DİZAYN GROUP INFRASTRUCTURE SYSTEMS CATALOGUE

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DİZAYN GROUP

Dizayn Group was established in 1987 for developing and applying projects in sanitary piping sector and started to manufacture floor heating pipes in September 1992, then indoor clean water pipes. Now, it is the largest one of Mir Holding companies.

Dizayn Group organized many educational and promotional activities for popularizing plastic pipe use and makes production in its facilities in Çorlu, Azerbaijan and Trabzon, which has a total of closed production area over 35.000 m2 and a total of open production area over 100.000 m2.

Dizayn Group reserves 5% of its turnover every year for R&D and every product developed by the Group bears certificates, each received from international independent institutions.
Some of these institutions are:

MEYER ISO 9001:2008, DVGW (Germany), Hygiene Institute (Germany), GOST (Russia), IMA (Germany), GOST (Ukraine), TSE (Turkey).

Dizayn Group exports to more than 80 countries, most important regions being the Middle East, South America, West and East Europe, Russia, Turkic Republics, North Africa, Far East and Australia. Dizayn Group also has more than 100 patents for products developed. In addition, Dizayn Group has been awarded in July 2004 by Turkish Patent Institute for its contribution in development of technology in our country and the world.

The reason for Dizayn Group to achieve such a success in a very short time is the three separate missions. With Product Development mission, Dizayn Group manufactures from 12 mm to 1600 mm diameter high pressure, from 50 mm to 8000 diameter low pressure, Polyethylene and Polypropylene raw material resilient to high soil and traffic load, 23 different systems with flow and more than 4.000 product varieties.

Product groups developed by Dizayn Group can be sorted as follows:

• Superstructure Product Group
Indoor clean water systems
Indoor waste water systems
Indoor heating installation systems
Radiator product group
Metal Systems

• Infrastructure Product Group
Drinking water systems
Sewerage systems
Natural gas systems
Pre-isolated city heating systems

• AGreycultural Irrigation Product Groups
Drip irrigation systems
Sprinkler irrigation systems
Drill pipes

Dizayn Group has achieved a world first and broke a World record by manufacturing 1600 mm diameter pipe under PN 12,5 pressure in October 2001. Dizayn Group has perfectly manufactured this product, which the rivals in the World said to be impossible, by developing a completely different technology. Also with this record, Dizayn Group manufactured the first industrial product from Turkey being a world first.

In recent years, Dizayn Group has been supporting tens of doctorate, masters, license and project studies continuing in various universities of Turkey. Project and test subjects of these studies are in Dizayn Group's area of expertise. Again, more than 30 articles issued by Dizayn Group have taken part in various national and international publications.

With Investment Mission, Dizayn Group invests regarding the products developed. Objective of Dizayn Group in future years is to become an international company active in international arena with internal and external investments.

With Project Development mission, Dizayn Group develops projects for supplying city heating, drinking water needs, aGreycultural irrigation by carrying fluids (water, gas, etc.) from where it is in abundance to where it is lacking. At the same time, the Group designs a complete new system with primary and secondary distributions and establishes systems for the project.

Dizayn Group, as a part of many domestic and international projects, has been awarded by UNESCO with "Water and Water Management" for its project of bringing water to Sudan. Award Ceremony held place in "Water Symposium" organized in Cannes, France. Most important specialty of this award is that it has been given to a private company for the first time, Dizayn Group. On the other hand, Dizayn Group has been qualified to participate in the Turkey Final of World Young Entrepreneur Businessmen Competition as the winner of Universal Participation Award and the World Final as the winner of Grand Award for all developed projects, products, patents, quality certificates and other achievements since established. In the World Final, which was an international organization that took part in Philippines with participation of 12 countries such as Germany, UK, Netherlands, Mir Holding Chairman of the Board Mr. İbrahim Mirmahmutoğulları successfully represented our country and won Grand Award of World Young Entrepreneur Businessmen Competition.

Another project successfully organized by Dizayn Group is "Encouragement of Brain Power Against Brain Drain" campaign. The aim of this campaign, which was first organized in 2002, is to prevent productive minds from leaving abroad and to support projects that can contribute to the economy.

We are aware of our responsibilities. The world needs Dizayn!

