

Трубы для водоснабжения и отопления для монтажа под землей PE WATER, PE WATER RC, ARMO

Технические характеристики

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Armo Pipes

Technical Datasheet

Product description

ARMO is a double-walled pipe made of innovative, highly robust plastic BorSafe HE3490-LS-H. This tube provides increased safety and longer life compared to traditional PE pipes, even when it comes to extreme loads such as pipe notches, grooves and point loads.

Pipes are with dimensionally added protective outer sheath of polyethylene or polypropylene.

The dimension of pipes, as required by ISO 4065 for tubes with an outer protective layer, consist of a core tube of one-layer PE-100-RC standard dimension and a protective sheath of polypropylene or polyethylene. The minimum thickness of the sheath shall be 0.8 mm. The thickness of the sheath depends on the dimension of the pipe. Large pipes have a thicker liner due to the larger loads the pipes are designed for.

Pipe design

PEŠTAN Armo pipes are designed to respond to any market requirements, and are therefore divided into the following categories:

- pipes without copper wire: black single layer PE-100-RC pipe, with painted blue stripe + additional PP / PE layer.
- copper wire pipes: black single layer PE-100-RC pipe with painted blue stripe + additional PP layer.

In accordance with EN 12201-2/ISO 4065, made as a single layer pipes from PE-100-RC according to PAS 1075 Type 3 with additional protection, with a layer of modified PP or PE material.

PEŠTAN Armo pipe is thanks to its excellent resistance on cracking under stress insensitive to point loads and therefore does not need a sand bed.

PEŠTAN Armo pipe is flexible and movable. Because of its greatness resistance to point load PEŠTAN Armo pipe is extremely suitable for laying techniques in which the ground excavation used as filling material.

Open trenches for pipelines endanger uninterrupted flow road traffic and disturb the surrounding population. The asphalt on the roads is permanently damaged. For these reasons trench-free laying techniques are increasingly accepted since they also provide the possibility of taking the exam pipes under rivers, lakes and busy roads.

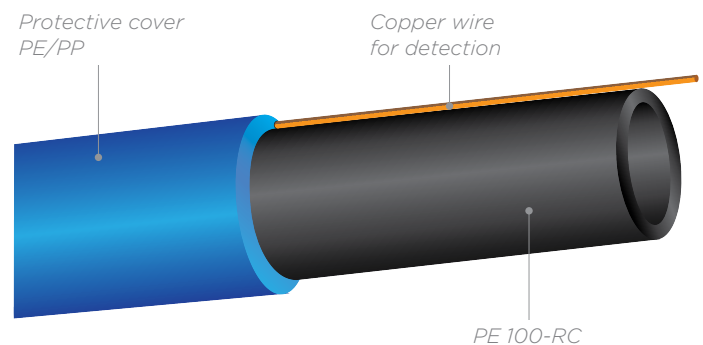
Advantages of PEŠTAN ARMO pipes

- High reliability and proven performance make PE an excellent choice, especially for buried pipe systems;
- Resistance to low temperature - due to its high extensibility, toughness and elasticity, PEŠTAN ARMO pipes do not create problems during installation and operation at low temperatures;
- High impact resistance - high hydraulic resistance shock, fatigue and wear eliminate the need for a higher nominal pressures and reduces the value of the investment;

- Comparisons have shown that polyethylene pipes have the larger wear resistance of other materials, so PE make the most desirable material for transporting soluble pipes matter;
- Excellent hydraulic characteristics (low absolute roughness) - smooth surface and turbulent flow resistance fluids allow greater flow;
- Excellent chemical resistance - resistance to large numbers chemical agents;
- Weldability - due to good weldability and elasticity, PE large length pipelines can be connected outside the trench and then laid (which reduces the required width of the trench) and welded the joints will be strong and reliable;
- Wide range of installation methods, PE pipes offer to installers numerous installation solutions that they can provide significant time and cost savings, for example PE pipes prefer in installations without a trench or with a narrow trench.

Pipe detection

For detecting PE-100-RC pipelines, the simplest and most economical the method is to place the pipe in a trench that is on its own the structure contains a marker copper wire for tracking-detection.



Connection of PEŠTAN ARMO pipes

Pipes can be connected by conventional connection (as well as other PE pipes) with the difference that care must be taken if the pipes in the structure have copper wire. Pipes and fittings can be connected by joining the ends by standard PE pipe joining techniques. Peštan ARMO pipes are compatible with fittings from the world's leading manufacturers and do not require special installation material, which is its biggest advantage. Methods of connecting PEŠTAN ARMO pipes are:

- butt welding (for RC | PE and for RC | PP);
- electrofusion finishing (for RC | PE and for RC | PP);
- mechanical connection.

PEŠTAN ARMO pipes are compatible with electrofusion couplings welding of renowned world manufacturers.

In electrofusion welding of pipes, the minimum removal of the added protective layer of PP or PE, for a certain diameter of the pipe, should be according to the dimensions shown in the table:

DN [mm]	Protective layer peeling length [mm]
110	90
125	95
140	105
160	110
180	115
200	120
225	125
250	135
280	150
315	160
355	160
400	170
450	180
500	190
560	200
630	220



Chemical resistance

They can be used to transport water, gas, industrial fluids. Resistant to salt and fresh water, vegetable and animal oils, alcohols, chlorine compounds, alkaloid acids, bases, and detergents. They do not contain heavy metals (eg Pb, Cd, Sn...).

* Plastic pipes and fittings - Combined classification table chemical resistance ISO/TR 10358

Availability of ARMO pipes

Available in dimensions from 110 mm to 630 mm, in pipes of 6, 12, 13.5, and 16 m.

Dimensions: SDR 41; SDR 33; SDR 21; SDR 17; SDR 13.6; SDR 11; SDR 9; SDR 7.4; SDR 6.

1) Connection of pipes without copper wire for detection is done in the following steps:

- the outer PP layer is peeled off (example: pipe $\varnothing 110 + 2\text{mm}$ PP / PE protective layer);
- connect the two ends of the pipe to one of the standard methods;
- Finally, the joint of the PE-100-RC middle layer is insulated with heat-shrinkable foil and/or self-adhesive tape based on butyl rubber (to prevent corrosion and electrical insulation on pipes and metal parts).



2) The connection of the pipe with the copper wire for detection is done in the following steps:

- peel off the outer PP layer of the pipe in the desired and/or design length (with care not to damage the copper wire and the middle layer);
- the copper wire will move to the side (usually "throw" back);
- the middle layer is joined to one of the standard methods;
- the two ends of the copper wire are connected by an electrical connector;
- Finally, the junction of the PE-100-RC middle layer and the junction of the copper wire is insulated with heat-shrinkable foil and/or self-bonding tape based on butyl rubber (to prevent corrosion and electrical insulation on pipes and metal parts).

DN [mm]	SDR 41	SDR 33	SDR 26	SDR 21	SDR 17	SDR 13.6	SDR 11	SDR 9	SDR 7.4	SDR 6
	PN 4	PN 5	PN 6	PN 8	PN 10	PN 12.5	PN 16	PN 20	PN 25	PN 32
	e _{min} [mm]	e _{min} [mm]	e _{min} [mm]	e _{min} [mm]	e _{min} [mm]	e _{min} [mm]	e _{min} [mm]	e _{min} [mm]	e _{min} [mm]	e _{min} [mm]
110			4.2 + APL*	5.3 + APL*	6.6 + APL*	8.1 + APL*	10.0 + APL*	12.3 + APL*	15.1 + APL*	18.3 + APL*
125			4.8 + APL*	6.0 + APL*	7.4 + APL*	9.2 + APL*	11.4 + APL*	14.0 + APL*	17.1 + APL*	20.8 + APL*
140			5.4 + APL*	6.7 + APL*	8.3 + APL*	10.3 + APL*	12.7 + APL*	15.7 + APL*	19.2 + APL*	23.3 + APL*
160			6.2 + APL*	7.7 + APL*	9.5 + APL*	11.8 + APL*	14.6 + APL*	17.9 + APL*	21.9 + APL*	26.6 + APL*
180			6.9 + APL*	8.6 + APL*	10.7 + APL*	13.3 + APL*	16.4 + APL*	20.1 + APL*	24.6 + APL*	29.9 + APL*
200			7.7 + APL*	9.6 + APL*	11.9 + APL*	14.7 + APL*	18.2 + APL*	22.4 + APL*	27.4 + APL*	33.2 + APL*
225			8.6 + APL*	10.8 + APL*	13.4 + APL*	16.6 + APL*	20.5 + APL*	25.2 + APL*	30.8 + APL*	37.4 + APL*
250			9.6 + APL*	11.9 + APL*	14.8 + APL*	18.4 + APL*	22.7 + APL*	27.9 + APL*	34.2 + APL*	41.5 + APL*
280			10.7 + APL*	13.4 + APL*	16.6 + APL*	20.6 + APL*	25.4 + APL*	31.3 + APL*	38.3 + APL*	46.5 + APL*
315	7.7 + APL*	9.7 + APL*	12.1 + APL*	15.0 + APL*	18.7 + APL*	23.2 + APL*	28.6 + APL*	35.2 + APL*	43.1 + APL*	52.3 + APL*
355	8.7 + APL*	10.9 + APL*	13.6 + APL*	16.9 + APL*	21.1 + APL*	26.1 + APL*	32.2 + APL*	39.7 + APL*	48.5 + APL*	59.0 + APL*
400	9.8 + APL*	12.3 + APL*	15.3 + APL*	19.1 + APL*	23.7 + APL*	29.4 + APL*	36.3 + APL*	44.7 + APL*	54.7 + APL*	66.5 + APL*
450	11.0 + APL*	13.8 + APL*	17.2 + APL*	21.5 + APL*	26.7 + APL*	33.1 + APL*	40.9 + APL*		61.5 + APL*	
500	12.3 + APL*	15.3 + APL*	19.1 + APL*	23.9 + APL*	29.7 + APL*	36.8 + APL*	45.4 + APL*			
560	13.7 + APL*	17.2 + APL*	21.4 + APL*	26.7 + APL*	33.2 + APL*	41.2 + APL*				
630	15.4 + APL*	19.3 + APL*	24.1 + APL*	30.0 + APL*	37.4 + APL*	46.3 + APL*				

* APL - additional protective layer (PP/PE), minimum 0.8 mm. It depends on the pipe dimensions, application conditions and type of project

Technical assistance

For more information, you can contact PEŠTAN technical support or a regional sales representative.



