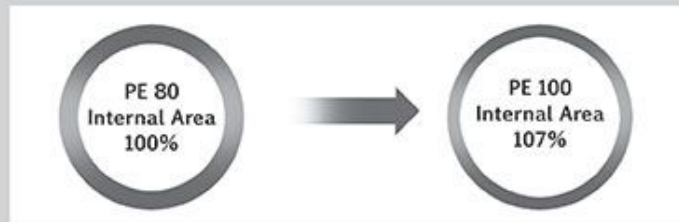
TABLE 1 MATERIAL DESIGNATION & CORRESPONDING MAXIMUM DESIGN STRESS VALUES

| | MATERIAL DESIGNATION | CLASSIFICATION NUMBER | MRS Minimum Required Strength | SAFETY FACTOR C for water | DESIGN STRESS σ_s |
|----------------------------|----------------------|-----------------------|-------------------------------|---------------------------|--------------------------|
| 1 st GENERATION | PE 63 | 63 | 6.3 MPa | 1.25 | 5.0 MPa |
| 2 nd GENERATION | PE 80 | 80 | 8 MPa | 1.25 | 6.4 MPa |
| 3 rd GENERATION | PE 100 | 100 | 10 MPa | 1.25 | 8.0 MPa |

*The Classification Number given for the material is 10 times the Minimum Required Strength (MRS).

*The Design Stress σ_s is obtained by dividing the MRS by a safety factor C.

*For Water System, C has a minimum value of 1.25.



ELASTICITY AND PRESERVATION

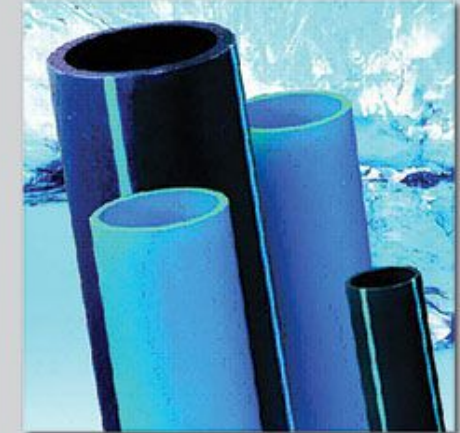
High density polyethylene PE 100 material, with bimodal distribution of molecular mass, is specifically designed for pressure pipe applications, it provides excellent stress crack resistance properties (ESCR) combined with very good long term hydrostatic strength, even at low temperature down to minus 20°C.

CHARACTERISTIC

High density polyethylene PE 100 material being the latest discovery in the world of polyethylene after PE 80, that gives the pipe an additional advantage to have the thinnest wall with the highest resistance, which means more water flow with the same outside pipe size.

EFFECT ON WATER QUALITY

High density polyethylene PE 100 pipes are suitable for drinking water. Due to the high quality material used in our pipes, it has no effect on water taste, odor, appearance of water, and growth of aquatic micro-organisms.



COLOR OF PIPES

HDPE pipes for water use are supplied in two colors: totally blue or black with blue stripes. Note that other stripe colors are co-extruded with black pipe, to designate the usage, for example: orange stripes for conduit and yellow stripes for gaz application.

TABLE 2 PE 100 MATERIAL DATA SHEET

| PROPERTIES | VALUE | UNIT | TEST METHOD |
|---|-------|----------------------|-------------|
| RESIN PROPERTIES | | | |
| Density @ 23°C | 959 | kg / m ³ | ISO 1183 |
| Melt Flow Rate @ 190°C & 2.16 kg load | 0.64 | g /10 min | ISO 1133 |
| Melt Flow Rate @ 190°C & 5.00 kg load | 0.22 | g /10 min | ISO 1133 |
| MECHANICAL PROPERTIES | | | |
| Tensile Strength @ Yield Specimen Thickness 2mm, Test Speed 50 mm/min. | 23 | Mpa | ISO 527-2 |
| Elongation @ Break | >600 | % | ISO 527-2 |
| Charpy Impact Notched @ 23°C | 26 | KJ / m ² | ISO 179 |
| Charpy Impact Notched @ - 30°C | 13 | KJ / m ² | ISO 179 |
| MRS Classification | 10 | Mpa | ISO/TR 9080 |
| Hardness, (Shore D) | 63 | | ISO 868 |
| THERMAL PROPERTIES | | | |
| Thermal Stability (210°C) | >20 | min | EN 728 |
| Thermal Conductivity | 0.4 | w / m ⁰ k | DIN 52612 |

PIPES SPECIFICATIONS

HDPE PE 100 pipes dimensions are manufactured according to ISO 4427, DIN 8074/8075 and EN 12201 standards.

The pressure rating of a pipe (PN) is determined by the diameter, wall thickness and material type at a given temperature, and is expressed as:
PN bar – pipe pressure rating at 20°C (MPa x 10).