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Hdpe - Pe 100 Pipes For Potable Water System

HDPE - PE 100 PIPES FOR POTABLE WATER SYSTEM

PRODUCT IDENTITY

Product Name	DIZAYN HDPE 100 POTABLE WATER NETWORK PIPES
Raw Material	HDPE 100 (=PE 100)
Product Color	Black or Blue
Production Standard	EN 12201-2
Other Standards	ISO 4427,DIN 8074 - EN 12201-2

PRODUCT SPECIFICATIONS

Production Range	Ø20 - Ø2.500 mm
Pressure Range	PN 4 - PN 32
Production Unit Lenghts	Ø20 - Ø90 - (200 meters) Ø110 - Ø2.500 - (11,8 - 12 - 13,5 meters) P.S.: 100,300 and 500 meters pipe length is possible. Please get into contact with project management for special inquiries.

QUALITY CERTIFICATES OF DİZAYN GROUP

Turkey Germany Russia

TECHNICAL SPECIFICATIONS

Polymer Data	PE 100	Unit	Test Method
Density at (23°C)	0.955	g / cm^3	ISO 1183
Viscosity Number	360	cm^3 / gr	ISO 1628-3
MFR (190° / 5 kg)	0.22	g /10 dak.	ISO 1133
MFR (190° / 25 kg)	6,6	g / 10	ISO 1133
Mechanical Properties			
Yield Stress	23	Mpa	ISO 527
Elogation at yield	9	%	ISO 527
Tensile Modulus	900	%	ISO 527
Notched Impact strenght			
+ 23 °C	26	kJ / m^2	ISO 179/1eA
- 23 °C	13	kJ / m^2	ISO 179/1eA
Other Properties			
Oxidation - Induction time at (210°C)	≥ 20	min	ISO TR 10837
Carbon Black Content	2,3±0,2	%	ISO 6964
Carbon Black Dispersion	≤ 3		ISO CD 11420
MRS minimum Required Strenght	< 10	MPa	ISO TR 9080
Resistance to S.C.P (Slow Crack Propagation) x=4,6 Mpa, 80°C Notched	> 3000	h	EN 33479
Resistance to R.C.P (Rapid Crack) Propagation S4-test 110/10 mm 0°C	< 25	bar	ISO DIS 13477
Elogation at break	< 600	%	EN 638
Linear Thermal Expansion	1.8x10^{-4}	0°C^{-1}	ASTM D 696 (20-60°C)
Specific Heat Capacity	1.9	J / g °C	BPCL
Electrical Properties			
Electric Strenght	> 20	kV / mm	BS 27 82: 201 B
Volume resistivity	> 1013	Ωm	BS 27 82: 230A
Surface resistivity	> 1015	Ωm	BS 27 82: 231A
Relative resistivity	2,6	-	BS 2067 (1 to 20 MHZ)
Loss tangent	3x10^{-4}	-	BS 2067

HDPE - PE 100 PIPES FOR POTABLE WATER SYSTEM

1.1 Specifications of Dizayn PE 100 pipes

- Advantage of perfect leak proof, no crack, no break and no deformation under pressure
- Availability of more than one connection method (but welding electrofusion welding, push fit sockets, etc.)
- Availability of connection at a place out of the trench,
- High resistance to chemicals, not affected from corrosion, decaying, and abrasion,
- Advantage of less need of excavation and less need of bringing special filling sand from out of the site,
- Advantage of safe application in irregular surfaces like sea, river, lake, passages and at places where there maybe frequent earth movements,
- Advantage of having perfectly smooth internal surface. Because of this advantage of PE pipes in comparison to the other pipe types, one size smaller PE pipe can make the same work of one size bigger pipe from the other pipe types. This brings considerable savings in the overall cost of the pipe line and the service costs,
- PE pipes require less fittings for connection because they are elastic and in many laces they do not require connection where the other types do. Because PE pipes re bendable with a radius of 20-35 times of its outer diameter. The other pipe types do not have this advantage,
- Advantage of higher durability and advantage of easy installation and transport without material loss,
- Advantage of mobilizability of the PE pipe production facilities. This enables very big savings in transport costs for projects where large diameter pipes are required,
- PE pipes have the advantage of very long service life under severe conditions.
- Minimum guaranteed service life of PE pipes is 50 years and decaying time 1000 years in nature,
- PE pipes are light in weight which enables the installation with high speed at places where the construction season is short,
- PE pipes have very good welding characteristics,
- PE pipes are elastic which a big advantage is during the earthquake or any other earth movements. This charasteristics also gives big advantage in transport (coiling up to 90 mm diameter) and in installation costs,
- High impact and breakage resistance,
- Very good adaption to earth movements,
- Very high resistance to direct sun light (UV resistance) for long time. This is supplied by Ultraviolet light resistance agent mixed to the PE raw material,
- Many different pressure resistance options. PE pipes can be produced resistant to 10 different pressure classes from 4 Bars up to 32 Bars.
- There is no need to take protection precautions at the time of installation like cathodic protection.