BELNIIS - Belarus



KIWA - Netherland



VUPS - Czech Republic



BELNIIS - Belarus



IMS - Serbia



GOST R - Russia



MPA - Germany



IGH - Croatia

PEHD Water pipes

Technical datasheet

Applications

Peštan PEHD pipes are used for water conduction under pressure. Pipeline can follow configuration of the ground because of its elasticity that reduces couplings needed. Very flexible and extremely resistant to vibration, seismic strikes and ground movements.

Product description

Peštan PEHD pipes are high quality pipes made of supreme quality polyethylene PE-80 and PE-100. Complete program Peštan PEHD pipes is produced under the norm EN 12201. Polyethylene water pipes are resistant to UV rays and temperatures up to 60°C. They are completely physiologically and toxicologically safe for use in water supply.



Product Availability

Production range covers diameters from Ø16 to Ø1200. These pipes are being made in 10 versions (depending on the pressure they are ment for):

SDR 7,4 - PN 25	SDR 17 - PN 10	SDR 41 - PN 4
SDR 9 - PN 20	SDR 21 - PN 8	
SDR 11 - PN 16	SDR 26 - PN 6	
SDR 13,6 - PN 12,5	SDR 33 - PN 5	

Peštan is able to offer complete program of welded accessories made in all diameters and in all working pressures. Also other working pressures are available by the request

Characteristics and technical data

Safety coefficient of PEHD pipes is 1,25. Bending radius is 20d. PEHD pipes have high abrasion resistance. Very low pressure losses since coefficient friction are 10 times less than with steel pipes. Easy for transport and handling. Easy connection by welding or with couplings. Life time above 50 years. No impact on water taste and smell. Tartar free that helps reduction water flow during the time. Coefficient of linear extension for polyethylene is $1,3 \times 10^{-4} \text{C}^{-1}$ (0,13 mm/m °C).

Resistance to superficial temperatures:

Under the higher exploitation temperatures (industrial appliance) it is necessary to adjust the value of PN by using reducing coefficient from the table

Pressure reduction coefficient for PE100 i PE80 piping systems	
Temperature	Coefficient
20°	1,00
30°	0,87
40°	0,74

Physical properties of materials

	Norm	UOM	PE 80	PE100
Density on 23°C	ISO 1183-1	g/cm ³	0,93	0,95
Mass flow	ISO 1133	g/10 min	0,45	0,45
Tensile strenght	ISO 527	MPa	23	25
Elasticity modul	ISO 178	MPa	1000	1300
The coefficient of linear expansion	DIN 53 752	mm/m°K	0,18	0,18
Vicat softening point	ISO 306	C°	72	77
Thermal conductivity on 20°	DIN 53 612	W/m°K	0,4	0,38
Surface resistivity	DIN/IEC60167	Ω	>10 ¹⁴	VT>10 ¹⁴

Assembly of polyethylene pipes

There are more ways of connecting polyethylene water pipes:

- Head welding
- Electro-fusion
- Compression fitting (up to diameter 125)
- Connecting sleeves and langes

Head welding and electro-fusion are being executed according to DVS 2207-1

Chemical resistance

Resistant to fresh and salt water, to vegetable and animal oils, alcohol, chlorine compounds, alkaloid acids, bases and detergents. Do not contain heavy metals (eg Pb, Cd, Sn...).

*Plastic pipes and fittings - Combined chemical-resistance classification table ISO/TR 10358.

Technical Assistance

Our technical and engineering team is supported and advised by European institutes. For more information about products please contact PEŠTAN technical support or regional salesman.



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IGH - Croatia

PEHD RC pipes

Technical datasheet

Applications

Peštan PEHD pipes are used for water conduction under pressure. Pipeline can follow configuration of the ground because of its elasticity that reduces couplings needed. Very flexible and extremely resistant to vibration, seismic strikes and ground movements. They have significantly higher resistance to slow crack growth, compared to ordinary pipes made of PE 80 and PE 100. They are used for alternative ways of installation, such as directional drilling, drilling, pipe bursting, laying pipelines without sand bedding, etc.

Product description

Peštan RC is a compact (full wall) tube made of an innovative, extremely robust plastic BorSafe HE3490-LS-H. Tube prepared like this provides increased security and longer lifetime of pipes compared to traditional PE pipes, even when it comes to extreme loads, such as notching pipes, gutters and spotty loads. All BorSafe LS-H are certified as PE 100-RC (resistant to crack).

Increased security and improved mechanical properties are the result of a shift catalyst in the production process of the material.



Product Availability

Production range covers diameters from Ø16 to Ø800. These pipes are being made in 10 versions (depending on the pressure they are ment for):

SDR*6	SDR 7,4	SDR 9	SDR 11	SDR 13,6	SDR 17	SDR 21	SDR 26	SDR 33	SDR 41
S**2,5	S3,2	S4	S5	S6,3	S8	S10	S12,5	S16	S20
	PN 25	PN 20	PN 16	PN 12,5	PN 10	PN 8	PN 6	PN 5	PN 4

Peštan produces two types of pipes from PE 100 RC:

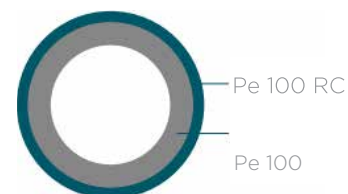
TYPE 1 - Solid wall pipes made of PE 100-RC:

Pipes solid wall of one wall made of PE 100-RC as defined by ISO 4065. The pipes can be made in blue or black water pipes with blue stripes, according to the applications which are also made of PE 100 RC materials.

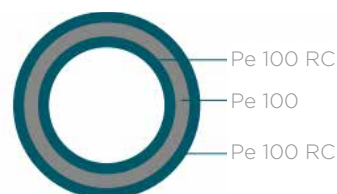


TIP 2 - Pipe with dimensional integrated protective layer made of PE 100-RC:

1. Double-layer pipes dimensional integrated protective layer which are made of PE 100 and PE 100 RC and have a co-extruded outer protective layer made of PE 100-RC.



2. Three-layer pipes with dimensional integrated protective layers of PE 100-RC. The pipes are made of PE 100 or PE 100-RC and have from the internal and external co-extruded protective layer made of PE 100-RC.



Peštan is able to offer complete program of welded accessories made in all diameters and in all working pressures. Also other working pressures are available by the request.

Characteristics and technical data

Safety coefficient of PEHD pipes is 1,25. Bending radius is 20d. PEHD pipes have high abrasion resistance. Very low pressure losses since coefficient friction are 10 times less than with steel pipes. Easy for transport and handling. Easy connection by welding or with couplings. Life time above 50 years. No impact on water taste and smell. Tartar free that helps reduction water flow during the time. Coefficient of linear extension for polyethylene is $1,3 \times 10^{-4} \text{C}^{-1}$ (0,13 mm/m°C)

Resistance to superficial temperatures:

Under the higher exploitation temperatures (industrial appliance) it is necessary to adjust the value of PN by using reducing coefficient from the table:

Pressure reduction coefficient for PE100 i PE80 piping systems	
Temperature	Coefficient
20°	1,00
30°	0,87
40°	0,74

Physical properties of materials

	Norm	UOM	PE100-RC
Density on 23 °C	ISO 1183-1	g/cm ³	0,95
Mass flow	ISO 1133	g/10min	0,45
Tensile strenght	ISO 527	MPa	25
Elasticity modul	ISO 178	MPa	1300
The coefficient of linear expansion	DIN 53 752	mm/m °K	0,18
Vicat softening point	ISO 306	C°	77
Thermal conductivity on 20°	DIN 53 612	W/m °K	0,38
Surface resistivity	DIN/ IEC60167	Ω	VT>10 ¹⁴

Assembly of polyethylene pipes

There are more ways of connecting polyethylene water pipe:

- Head welding
- Electro-fusion
- Compression fitting (up to Ø125)
- Connecting sleeves and langes

Head welding and electro-fusion are being executed according to DVS 2207-1.

Methods of installation of PEHD RC pipes:

There are several alternative ways to install PEHD RC pipes:

- Laying in narrow trenches
- Laying plowing
- Directional drilling
- Drilling
- Pipe bursting
- Slip lining

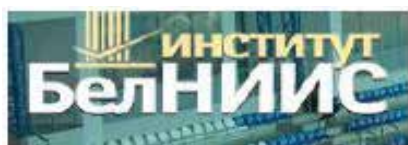
Chemical resistance

Peštan PEHD 100 RC is resistant to fresh and salt water, to vegetable and animal oils, alcohol, chlorine compounds, alkaloid acids, bases and detergents. Do not contain heavy metals (eg Pb, Cd, Sn ...).