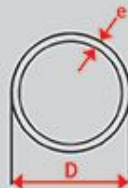
TABLE 3 OUTSIDE DIAMETERS AND WALL THICKNESSES

| PE 100 OUTSIDE DIAMETER (D) in millimeter | PIPE SERIES | | | | | Coil/Pipe Length (meter) |
|--|-------------------------------|---------------|---------------|--------------|------------------|-----------------------------|
| | SDR 26 S 12.5 | SDR 17 S 8 | SDR 11 S 5 | SDR 9 S 4 | SDR 7.4 S 3.2 | |
| | NOMINAL PRESSURE, (PN) IN BAR | | | | | |
| | PN 6.3 | PN 10 | PN 16 | PN 20 | PN 25 | |
| WALL THICKNESS (e) in millimeter | | | | | | |
| e mm | e mm | e mm | e mm | e mm | e mm | |
| 16 | -- | -- | 1.5 | 1.8 | 2.3 | 100 |
| 20 | -- | -- | 1.9 | 2.3 | 2.8 | 100 |
| 25 | -- | 1.5 | 2.3 | 2.8 | 3.5 | 100 |
| 32 | -- | 1.9 | 2.9 | 3.6 | 4.4 | 100 |
| 40 | 1.8 | 2.4 | 3.7 | 4.5 | 5.5 | 100 |
| 50 | 2.0 | 3.0 | 4.6 | 5.8 | 6.9 | 100 |
| 63 | 2.5 | 3.8 | 5.8 | 7.1 | 8.6 | 100 |
| 75 | 2.8 | 4.5 | 6.8 | 8.4 | 10.3 | 100 |
| 90 | 3.5 | 5.4 | 8.2 | 10.1 | 12.3 | 100 |
| 110 | 4.2 | 6.6 | 10.0 | 12.3 | 15.1 | 50 |
| 125 | 4.8 | 7.4 | 11.4 | 14.0 | 17.1 | 12 |
| 140 | 5.4 | 8.3 | 12.7 | 15.7 | 19.2 | 12 |
| 160 | 6.2 | 9.5 | 14.6 | 17.9 | 21.9 | 12 |
| 180 | 6.9 | 10.7 | 16.4 | 20.1 | 24.6 | 12 |
| 200 | 7.7 | 11.9 | 18.2 | 22.4 | 27.4 | 12 |
| 225 | 8.6 | 13.4 | 20.5 | 25.2 | 30.8 | 12 |
| 250 | 9.6 | 14.8 | 22.7 | 27.9 | 34.2 | 12 |

PN Values are based on C=1.25 for water

*SDR (Standard Dimension Ratio) = $\frac{D}{e}$ S is the Pipe Series as defined in ISO 4065: $S = \frac{SDR-1}{2}$

Material: PE 100
Minimum required strength: MRS = 10.0 Mpa
Design stress: $\sigma_s = 8.0$ Mpa
Design safety factor: C = 1.25 for water



$$PN_{bar} = \frac{20 \times \sigma_s \times e}{D - e}$$

JOINTING METHODS FOR HDPE PIPES AND FITTINGS

There are several types of jointing HDPE pipes depending on the size and the type of application which are mentioned in details hereafter:

COMPRESSION TYPE

It is a mechanical jointing of PE pipes by use of PP compression fittings. This jointing applies mainly in potable water systems as well as in other applications, the dimensions of the fittings range is from 16mm up to 110mm. This method enables jointing different wall thicknesses and different grades of pipes.



FLANGE TYPE

Polyethylene pipes cannot be joint by any other method to other pipes made of non PE materials (eg: UPVC, asbestos, PP, etc). Wherever possible flange joints should be made before other joints are completed. The flange adaptor is butt welded to the pipe with the loose steel backing flange inserted inside, the use of bolts will be fitted to tighten the connection. This type of jointing is applicable where easy maintenance is required in the future.



BUTT FUSION WELDING

This method is not applicable for smaller diameters pipe (<63mm) but recommended for size (>63mm) it is a simple and space saving jointing method. The process consists of cutting the pipe ends straight and square to the axis and cleaned properly. The pipes and fittings are hold tightly and pressed against a coated heating plate. As soon as the heating time and the required bead are reached, the heating plate is withdrawn from the weld faces and the connection are pressed together to form a permanent joint.



ELECTROFUSION WELDING

This method is easy for jointing pipes and fittings of HDPE. A preinstalled resistance wires are embedded in the inside surface of the electrofusion 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 method and this method is easy and practical in narrow and tight installation. One of the advantages of this method is to weld pipes or fittings with different wall thicknesses and dissimilar PE grades, using the same welding conditions.