1.1.1 Perfect Leak Proof at Connection Points

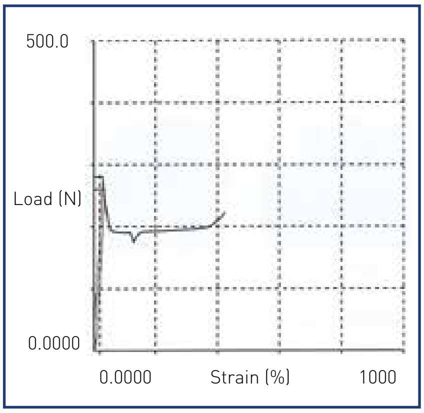


Figure 1.1.1a - Sample with butt welding

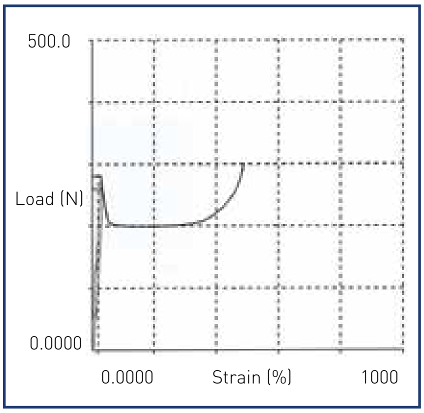


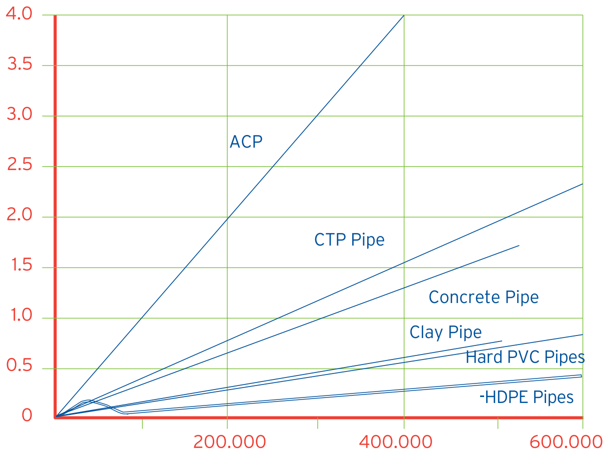
Figure 1.1.1b - Sample without welding (Result of tensile test)

As seen in the test samples, as the result of the tensile test, the energy required for breaking the welded and unwelded pipe area is the same. It means that the butt welded area is also as strong as the pipe itself. (Test sample is shown in picture 1.1.8)

The Advantage of Butt Welding;

- It does not require special fitting for connection.
- With butt welding, some fittings like bends and T pieces can be produced at the site.
- The butt welding machines are easy to supply in all corners of the World.
- The fittings produced for butt welding have low production costs.
- Butt welding can be applied for all diameters and for all pressure ratings (For best results the minimum wall thickness must be 3 mm.)
- The lips forming inside and outside the pipe increases the welding area's cross-section hence increasing the safety of the welded area.
- Butt welding operation is very easy to learn.

1.1.2 No Abrasion in PE pipes



The curve above proves that HDPE PE 100 pipes have the best brasion resistance value among the other pipes. For PE, throughout the service life, the abrasion is only 0.09 mm.
The curve above also proves that Asbestos steel pipes and GRP pipes have worse abrasion in comparison to the concrete pipes. Besides their very good abrasion resistance, PE pipes have perfect resistance against the chemicals. These pipes give the best service in all acidic, alkaline ad salty solutions.
The resistance of PE pipes to different chemical materials is listed in Table 1.1.2

1.1.3 The advantage of less need of bringing special filling sand out of the site , less excavation and less filling sand need.

For laying down the PE pipes, it is enough to leave a small place at each side of the pipe which is enough for the operation of the compaction machine. There is no need to bring sand for bedding. It is enough to prepare the trench bottom surface with an angle of 120 degree. The earth derived from the excavation can be used as filling sand after eliminating the big size stones and sharp object that may damage the pipe. In rocky place, the sharp sides of the rocks are covered by sand in order not to allow it to damage the pipe.

Advantage

- Since there is no need to bring special filling sand from out of the excavated area, filling sand cost is minimum.
- Since less excavation is done, excavation and filling costs are minimum compared to the other pipe types.

Picture 1.1.2a - A view from sea discharge application of 1600 mm o.d. PN 4 PE pipes in Istanbul.

Picture 1.1.2b - Pipes another view from sea discharge application of 1600 mm o.d.