*Plastic pipes and fittings - Combined chemical-resistance classification table ISO/TR 10358.

Technical Assistance

Our technical and engineering team is supported and advised by European institutes. For more information about products please contact PEŠTAN technical support or regional salesman.



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HDPE RC WATER PIPES

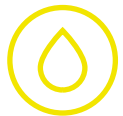


WE ARE

a private company Peštan, leader in the Balkans in the production and distribution of products and solutions from the polymers.

Company was founded in 1989 and has been producing water pipes made of polyethylene.

Over time, we introduced new materials (polypropylene and PVC) and expanded product range. Today, in our offer you may find more than 6500 products, divided into four categories:



**PIPING
SOLUTIONS**



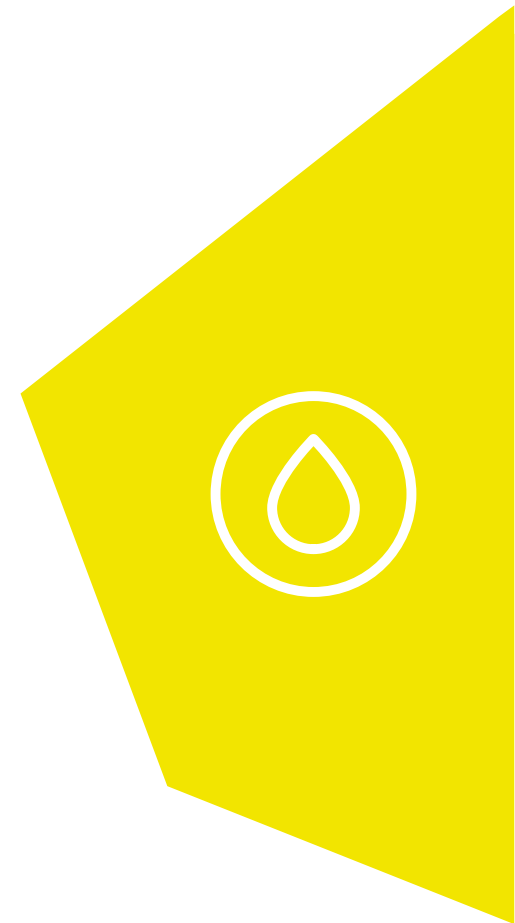
**DRAIN
SOLUTIONS**



**AGRICULTURE
SOLUTIONS**



**HOUSEHOLD
SOLUTIONS**



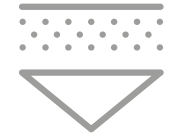
Edition 5



HDPE RC WATER PIPES

Water pipes made out of high density polyethylene PE 100 - RC

BELOW GROUND





POLYETHYLENE PIPES - BASIC DATA

Polyethylene is the most famous product made of plastic in mass production. It is classic member of polyolefin material family. Chemical formula of PE is $-(CH_2 - CH_2)$ which makes it ecologically compatible hydro-carbonic product. Pestan uses for it's production of PE pipes PE-HD, polyethylene of high density that is.

PE-HD pipes are of very high quality for which the tests under the norms DIN EN ISO 12162 and ISO/TR 9080 have proven their life time to be more than 100 years. Practical use also confirms the same, in application in gas, water or sewage networks. PE-HD pipeline systems, some of which are in function for over the 40 years, are characterized by great security in it's usage, low costs of maintenance.

Pestan is offering a wide range of PE pressure pipe systems, designed for potable water, gas (EN 1555 and EN 12201). Pestan pressure pipes are made of polyethylene HD: PE-100.

Positive characteristics of polyethylene pipes are undoubtable. They are firm, resistant in touch with aggressive environment, resistant to corrosion and mechanical impacts. Advantage of PE pipes comparing them to others are: light weight, flexibility, very small pressure loss during friction, toughness in low temperatures, high chemical resistance, good connectivity and low price. PE has a great resistance to acids and greasy substances, insoluble in organic or non organic solvents in temperatures from 20C. They are very light and flexible so they offer economical application. Due to it's flexibility very long lines can be layed without using the fittings because pipes can follow the configuration of the grounds, like horizontal turnings of the pipeline routes. By applying PE pipes during the construction of the pipelines the share of fittings and armature in works is minimal. Also the length of pipes can be delivered by special requests for projects, that can diminish building expenses.



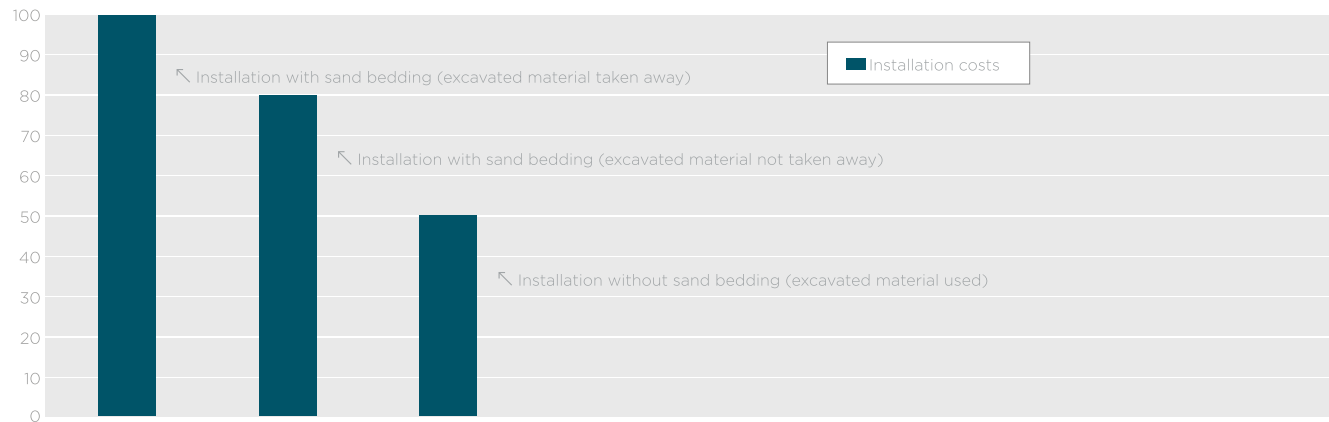
ADVANTAGES OF PE PIPES:

- High reliability and proven performance of functionality make PE a great choice, especially with buried systems.;
- Resistance to low temperatures - because of its great expandability PE pipes do not make problems during application and works in low temperatures.;
- High resistance to impact - huge resistance to hydraulic impact, fraying and weariness eliminate the need for greater nominal pressures and decreases the values of investment.;
- Comparisons have shown that PE pipes have greater resistance to abrasion than the other material, so PE is most wanted for this characteristics when transport of solutes is in question.;
- Great hydraulic characteristics - smooth surface and resistance to turbulent flow which allows the flow to be greater.;
- High chemical resistance - resistance to vast number of chemicals.;
- Ability to get weld - Because of the good flexibility PE pipelines of greater longitude can be connected out of the trench and layed afterwards (which decreases the width of the trench) and welded connections will be strong and reliable.
- Wide spectre of application methods - PE pipes offer to the workers numerous solutions of integration , that can save time and money, for example it is preferred the installation without the trench or with very narrow trench.

HOW DOES THE NEED FOR REINFORCED AND ENHANCED HDPE PE - 100 APPEAR

Sand coat around the pipe provides simple laying and protection from the rocks and stones. Conventional techniques of pipe placement are proven to be safe and reliable and they guarantee long term function of PE 80 and PE 100.

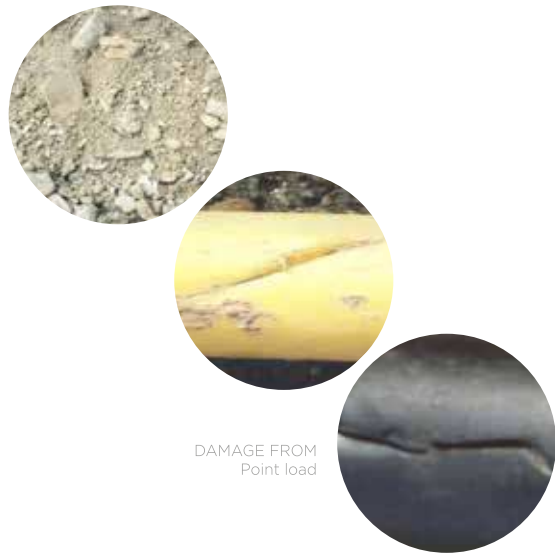
In last years the workers are more and more turning to new pipe laying techniques. Economic crisis and need for rationalization of spending made numerous producers question the price of making the sand coating for new pipelines and analyzing their necessity. If it is possible put in the dirt dug out from the trench hole it can be used for filling instead of the sand.



Peštan RC - resistant to crack

Rejecting the sand coat can result in scratches on the surface of newly placed pipeline. (Permitted damage is 10% of wall thickness) Besides that it is possible that rocks do the pointy or linear pressure the outer wall for a longer period - along with workload such as working pressure, weight of the dirt, or traffic so it could make damage.

If the protective sand coat is rejected it is necessary that chosen pipeline is protected from superficial damage derived from scratches, especially from pointy pressure so it wouldn't make cracks during the strain. So the condition for applying the pipe like this is that the pipe is made of material who can handle the load.