PART 2

ELECTRICAL CONDUITS AND FIBER OPTIC DUCTS

HDPE pipes are also usefull as ducts and sub-ducts for electrical conduit and fiber optic cables installation, providing the following benefits:

- Flexible and lightweight which allows remarkable direction changes without the use of joints.
- Smooth bore with very low friction for cable placement.
- Excellent shock resistant even at low temperature.
- Highly resistant to most chemical agents and micro-organisms.
- Good weathering resistant and long term stability.
- Secured protection against ultra-violet radiation, providing installation above ground and underground.
- Ideal for data and telecommunications applications.

The basic color of a duct pipe is black, an orange stripe can be applied upon request, as well as other basic colors can be produced on demand.



TABLE 1 HDPE DUCTS DIMENSIONS AS PER DIN 8074

| OUTSIDE DIAMETER (D) in millimeter | PIPE SERIES | | | Coil/Pipe Length (in meter) |
|------------------------------------|------------------|---------------|---------------|-----------------------------|
| | SDR 26 S 12.5 | SDR 17 S 8 | SDR 11 S 5 | |
| 16 | -- | 1.0 | 1.5 | 100 |
| 20 | -- | 1.2 | 1.9 | 100 |
| 25 | 1.2 | 1.5 | 2.3 | 100 |
| 32 | 1.5 | 1.9 | 2.9 | 100 |
| 40 | 1.8 | 2.4 | 3.7 | 100 |
| 50 | 2.0 | 3.0 | 4.6 | 100 |
| 63 | 2.5 | 3.8 | 5.8 | 100 |
| 75 | 2.8 | 4.5 | 6.8 | 100 |
| 90 | 3.5 | 5.4 | 8.2 | 100 |
| 110 | 4.2 | 6.6 | 10.0 | 50 |
| 125 | 4.8 | 7.4 | 11.4 | 12 |

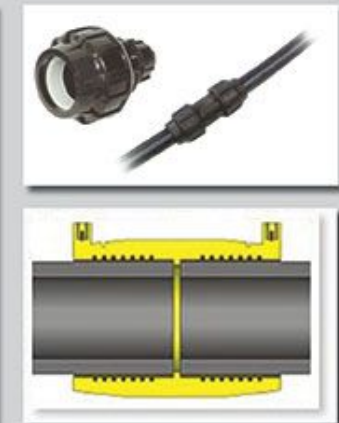
*Other Lengths are also available

SUITABLE JOINTING

Electrofusion Fitting



Compression Fitting



PART 3

DRIP IRRIGATION PIPES SYSTEMS

CHARACTERISTICS AND APPLICATIONS

Sarkis Co. produces also LDPE drip irrigation pipes, with high quality material, which resists changes in climate temperature and adjusts its elasticity accordingly, especially in regions where temperature drops in winter to below 0°C.

This system supplies water directly to the roots of the plant, that minimize the loss in evaporation as well as water consumption.



TABLE 1 PHYSICAL PROPERTIES OF LDPE MATERIAL

| POLYMER PROPERTIES | VALUE |
|---|--------------------------|
| DENSITY @ 23°C | 0.920g / cm ³ |
| MELT FLOW INDEX | 0.30gm / 10min |
| MECHANICAL PROPERTIES | VALUE |
| TENSILE STRENGTH @ YIELD | MD/TD: 16/11 MPA |
| TENSILE STRENGTH @ BREAK | MD/TD: 25/25 MPA |
| ELONGATION @ BREAK | MD/TD: 550/600% |
| BRITTLINESS TEMPERATURE | <-70°C |
| IMPACT STRENGTH, F 50 | 220g |
| PROPERTIES | |
| -EXCELLENT MECHANICAL PROPERTIES | |
| -GOOD SHRINK PROPERTIES | |
| -EXCELLENT STRESS CRACK RESISTANCE (ESCR) | |
| APPLICATION | |
| DRIP IRRIGATION PIPE | |

TABLE 2 LDPE PIPE DIMENSIONS ARE BASED ON DIN 8072 WITH A WORKING PRESSURE OF 4 BARS & 6 BARS AT 20°C

| LDPE | | NOMINAL PRESSURE PN BAR | | COIL LENGTH in meter |
|-----------------------|------|---------------------------------|------|-------------------------|
| | | PN 4 | PN 6 | |
| OUTSIDE DIAMETER | | WALL THICKNESS e in millimeters | | |
| EQUIVALENT in inch | D mm | e mm | e mm | |
| 3/8" | 16 | 1.2 | 1.4 | 100 |
| 1/2" | 20 | 1.5 | 1.7 | 100 |
| 3/4" | 25 | 1.8 | 2.2 | 100 |
| 1" | 32 | 2.0 | 2.8 | 100 |
| 1 1/4" | 40 | 2.4 | 3.5 | 100 |
| 1 1/2" | 50 | 3.0 | 4.3 | 100 |
| 2" | 63 | 3.7 | 5.4 | 100 |
| 2 1/2" | 75 | 4.5 | 6.5 | 100 |
| 3" | 90 | 5.3 | 7.8 | 100 |
| 4" | 110 | 6.5 | 9.5 | 50 |

*Special orders are available