1.1.4 Advantage of PE pipes used in sea, lake and river passes

PE 100 pipes are elastic, nor easily breakable, perfectly strong to external loads, perfectly strong to internal pressure and have 1000 years of decaying time in nature. These big advantages make them very suitable to be used in sea discharge, as well as sea, river and lake passes and also taking water to islands. PE 100 pipers are the easiest pipes to be sank under water either completely or as units of 300-500 meters.

HDPE - PE 100 PIPES FOR POTABLE WATER SYSTEM

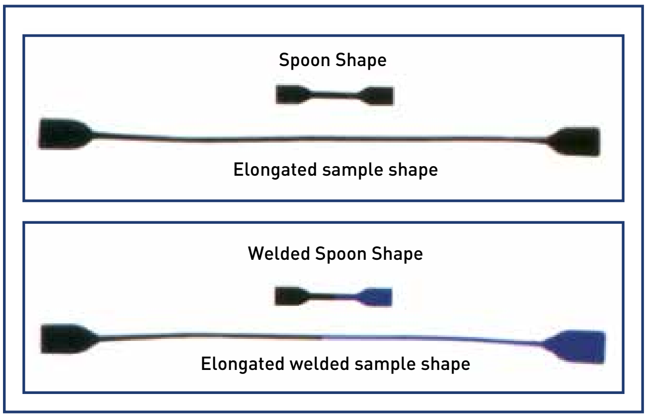
1.1.5 Advantage of adaption to the earth movements, durability and high impact resistance

Below are the statistical values regarding the damage percentages of various pipe types at Kobe/Japan earthquake in 1995. This table tells everything about the superiority of PE pipes to the other pipes at tough conditions.

After the earthquake in Kobe, the use of PE pipe in Japan increased as a boom. As a country in a region of very active seismic zone, the use of PE 100 is increasing as a boom in Turkey.

Pipe type	Percentage of damage Piece/km
Ductile cast iron pipe	0.488
Cast iron pipe	1.508
PVC pipe	1.430
Steel Pipe	0.437
Asbestos Steel Pipe	1.782
PE pipe	0 (zero)

Table 1.1.1 - The damage percentages in the potable water lines at Kobe/Japan earthquake.



Picture 1.1.8 - Dizayn PE 100 material in standard test unit elongates 600 % at the pulling test until break.

	Steel pipe	Ductile cast iron pipe	PE pipe
Total length (km)	21,338	12,204	1,458
Number of damage	25,821	630	0
Damage ratio (place/km)	1,21	0,052	0,000

Table 1.1.2 - The damage percentages in the potable water lines at Kobe / Japan earthquake

Picture 1.1.9 - Telescopic storage of PE pipes.

1.1.6 PE pipes have perfect resistance to water impact

Velocities	PE 100, DN140, D				PVC mm DN140, D					Steel 5" Dim= 123,4		
m/s	c/g	H	H	H	c/g	H	H	H	c/g	H	H	H
	13,42				38,77							
1		11,34	10	8,65		19,88	10	6,12		22,84	10	-2,84
2		12,68	10	7,31		17,75	10	2,24		35,69	10	-15,69
3		14,03	10	5,74		21,63	10	-1,63		48,53	10	-28,53

Table 1.1.3 - Comprasion of resistances of some pipe types to water impact

Because of perfect surface elasticity coefficient, Dizayn pipes have the lowest affection from water impact when compared to the other pipe types. For this reason, for certain pipe lining projects, one size smaller Dizayn PE 100 pipe can be used for the same work of the other alternative pipes. As it is seen form the table, for a velocity of 3 m/s, the maximum internal pressure stands to be 21.63 Bars for PVC pipes and 48.53 Bars for steel pipes.

PE pipes can be transported as the smaller diameter pipes are inserted into bigger diameter pipes (telescopic transport) enabling big transport cost savings.