DAMAGE FROM
Point load

ADVANTAGES OF UNCONVENTIONAL METHODS ARE:

- Unconventional methods of installation bring significant decrease of spendings. Decrease of digging costs, bringing the sand and transport... It can all be decreased up to 50%;
- Problems of local inhabitants, decrease of incomes of local stores, redirection and slowed traffic represent indirect spendings of local community that don't occur with unconventional techniques.;
- Programs of efficient CO2 emission are necessary for solving the climate change problems in future. Emission of CO2 made from bringing the sand and putting away extra dirt from digging the site can be avoided with unconventional methods.

New unconventional techniques have been developed, however, damaging pipes during these techniques can always be avoided which led to the evaluation of pointy load/pressure during the works. New and unconventional techniques are:

- Open trench without sand coating for decreasing spending.;
- Laying the pipeline by plowing;
- Directed drilling ;
- Relining, breaking the pipeline



Installation without digging an open trench, method
of pipe laying - ploughing.



Installation without sand bedding

- Time means money and comfort. Swiftness in executing the works makes the difference in the eyes of local inhabitants. Projects too long can be often seen as troublesome and hard bearing while swift projects with unconventional techniques can be done very fast and often unnoticed;
- In total unconventional techniques are good for the environment because of the decreased emission of CO2, landscape preservation, trees, land structures...

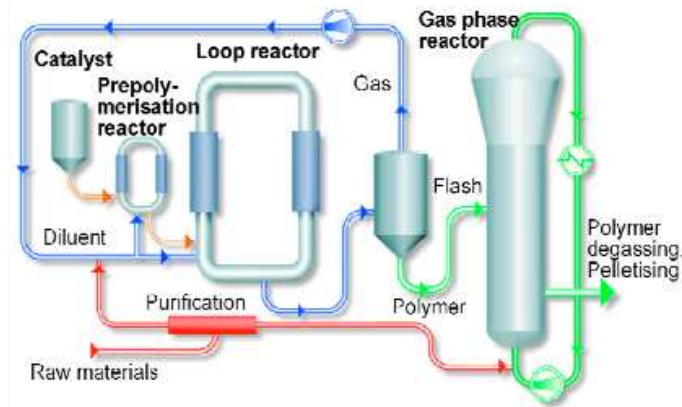
PE 100 RC

In manner of responding to challenges of unconventional methods in laying pipes PE 100, to empower resistance to pointy load and pressure and fast spreading of a crack, Borealis has developed new and advanced grain BorSafe HE3490-LS-H. This is the compound that Pestan uses in producing the PE 100 RC pipes.

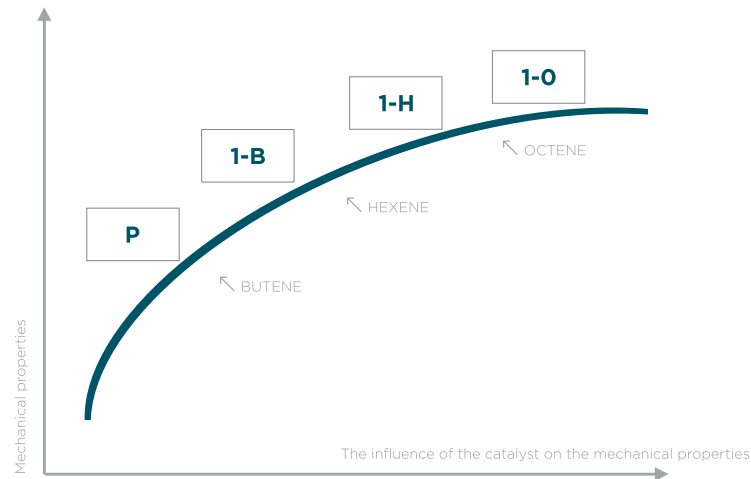
In business of pipes production the flexibility of two way or multi way process of producing PE material has provided a vast space for production of custom materials. The choice of catalysts, content and selective distribution in their content of polymer chains like the choice of parameters of process in every reactor affect the development of polymer structures and characteristics of final product. Two way process consists of two polymer reactors in row. In picture 1 it is shown the simplified view at basic principle of two way process. On illustration can be seen Borstar® drives with low pressure solution loop and gas phase reactor process. Catalyst enters the first reactor, where the polymer is formed as powder particles and through the polymerization of ethylene monomers and appropriate quantities of the comonomers, continuing in sequence mode in the second reactor.

THE MAIN ADVANTAGES OF THE PROCESS ARE:

- Applies independent control of the reactor that operates distribution and comonomer adjust the molecular weight distribution (MVD);
- Blink between the reactors guarantee independent reaction mixtures. This may have produced a wide range of densities, from LLDPE to HDPE;
- Various comonomers can be incorporated in accordance with the needs, for example, butene and hexene;
- MFR2 of different reactors can vary within a wide range, from 0.1 to << more than 1000 g / 10 min;
- The process offers great flexibility as to the type of comonomer that can be incorporated in the correct regions of the polymer. For example, the use of the bimodal comonomer Hacken drives Borstar process results in polymers having an extremely high resistance slow crack growth.



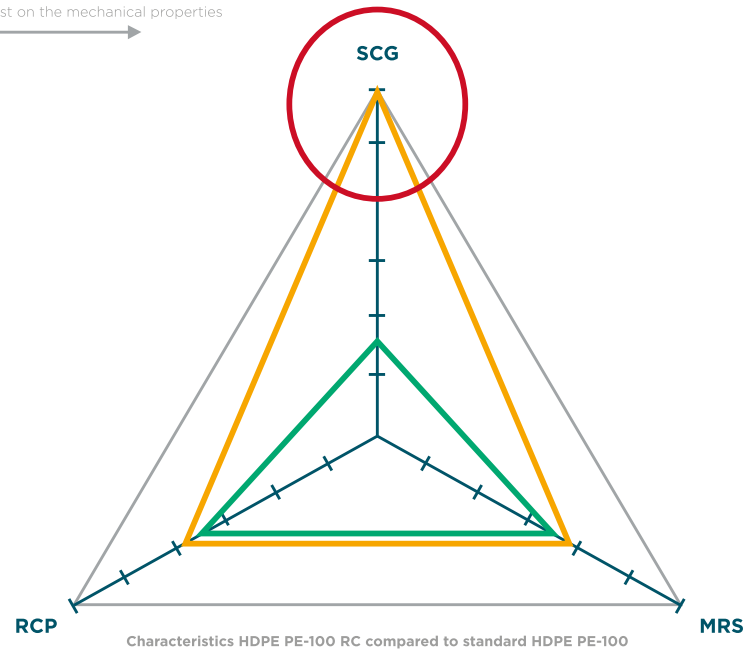
Bimodal polymerisation process Borealis Borstar technology



SCG
slow crack growth

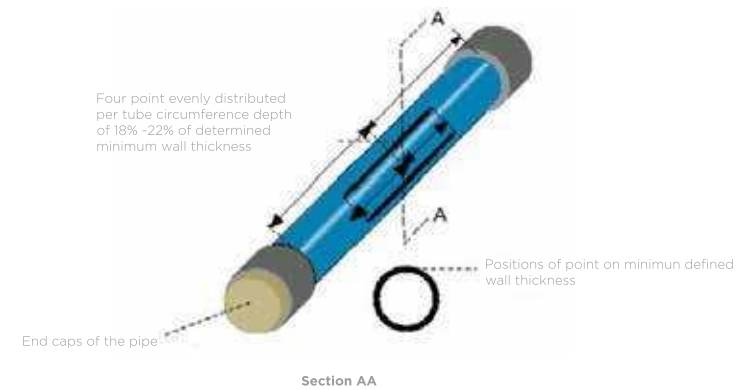
RCP
rapid crack propagation

MRS
minimum reqired strength



ESTABLISHIN THE CHARACTERISTICS OF PE 100 RC PIPES

Therefore, PE-HDPE RC 100 is an enhanced HDPE PE-100, which has improved mechanical properties. Improved mechanical properties are the result of a shift catalyst in the process production. Namely, the catalyst for the production of HDPE PE-100 is a butene, and the catalyst is for the production of PE-100 HDPE RC hexene. The assays are described below, indicate the excellent properties RC PE 100 tubing. NPT - notch pipe test, indicating the resistance tube to the recesses that may arise in the trench due exposure pipe stone or the rest of the old pipeline. PLT - point load test demonstrates thinkable tube to point loading, simulating the load that occurs when the tube. Functioning exposed stone walls or a longer period. FNCT - full notch Creep test is the test of raw materials that are produced by PE 100 RC pipe.



- **Notch test**

is the test method that is used in accordance with EN 12201, EN 1555, ISO4427 and ISO4437, formeasuring the resistance to slow crack growth. Notch test is performed according to ISO 13478 by what a piece of pipe defined cuts and then be tested by releasing water temperature 80 ° C under a pressure of 9.2 bar (SDR 11, PE 100) to the moment of cracking.

The results of this test indicate excellent properties HDPE PE 100 RC pipes. The requirements of the standard is more than 500 h, time of cracking of the standard HDPE PE-100 pipe is 1000-2000 h, and at this time in HDPE PE-100 pipe RC increased to 8670 h (one day), which is 4,3 more!



- **Point-Load Test method (PLT)**

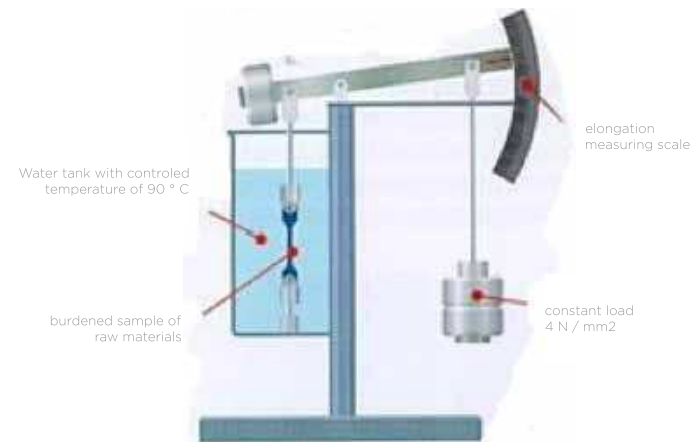
is a testing method that simulates stones in a trench without sand cots. Test is performed on a way that the tube, which is exposed to internal pressure, is loaded with the external force (Simulation of a stone). This test was developed by the institute Dr Hassel. In order to shorten the time of cancellation pipes, the medium that is used in this test is not the water, but it is detergent Akropol N 100. Detergent that is placed at a temperature of 80 °C is released under the pressure, and under these conditions the pipe is loaded with external force from 4 N / mm². Under these conditions the time of cancellation HDPE PE 100 RC pipe is > 8760 h which means that in the case of loading the water at a temperature of 20 ° C, life of the pipe HDPE PE-100 RC is more than 100 years. (Taken from the publication Dr Hassel).



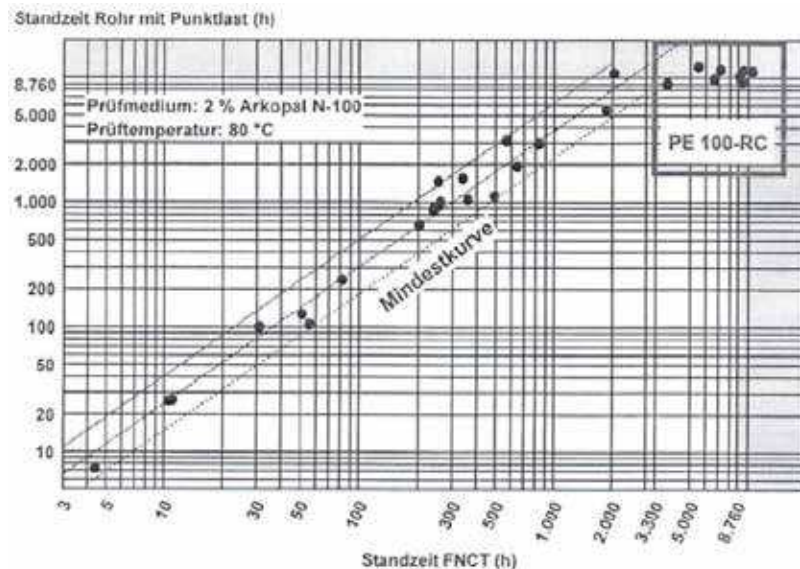
Point load test according to dr. Hessel

- **Full Notched Creep Test**

Test stretching of nicked raw material - is a test in which the test of rod material are cut sharply, and then when it is exposed to the water pool at a temperature of 90°C with constant stretching, tightening strain of a force is 4N/mm² until they burst. Test simulates local stress concentrations and implemented according to ISO 16770th. How we may have estimate the predicted lifetime of pipes that are under additional point load, Dr.Hessel's engineering and technical testing of pipes are under internal pressure, with additional point load compared with the results of the FNCT test (3RInternational 4/2001 and 6/2001).



FNCT test - Full Notch Creep-Test (test istezanja) (ISO 16770)



Research Dr Hessel-a is covered with at least 30 test series in three decades with the target size of 8760 hours FNCT test. The correlation coefficient should be > 0.9 (dispersion results) with minimum requirements for the lower confidence limit of 2.5% (97.5% points must be above the line). Correlation is accredited in accordance with EN 17025, ISO / IEC. Based on this correlation, the stability of the FNCT-in for at least 2000 hours is taken as proof of the 100-year life of the pipe under concentrated load (Dr.Hessel in the journal 3R International 6/2001).

PEŠTAN RC

Peštan RC is a compact (full wall) tube made of an innovative, extremely robust plastic BorSafe HE3490-LS-H. Tube prepared like this provides increased security and longer lifetime of pipes compared to traditional PE pipes, even when it comes to extreme loads, such as notching pipes, gutters and spotty loads.

Peštan RC can be easily installed, as well as traditional PE pipes with equal ability. Welding and PE - 100 Pipes and fittings can be connected by connecting areas or electrofusion as well as other standard techniques for joining PE pipes. Peštan RC pipes are compatible with the world's leading manufacturers of fittings. Peštan RC does not require special material for the installation of which is its biggest advantage.

Peštan RC hose thanks to its excellent resistance to stress cracking insensitive to-point loads and therefore did not need her sandy bed.

Peštan's RC tube is flexible and mobile. These properties allow laying in the proceedings of milling. Because of its high resistance to point loading Peštan RC tube is suitable for laying technique in which the soil is excavated and used as fill material.

Open trenches for pipelines threaten undisturbed running of road traffic and disturb nearby residents. Permanently damaging the asphalt on roads. For these reasons technique of laying without digging of a trench is facing the increasing acceptance, since in addition to provide the possibility of laying pipes under rivers, lakes and traffic routes.

APPLICATION TECHNIQUES FOR PE PIPES

As mentioned earlier a number of techniques have been developed by laying, in order to exploit the benefits of using polyethylene, these techniques are briefly described in text below.

- **Laying in narrow trenches**

This is a modification of the classic pipe laying in the trench. By using short or long ditches you have to dig the trenches that are 100 mm wider than the pipe which is to be installed into ground. Coiled or pre-welded pipes are laid in this passage. Significant savings can be achieved with less excavation volume, the less broth material (sand for bedding) and reduced labor.

- **Pipe bursting**

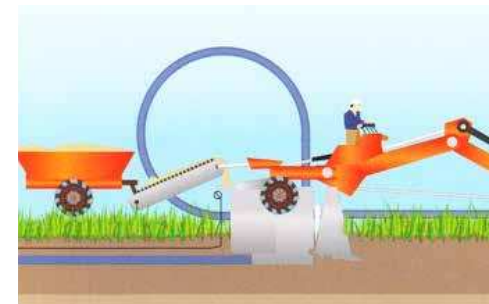
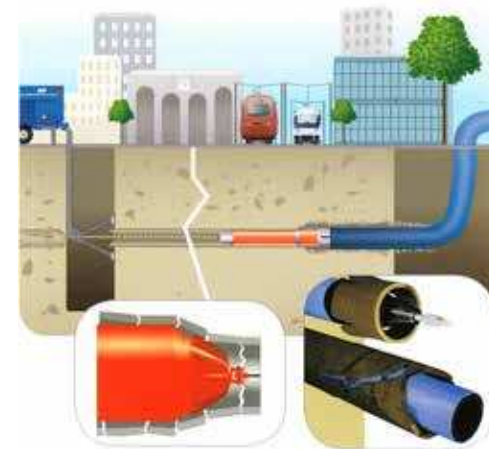
This is an increasingly popular method for rehabilitation of existing pipeline in places where excavation method is unacceptable. With pipe bursting metode the existing tube is destroyed and a new PE 100 RC pipe is drawn into the resulting hole that provides a replacement with the same diameter pipe or with the help of destroyers, pipe diameter can increase compared to the replased tube

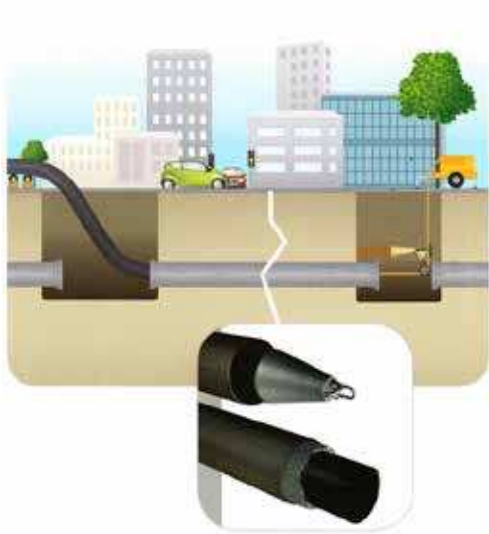
If the situation so requires, Today's hydraulic tools for bursting are capable for damaging the pipe and fittings, and with the further adaptation of tools it is possible to destroy even ductile and steel pipes.

NOTE. This method is technically challenging and requires expert trained staff and appropriate equipment. Depending on the material and the status of the old pipe, it may cause scratches and notches on the new pipe. Debris and stones are causing concentrated loads during the exploitation.

- **Laying plowing**

The technique were developed on the basis of Agricultural technology for laying and drain. This method is used for laying of the pipes for water and gas routes between settlements.





- **Slip lining**

Inserting of a small diameter of PE pipes, slip-lining in the existing Pipeline is one of many techniques for trenchless rehabilitation and repair of old pipeline.

With a slip lining it is inevitable to reduce the pipe diameter, although this can be minimized by thorough cleaning of old pipeline and selecting the largest possible diameter pipe for insertion..

The smaller diameter is compensated by an improved hydraulic characteristics of polyethylene, in some instances we have even higher throughput of the new pipeline.