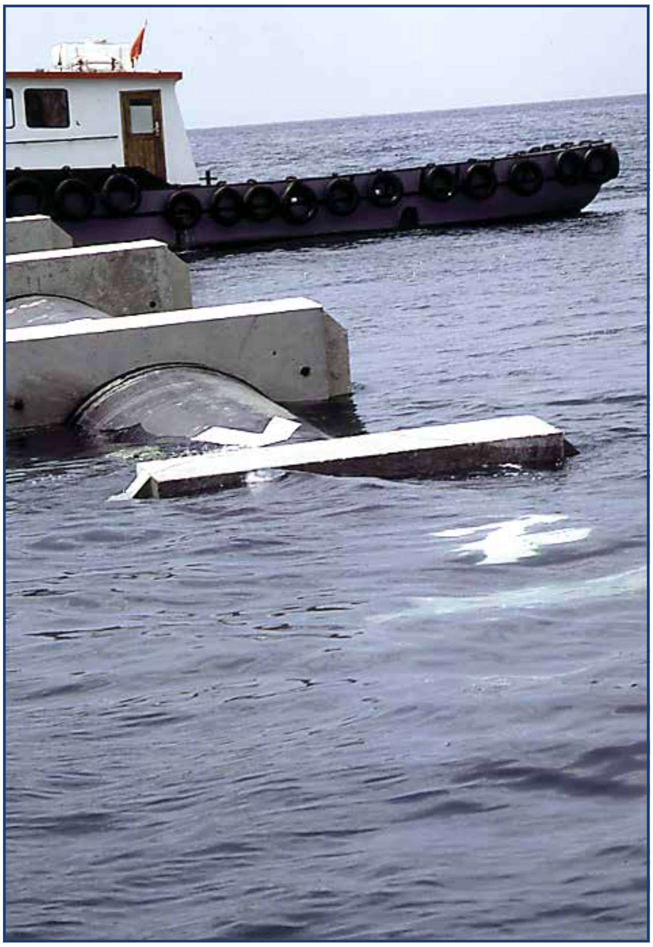
Pipe Material	Surface Elasticity Coefficient (K)
Iron and Steel pipe	0,5
Ductile font	1,0
lead pipe	5,0
asbestos concrete pipe	4,4
PVC pipe	33,3
Dizayn PE 100 pipe	377

1.1.7 Advantage of making turns using minimum number of elbows with PE pipes

Because of their perfect elasticity, Dizayn PE 100 pipes can make turns with a Radius of 20-35 times more than their outer diameter.. While the other pipe types can make even 11 and 22 degree turns by using Elbows, Dizayn PE 100 pipes can turn these angles without any elbow or another fitting. This means big material and time saving in the installation. Dizayn PE 100 pipe can even turn 90 degree without elbow with a turning radius which will be calculated with the following formula;

$$R=Dd/1,12\ (SDR-1)$$

R: The Radius with which the pipe can bend without breaking.
Dd: Outer Diameter of the pipe
SDR: Standard Dimension Ratio (outer diameter / Wall thickness)



Picture 1.1.10 - Pictures showing bending ability of Dizayn pipes of 1600 mm dia. PN 4 produced for sea discharge project in Buyukcemkece / Istanbul.

1.1.8 Advantage of installation and transportation without any material loss

Because of their perfect impact resistance, Dizayn PE 100 pipes do not break during installation and transportation. This enables having zero material loss during transportation and installation. The pipe pieces remained after installation can be used in production of fittings or installation in another place.

1.1.9 Advantage of mobilization of the production installations of PE pipes

By the advantage of easy mobilization of PE pipe production facilities, the production of PE pipes can be done in places near to the installation place enabling big transport cost savings especially for big diameter pipes.

Picture 1.1.12 - A mobile pipe production facility.

The production design of PE 100 pipes is made for a service life of 50 years at 20°C. So, the minimum service life of PE 100 pipes is minimum 50 years (20°C).

1.1.10 Advantage of minimum 50 years service life of PE Pipes

The curve in the figure below shows the change in the physical properties of PE 100 pipes in time.
The production design of PE 100 pipes is done for a service life of 50 years. So, the minimum service life of PE 100 pipes is minimum 50 years.