- **Drilling**

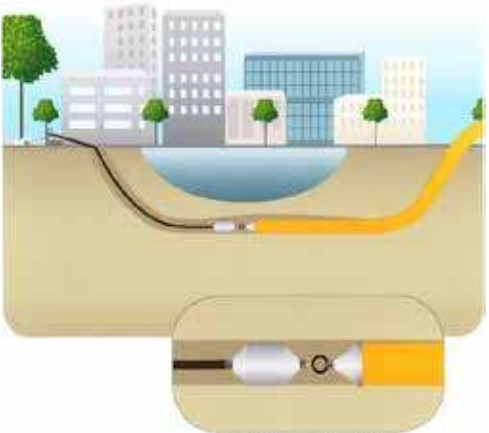
Drilling has become a frequently used method for trenchless setting of small diameters, and can deliver significant savings in relation to the installation of pipes from the excavation. Excavation is carried out for inbound and outbound caves, and it is ideal for passages, drilling pipeline under the road and out of sidewalk construction, gardens and places where there can be disrupted excavation of soils and plants.

Tool drilling is percussion tool with pneumatic motor, that drilled a hole (the tunnel) and in most cases drages a new PE pipe.

Experienced works contractors are required to perform these techniques installations, in order not to exceed a pre-allowed voltages welded pipe or the spool during threading.

- **Directional drilling**

This technique has also become an established method of installation for polyethylene pipes and it is used for passages under the road, rail railways and rivers and in places where excavation is difficult, expensive or impossible.



BENDING OF PIPES

One of the main advantages of PE is its flexibility and it can be used as an advantage for buried pipelines. Gradual changes of direction to point of 11.5° can be easily derived through bending of pipes without the need for additional valves and connecting costs.

Accepted rule for Pestan PE pipe systems (in hot conditions for SDR 11 pipes) is bending radius = $15 \times JV$ (Outer diameter) of pipe. In cold conditions safe bending radius for SDR 17 pipes is $25 \times S.P.$ For very cold winter, weather conditions of this value increases to $35 \times JV$ pipe. If you have a pipe with a thin wall, SDR 26 and SDR 33 you should increase this value up to 50%. Fittings and connections should not be installed on sections where the pipe is bent.

DETECTION OF TUBES

For detection of PE pipeline, the simplest and most economical method is to put in a trench and set with marker tapes that contains wire-track detection. Marker strips should be placed 300 mm above the top of the pipe.

CHARACTERISTICS AND ADVANTAGES OF THE HDPE PE-100 RC:

- Optimum protection against point source and surface pressure;
- Ideal for trenchless installation and without sand.
- Suitable for all modern welding technology, that can be applied with conventional joining methods used for PE 100;
- A simple and low cost-effective installation, similar to a traditional PE without a need for "Imported" backfill material
- Very long service of lifetime, even with external damages; excavated earth could be used as backfill material and significantly reduces installation costs;
- Other benefits. All other advantages of standard PE pipe systems are also applicable to Peštan RC, such as for example, cold bending, resistance to hydraulic shock and fatigue of material.

All BorSafe LS-H are certified as PE 100-RC (resistant to crack):

- Approved by independent institutes,
- Recorded in KRV in Germany,
- Regular testing and quality control

TYPES OF RC PIPES

Classification of pipe PE 100 RC CEV

There are several combinations of materials for the production of tubes, which allow the PE 100-RC material, and this combination is over minimum requirements applicable to PE 100th.

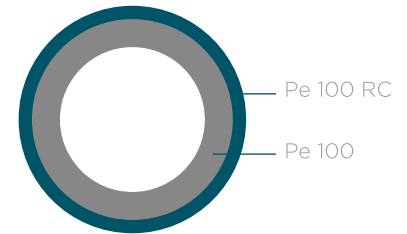
Type 1 Solid made of solid wall PE 100-RC

Pipes solid wall of one layer wall are made of PE 100-RC as defined by ISO 4065. These tubes can be made of full-color, blue or black water pipes with blue stripes to the applications which are made of such PE 100 RC materials.

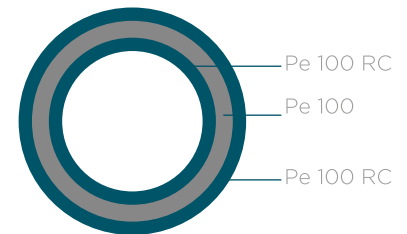


Type 2 Pipe with dimensionally integrated protective layer made of PE 100-RC

The dual-layered tube is dimensionally integrated with protective layers which are made of PE 100 or PE-100 RC and they have a coextruded layer made of PE 100-RC.

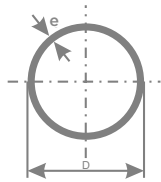


Three-layer pipes with dimensionally integrated protective layers are composed of PE 100 and PE 100 -R c and have inner and outer co-extruded layer made of PE 100-RC. This production is based on a two-layer and three-layer tube with a different outer layer in blue color for water.



CATALOG OF PRODUCTS

D (MM)	SDR 6 (S-2,5) PN		SDR 7,4 (S-3,2) PN25		SDR 9 (S-4) PN20		SDR 11 (S-5) PN16		SDR 13,6 (S-6,3) PN12,5		SDR17 (S-8) PN10		SDR21 (S-10) PN8		SDR 26 (S-12,5) PN 5		SDR33 (S-16) PN5		SDR41 (S-20) PN4	
	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M
16	3,0	0,15	2,3	0,1	2	0,09														
20	3,4	0,18	3,0	0,154	2,3	0,13	2	0,12												
25	4,2	0,278	3,5	0,240	3	0,21	2,3	0,17	2,0	0,151	1,9	0,14								
32	5,4	0,454	4,4	0,386	3,6	0,33	3	0,28	2,4	0,228	2	0,2								
40	6,7	0,701	5,5	0,600	4,5	0,51	3,7	0,43	3,0	0,354	2,4	0,29	2,0	0,251						
50	8,3	1,09	6,9	0,936	5,6	0,79	4,6	0,67	3,7	0,550	3	0,45	2,4	0,372	2,0	0,317				
63	10,5	1,73	8,6	1,47	7,1	1,26	5,8	1,06	4,7	0,869	3,8	0,72	3,0	0,586	2,5	0,482				
75	12,5	2,44	10,3	2,09	8,4	1,78	6,8	1,47	5,6	1,23	4,5	1,02	3,6	0,826	2,9	0,682				
90	15,0	3,51	12,3	3,0	10,1	2,56	8,2	2,14	6,7	1,76	5,4	1,46	4,3	1,19	3,5	0,987				
110	18,3	5,24	15,1	4,49	12,3	3,81	10	3,17	8,1	2,63	6,6	2,18	5,3	1,77	4,2	1,45				
125	20,8	6,75	17,1	5,77	14	4,3	11,4	4,11	9,2	3,39	7,4	2,78	6,0	2,28	4,8	1,86				
140	23,3	8,47	19,2	7,25	15,7	6,17	12,7	5,12	10,3	4,25	8,3	3,49	6,7	2,85	5,4	2,35				
160	26,6	11,0	21,9	9,44	17,9	8,04	14,6	6,73	11,8	5,54	9,5	4,55	7,7	3,73	6,2	3,08				
180	29,9	14,0	24,6	11,9	20,1	10,17	16,4	8,5	13,3	7,01	10,7	5,76	8,6	4,69	6,9	3,83				
200	33,2	17,2	27,4	14,8	22,4	12,58	18,2	10,49	14,7	8,65	11,9	7,11	9,6	5,81	7,7	4,74				
225	37,4	21,8	30,8	18,6	25,2	15,92	20,5	13,27	16,6	10,9	13,4	9,01	10,8	7,35	8,6	5,96				
250	41,5	27,0	34,2	23,0	27,9	19,57	22,7	16,33	18,4	13,5	14,8	11,05	11,9	9,03	9,6	7,38				
280	46,5	33,8	38,3	28,9	31,3	24,6	25,4	20,47	20,6	16,9	16,6	13,88	13,4	11,34	10,7	9,2				
315	52,3	42,7	43,1	36,5	35,2	31,11	28,6	25,9	23,2	21,4	18,7	17,57	15,0	14,3	12,1	11,7	9,7	9,7	7,7	7,60
355	59,0	54,3	48,5	46,3	39,7	39,5	32,2	32,88	26,1	27,2	21,1	22,36	16,9	18,2	13,6	14,8	10,9	12,1	8,7	9,6
400			54,7	58,8	44,7	50,12	36,3	41,75	29,4	35,2	23,7	28,27	19,1	23,6	15,3	19,1	12,3	15,7	9,8	12,5
450			61,5	74,4	50,3	62,7	40,9	52,87	33,1	44,6	26,7	35,81	21,5	29,8	17,2	24,2	13,8	19,9	11,0	15,8
500					55,8	77,3	45,4	65,24	36,8	55,0	29,7	44,25	23,9	36,9	19,1	29,9	15,3	24,4	12,3	19,4
560					62,5	97	50,8	80,8	41,2	69,0	33,2	55,43	26,7	46,2	21,4	37,5	17,2	30,7	13,7	24,4
630					71	127,6	57,2	102	46,3	87,3	37,4	70,21	30,0	52,9	24,1	47,4	19,3	38,7	15,4	30,8
710					80*	162*	64,5	130	52,2	110,8	42,1	89	33,9	74,2	27,2	60,2	21,8	49,2	17,4	39,0
800					90,1*	205,7*	72,7	170,4	58,8	140,7	47,4	113	38,1	94,0	30,6	76,3	24,5	62,4	19,6	49,5



BRAND MANIFESTO

We do not only sell pipes, we combine reliability with quality for the ultimate benefit of our clients.

We do not build short-term client relationships, but long-term and genuine partnerships.

Everything we do, we do with one thing in mind - to create ideas to perfectly match all our client needs and the best way for us to achieve this goal is to constantly educate our clients provide solutions that meet their specific needs and support them throughout the entire process.

Because our success is as big as your trust in us.



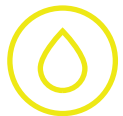
HDPE WATER PIPES



WE ARE

a private company Peštan, leader in the Balkans in the production and distribution of products and solutions from the polymers.

Company was founded in 1989 and has been producing water pipes made of polyethylene. Over time, we introduced new materials (polypropylene and PVC) and expanded product range. Today, in our offer you may find more than 6500 products, divided into four categories:



**PIPING
SOLUTIONS**



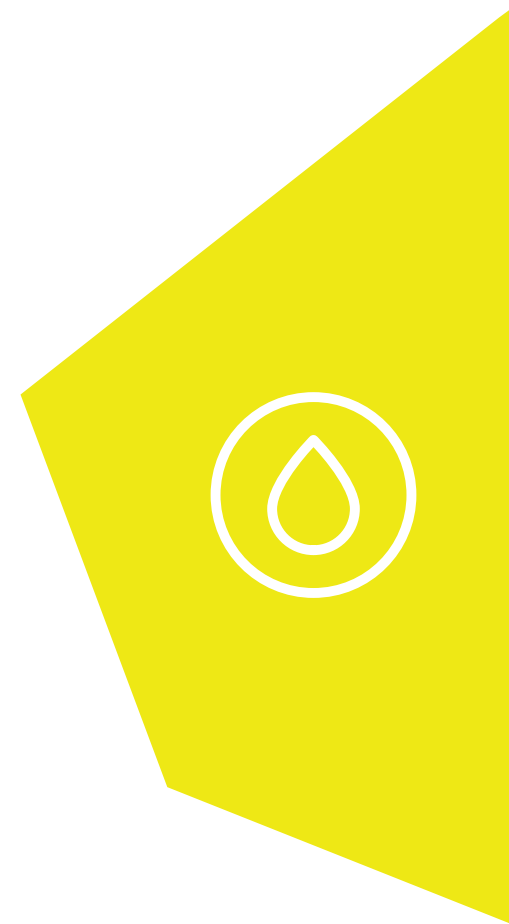
**BATHROOM
SOLUTIONS**

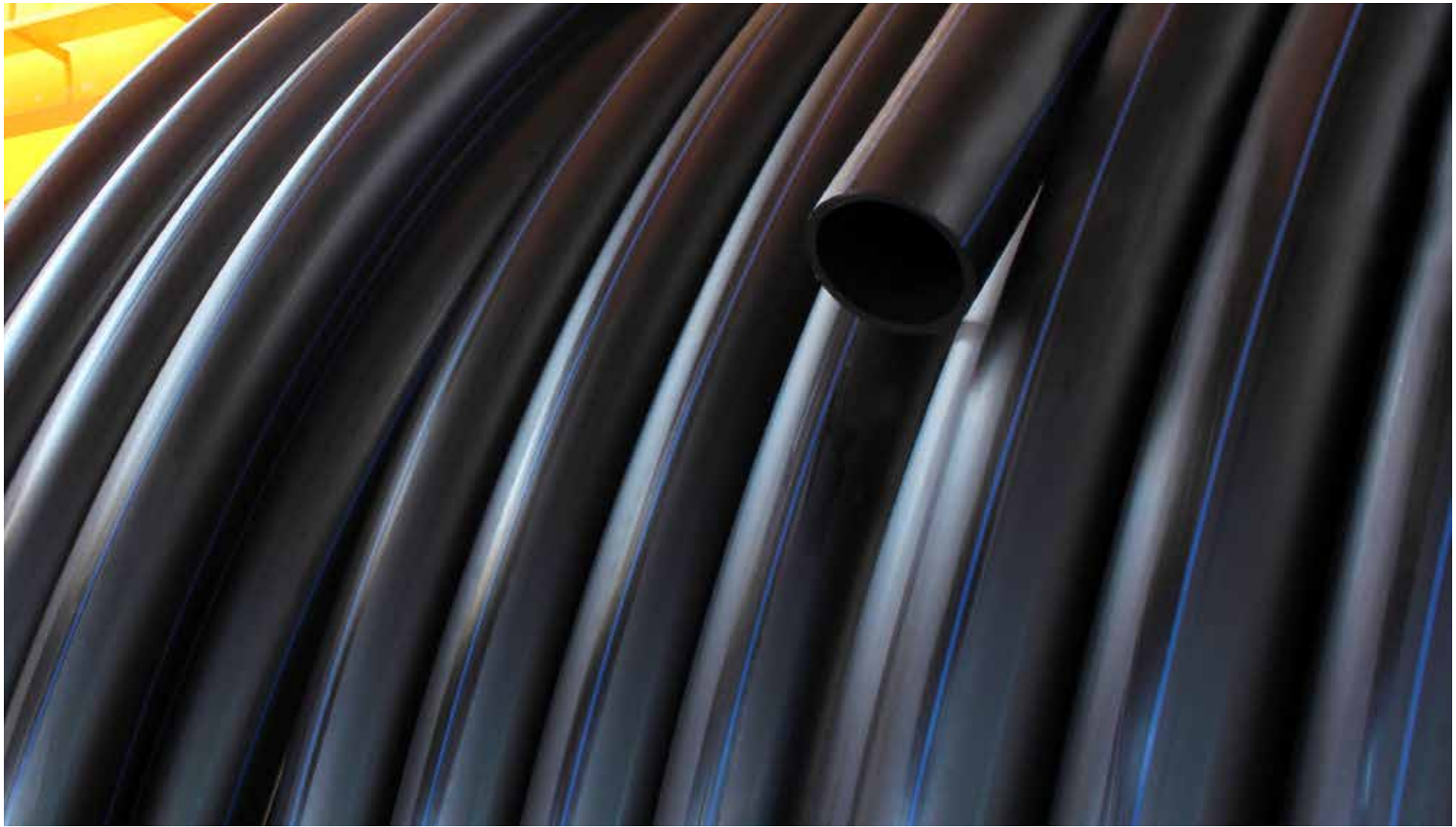


**AGRO CULTURE
SOLUTIONS**

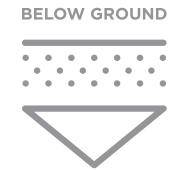


**HOUSEHOLD
SOLUTIONS**





HDPE WATER PIPES



High Density Polyethylene water pipes PE-80 and PE-100

HDPE water pipes are being manufactured from original High Density Polyethylene PE 80 and PE 100. MRS- classification is MRS=8Mpa, respectively MRS=10Mpa, meaning that pipe will tolerate the same stress 50 years after.

PEŠTAN is using the best raw materials of well-known worldwide raw material suppliers. Quality of products is being monitoring in modern control quality department laboratory. Used materials have a proof of independent European laboratory for MRS classification. Safety coefficient of pipes is 1,25.

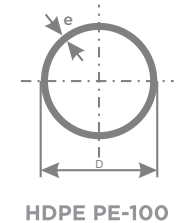
Pipes are completely in accordance with SRPS-EN 12201
Marking of pipes corresponds to European standards.

Advantages of PE-80 and PE-100 pipes

- Material is absolutely non-toxic and completely inert in contact with water
- Easy for transport and handling
- Easy connection by welding or with couplings
- Life time above 50 years
- No impact on water taste and smell
- Tartar free that helps reduction water flow during the time
- Very flexible and extremely resistant to vibration, seismic strikes and ground movements HDPE 80 pipes are more flexible
- Pipeline can follow configuration of the ground because of its elasticity that reduces couplings needed
- Bending radius is 20d
- Pipes are UV resistant and resistant to temperatures from -30 °C up to +60 °C
- High abrasion resistance
- Very low pressure losses since coefficient friction are 10 times less than with steel pipes
- Transition from PE80 to PE100 is being done with electric coupling