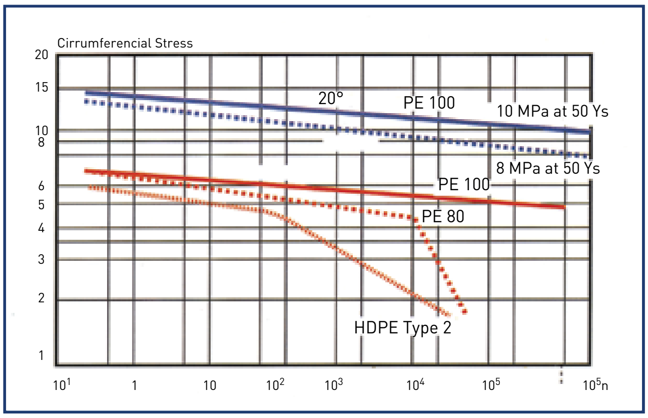


Figure 1.1.3 - The curve of hoop strees against time

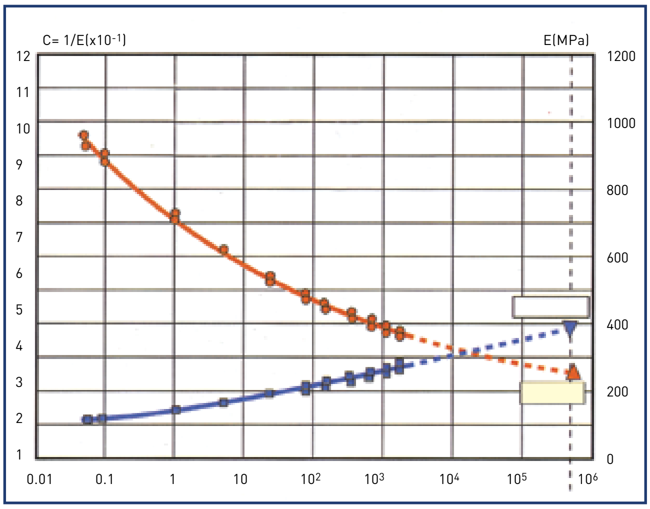


Figure 1.1.4 - The change in the elasticity module of PE pipes in time.

Table 1.1.3 - Comparison of Dizayn PE Pipes with the other Pipe Types.

	PIPE TYPE							
FEATURES	DIZAYN PE	PVC	STEEL	DUCTILE FONT	CONCRETE	GRP	ASBESTOS	EXPLANATION
Production range (mm)	Ø20 - Ø3600	Ø20 - Ø630	Ø15 - Ø4000	Ø50 - Ø2000	Ø200 - Ø3200	Ø20 - Ø1600	Ø... - Ø1600	
Guaranteed service life (year)	50	0-20	3-15	5-25	0-30	0-50	0-30	For the pipes other than PE 100 pipes, the service life depends on many parameters like quality of the raw material of the pipe, bedding in the trench, etc.
Feature of breaking	Very Durable	Weak	Durable	Durable	Very Weak	Partially Durable	Very Weak	
Max. Production length	500	6	12	6	4	6-Ara	4	
Standard production length (m)	12	6	6	6	2	6	2	
Strength against corrosion and abrasion	Very Durable	Partially Durable	Very Weak	Very Weak	Partially Durable	Durable	Weak	This evaluation depends on the nature and type of the chemical like SO2, Nax, Clorine
The easiness of producing fittings	Very easy	Very easy	Difficult	Very Difficult	Very Difficult	Very Difficult	Very Difficult	
The easiness of the installation (the easiest : 100 the most difficult : 0)	100	50	25	40	15	45	5	
Superiority from the side of hygiene	Perfect	Doubtful	Doubtful	Doubtful	Doubtful	Good	Troubles	
Surface roughness coefficient (C)	149	149	120	130	100	145	130	Depend on the qualit of the production and raw material
Variety of fittings and their price	Perfect-Cheap	Perfect-Cheap	Limited-Expensive	Limited-Expensive	Limited-Expensive	Limited-Expensive	Limited-Expensive	
Strength against chemicals	Perfect	Doubtful	Troubles	Doubtful	Doubtful	Good	Doubtful	
Surface elasticity coefficient (C)	377	33	0,5	1	4,4	>3	-0,5	
Ability for passifying the ram impact	Perfect	Troubles	Troubles	Troubles	Troubles	Troubles	Troubles	
The easiness of making pressure test at site	Perfect	Troubles	Troubles	Troubles	Troubles	Troubles	Troubles	Since the connection of the pipes other than steel and PE pipes is done using o-ring, it is very difficult to have perfect leak proof. It is necessary to take additional precautions for absolute leak proof
Need of bends at turn points	Very Little	Very much	Very much	Very much	Very much	Very much	Very much	For PE 100 pipes it is possible to make even full round shape with a diameter 25 times of the pipe outer diameter
Max. instant tes pressure (for PN10)	> 28 bar	> 16 bar	> 40 bar	> 40 bar	> 13 bar	> 18 bar	> 13 bar	
The safety of 1 connection point (max.:100 min.:0)	100	0-50	0-80	0-80	0-30	0-70	0-40	The connections with o-ring always create problems. For PE pipes, since the connection is done by welding, the molecular fusion makes.
Ability for passifying the ram impact	Perfect	Doubtful	Troubles	Doubtful	Troubles	Doubtful	Troubles	
Needed trench width (as % pipe diameter)	approx. %5-10 wider than the pipe dia	approx. %100 wider than the pipe dia	approx. %200 wider than the pipe dia	approx. %110 wider than the pipe dia	approx. %200 wider than the pipe dia	approx. %200 wider than the pipe dia	approx. %200 wider than the pipe dia	These figures are for pipes with average 400 mm diameter
Need of bedding around the pipe (max.: 100 min:0)	10	100	70	60	100	100	100	For PE 100 pipes, if there are not sharp stones which may damage the pipe, there is no need make bedding around the pipe.

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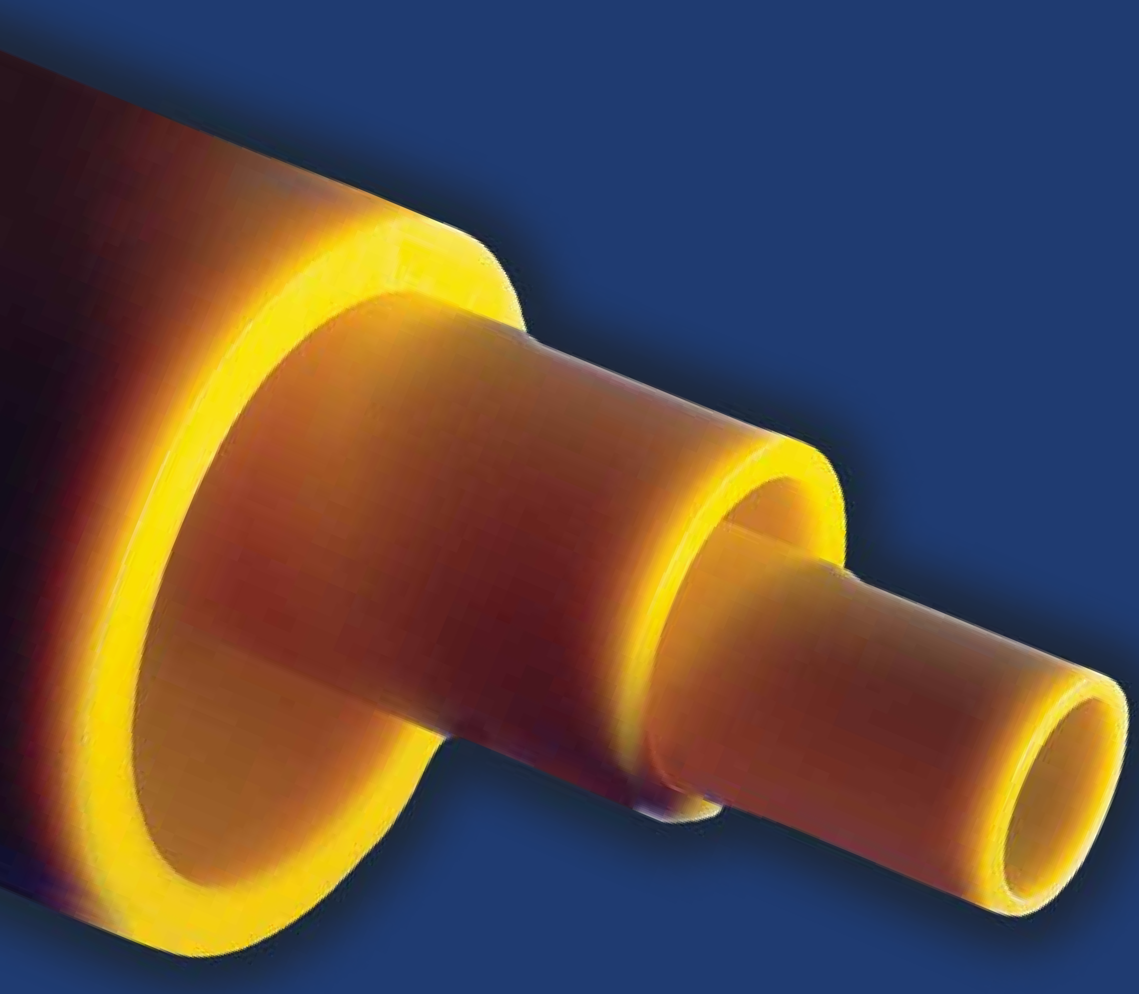
Table 1.4.4 - HDPE Dizayn PE 100 Pipes dimensions