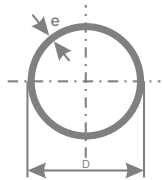
D (MM)	SDR 6 (S-2,5) PN32		SDR 7,4 (S-3,2) PN25		SDR 9 (S-4) PN20		SDR 11 (S-5) PN16		SDR 13,6 (S-6,3) PN12,5		SDR 17 (S-8) PN10		SDR 21 (S-10) PN8		SDR 26 (S-12,5) PN6		SDR 33 (S-16) PN5		SDR 41 (S-20) PN4	
	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M
16	3,0	0,15	2,3	0,1	2	0,09														
20	3,4	0,18	3,0	0,154	2,3	0,13	2,	0,12												
25	4,2	0,278	3,5	0,240	3	0,21	2,3	0,17	2,0	0,151	1,9	0,14								
32	5,4	0,454	4,4	0,386	3,6	0,33	3	0,28	2,4	0,228	2	0,2								
40	6,7	0,701	5,5	0,600	4,5	0,51	3,7	0,43	3,0	0,354	2,4	0,29	2,0	0,251						
50	8,3	1,09	6,9	0,936	5,6	0,79	4,6	0,67	3,7	0,550	3	0,45	2,4	0,372	2,0	0,317				
63	10,5	1,73	8,6	1,47	7,1	1,26	5,8	1,06	4,7	0,869	3,8	0,72	3,0	0,586	2,5	0,482				
75	12,5	2,44	10,3	2,09	8,4	1,78	6,8	1,47	5,6	1,23	4,5	1,02	3,6	0,826	2,9	0,682				
90	15,0	3,51	12,3	3,0	10,1	2,56	8,2	2,14	6,7	1,76	5,4	1,46	4,3	1,19	3,5	0,987				
110	18,3	5,24	15,1	4,49	12,3	3,81	10	3,17	8,1	2,63	6,6	2,18	5,3	1,77	4,2	1,45				
125	20,8	6,75	17,1	5,77	14	4,3	11,4	4,11	9,2	3,39	7,4	2,78	6,0	2,28	4,8	1,86				
140	23,3	8,47	19,2	7,25	15,7	6,17	12,7	5,12	10,3	4,25	8,3	3,49	6,7	2,85	5,4	2,35				
160	26,6	11,0	21,9	9,44	17,9	8,04	14,6	6,73	11,8	5,54	9,5	4,55	7,7	3,73	6,2	3,08				
180	29,9	14,0	24,6	11,9	20,1	10,17	16,4	8,5	13,3	7,01	10,7	5,76	8,6	4,69	6,9	3,83				
200	33,2	17,2	27,4	14,8	22,4	12,58	18,2	10,49	14,7	8,65	11,9	7,11	9,6	5,81	7,7	4,74				
225	37,4	21,8	30,8	18,6	25,2	15,92	20,5	13,27	16,6	10,6	13,4	9,01	10,8	7,35	8,6	5,96				
250	41,5	27,0	34,2	23,0	27,9	19,57	22,7	16,33	18,4	13,5	14,8	11,05	11,9	9,03	9,6	7,38				
280	46,5	33,8	38,3	28,9	31,3	24,6	25,4	20,47	20,6	16,9	16,6	13,88	13,4	11,34	10,7	9,2				
315	52,3	42,7	43,1	36,5	35,2	31,11	28,6	25,9	23,2	21,4	18,7	17,57	15,0	14,3	12,1	11,7	9,7	9,7	7,7	7,60
355	59,0	54,3	48,5	46,3	39,7	39,5	32,2	32,88	26,1	27,2	21,1	22,36	16,9	18,2	13,6	14,8	10,9	12,1	8,7	9,6
400			54,7	58,8	44,7	50,12	36,3	41,75	29,4	35,2	23,7	28,27	19,1	23,6	15,3	19,1	12,3	15,7	9,8	12,5
450			61,5	74,4	50,3	62,7	40,9	52,87	33,1	44,6	26,7	35,81	21,5	29,8	17,2	24,2	13,8	19,9	11,0	15,8
500			68,3	92,0	55,8	77,3	45,4	65,24	36,8	55,0	29,7	44,25	23,9	36,9	19,1	29,9	15,3	24,4	12,3	19,4
560					62,5	97	50,8	80,8	41,2	69,0	33,2	55,43	26,7	46,2	21,4	37,5	17,2	30,7	13,7	24,4
630					71	127,6	57,2	102	46,3	87,3	37,4	70,21	30,0	52,9	24,1	47,4	19,3	38,7	15,4	30,8
710					80*	162*	64,5	130	52,2	110,8	42,1	89	33,9	74,2	27,2	60,2	21,8	49,2	17,4	39,0
800					90,1*	205,7*	72,7	170,4	58,8	140,7	47,4	113	38,1	94,0	30,6	76,3	24,5	62,4	19,6	49,5
900							81,7	211,8	66,1	174,9	53,3	143,4	42,9	116,8	34,4	95,1	27,6	76,7	22	61,5
1000							90,8	261,6	73,4	215,9	59,3	177,2	47,7	144,4	38,2	116,9	30,6	94,0	24,5	76,2
1200									88,2	311	71,1	254,9	57,2	207,8	45,9	168,4	36,7	135,9	29,4	109,6

*other sizes are available upon request



HDPE PE-100

D (MM)	SDR 6 (S-2,5) PN 25		SDR 7,4 (S-3,2) PN 20		SDR 9 (S-4) PN 16		SDR 11 (S-5) PN 12,5		SDR 13,6 (S-6,3) PN 10		SDR 17 (S-8) PN 8		SDR 21 (S-10) PN 6		SDR 26 (S-12,5) PN 5		SDR 33 (S-16) PN 4		SDR 41 (S-20) PN 3,2	
	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M
16	3,0	0,15	2,3	0,1	2,0	0,09	1,9	0,9	1,8	0,08										
20	3,4	0,18	3,0	0,16	2,3	0,13	2,0	0,12	1,9	0,11										
25	4,2	0,278	3,5	0,24	3,0	0,21	2,3	0,17	2,0	0,15										
32	5,4	0,454	4,4	0,38	3,6	0,32	3,0	0,28	2,4	0,23	2,0	0,2								
40	6,7	0,701	5,5	0,6	4,5	0,56	3,7	0,43	3,0	0,36	2,4	0,29	2,0	0,24						
50	8,3	1,09	6,9	0,93	5,6	0,78	4,6	0,67	3,7	0,54	3,0	0,45	2,4	0,37	2,0	0,317				
63	10,5	1,73	8,6	1,47	7,1	1,25	5,8	1,06	4,7	0,87	3,8	0,72	3,0	0,58	2,5	0,482				
75	12,5	2,44	10,3	2,09	8,4	1,76	6,8	1,47	5,6	1,23	4,5	1,02	3,6	0,82	2,9	0,682				
90	15,0	3,51	12,3	2,99	10,1	2,54	8,2	2,14	6,7	1,76	5,4	1,46	4,3	1,18	3,5	0,987				
110	18,3	5,24	15,1	4,48	12,3	3,77	10,0	3,17	8,1	2,61	6,6	2,18	5,3	1,77	4,2	1,45				
125	20,8	6,75	17,1	5,77	14	4,86	11,4	4,11	9,2	3,36	7,4	2,78	6,0	2,27	4,8	1,86				
140	23,3	8,47	19,2	7,25	15,7	6,11	12,7	5,12	10,3	4,21	8,3	3,49	6,7	2,83	5,4	2,35				
160	26,6	11,0	21,9	9,44	17,9	7,95	14,6	6,73	11,8	5,29	9,5	4,55	7,7	3,72	6,2	3,08				
180	29,9	14,0	24,6	11,9	20,1	10,1	16,4	8,5	13,3	6,74	10,7	5,76	8,6	4,67	6,9	3,83				
200	33,2	17,2	27,4	14,8	22,4	12,4	18,2	10,49	14,7	8,3	11,9	7,11	9,6	5,78	7,7	4,74				
225	37,4	21,8	30,8	18,7	25,2	15,6	20,5	13,27	16,6	10,6	13,4	9,01	10,8	7,30	8,6	5,96				
250	41,5	27,0	34,2	2,3	27,9	19,4	22,7	16,33	18,4	13,4	14,8	11,05	11,9	8,93	9,6	7,38				
280	46,5	33,8	38,3	28,9	31,3	25	25,4	20,47	20,6	16,7	16,6	13,88	13,4	11,3	10,7	9,2				
315	52,3	42,7	43,1	36,6	35,2	30,8	28,6	25,9	23,2	21,2	18,7	17,57	15,0	14,2	12,1	11,7	9,7	9,7	7,7	7,60
355	59,0	54,3	48,5	46,3	39,7	39,1	32,2	32,88	26,1	26,9	21,1	22,36	16,9	18,0	13,6	14,8	10,9	12,1	8,7	9,6
400					44,7	49,6	36,3	41,75	29,4	34,1	23,7	28,27	19,1	22,9	15,3	19,1	12,3	15,7	9,8	12,5
450							40,9	52,87	33,1	43,2	26,7	35,81	21,5	28,9	17,2	24,2	13,8	19,9	11,0	15,8
500							45,4	65,24	36,8	53,4	29,7	44,25	23,9	35,7	19,1	29,9	15,3	24,4	12,3	19,4
560							50,8	80,8	41,2	66,9	33,2	55,43	26,7	44,7	21,4	37,5	17,2	30,7	13,7	24,4
630							57,2	102	46,3	84,6	37,4	70,21	30,0	56,4	24,1	47,4	19,3	38,7	15,4	30,8
710							64,5	130	52,2	109	42,1	89	33,9	71,8	27,2	60,2	21,8	49,2	17,4	39,0
800							72,7	170,4	58,8	138	47,4	113	38,1	91,8	30,6	76,3	24,5	62,4	19,6	49,5



HDPE PE-80



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D (MM)	SDR 11 (S-5) PN16		SDR 13,6 (S-6,3) PN12,5		SDR 17 (S-8) PN10		SDR 21 (S-10) PN8		SDR 26 (S-12,5) PN6		SDR 33 (S-16) PN5		SDR 41 (S-20) PN4	
	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M	e _{min}	KG/M
900	81,7	211,8	66,1	174,9	53,3	143,4	42,9	116,8	34,4	95,1	27,6	76,7	22	61,5
1000	90,8	261,6	73,4	215,9	59,3	177,2	47,7	144,4	38,2	116,9	30,6	94,0	24,5	76,2
1200			88,2	311,1	71,1	254,9	57,2	207,8	45,9	168,4	36,7	135,9	29,4	109,6

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