Sr_{24}=5;Sr_{50}=2.7 SDR 41; PN 4			Sr_{24}=9,7;Sr_{50}=5.2 SDR 33; PN 5			Sr_{24}=17; Sr_{50}=9.2 SDR 27.6; PN 6			Sr_{24}=40; Sr_{50}=21.7 SDR 22; PN 8			Sr_{24}=78;Sr_{50}=22.3 SDR 17; PN10			Sr_{24}=160;Sr_{50}=86.7 SDR 13.6; PN12.5			Sr_{24}=320;Sr_{50}=173 SDR11;PN 16			Sr_{24}=625;Sr_{50}=339 SDR 9; PN 20			Sr_{24}=1221;Sr_{50}=661 SDR 7.4; PN 25			Sr_{24}=2560;Sr_{50}=138 SDR 6; PN 32		
DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)
mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m
																											16	3.0	0.14
																								20	3.0	0.17	20	3.4	0.19
																					25	3,0	0.22	25	3.5	0.25	25	4.2	0.29
																		32	3,0	0,29	32	3,6	0.34	32	4.4	0.40	32	5.4	0.47
												40	2,4	0,31	40	3,0	0,38	40	3,7	0,45	40	4,5	0.53	40	5.5	0.63	40	6.7	0.73
						50	1.8	0.29	50	2.4	0.40	50	3,0	0,47	50	3,7	0,58	50	4,6	0,70	50	5,6	0.83	50	6.9	0.98	50	8.3	1.14
			63	2,0	0,42	63	2.4	0.48	63	3.0	0.61	63	3,8	0,76	63	4,7	0,92	63	5,8	1,10	63	7,1	1.32	63	8.6	1.54	63	10.5	1.82
75	1,8	0,44	75	2,3	0,59	75	2.7	0.65	75	3.6	0.87	75	4,5	1,07	75	5,6	1,30	75	6,8	1,54	75	8,4	1.85	75	10.3	2.20	75	12.5	2.58
90	2,3	0,68	90	2,8	0,83	90	3.3	0.93	90	4.3	1.25	90	5,4	1,53	90	6,7	1,85	90	8,2	2,23	90	10,1	2.66	90	12.3	3.15	90	15.0	3.71
110	2,7	0,99	110	3,4	1,24	110	4.0	1.39	110	5.3	1.87	110	6,6	2,28	110	8,1	2,75	110	10,0	3,30	110	12,3	3.96	110	15.1	4.72	110	18.3	5.54
125	3,1	1,31	125	3,9	1,59	125	4.5	1.80	125	6.0	2.38	125	7,4	2,90	125	9,2	3,54	125	11,4	4,27	125	14,0	5.12	125	17.1	6.08	125	20.8	7.15
140	3,5	1,63	140	4,3	1,98	140	5.1	2.26	140	6.7	2.98	140	8,3	3,64	140	10,3	4,43	140	12,7	5,34	140	15,7	6.43	140	19.2	7.65	140	23.3	8.97
160	4,0	2,10	160	4,9	2,55	160	5.8	2.95	160	7.7	3.90	160	9,5	4,75	160	11,8	5,77	160	14,6	7,00	160	17,9	8.39	160	21.9	9.97	160	26.6	11.70
180	4,4	2,62	180	5,5	3.23	180	6.5	3.73	180	8.6	4.90	180	10,7	6,00	180	13,3	7,33	180	16,4	8,83	180	20,1	10.60	180	24.6	12.60	180	29.9	14.80
200	4,9	3,21	200	6,2	4,05	200	7.2	4.60	200	9.6	6.07	200	11,9	7,39	200	14,7	8,98	200	18,2	10,90	200	22,4	13.12	200	27.4	15.59	200	33.2	18.26
225	5,5	4,07	225	6,9	5,01	225	8.2	5.83	225	10.8	7.66	225	13,4	9,38	225	16,6	11,41	225	20,5	13,79	225	25,2	16.60	225	30.8	19.72	225	37.4	23.13
250	6,2	5,10	250	7,7	6,22	250	9.1	7.20	250	11.9	9.37	250	14,8	11,48	250	18,4	14,04	250	22,7	17,03	250	27,9	20.43	250	34.2	24.33	250	41.5	28.53
280	6,9	6,28	280	8,6	7,78	280	10.1	9.03	280	13.4	11.84	280	16,6	14,43	280	20,6	17,61	280	25,4	21,32	280	31,3	25.66	280	38.3	30.52	280	46.5	35.80
315	7,7	7,90	315	9,7	9,85	315	11.4	11.42	315	15.0	14.85	315	18,7	18,27	315	23,2	22,28	315	28,6	27,04	315	35,2	32.47	315	43.1	38.63	315	52.3	45.30
355	8,7	10,04	355	10,9	12,44	355	12.9	14.51	355	16.9	18.85	355	21,1	23,26	355	26,1	28,30	355	32,2	34,27	355	39,7	41.27	355	48.5	49.01	355	59.0	57.58
400	9,8	12,71	400	12,3	15,86	400	14.5	18.42	400	19.1	24.07	400	23,7	29,40	400	29,4	35,93	400	36,3	43,53	400	44,7	52.36	400	54.7	62.27	400	66.7	73.26
450	11,0	16,01	450	13,8	19,93	450	16.3	23.31	450	21.5	30.40	450	26,7	37,26	450	33,1	45,48	450	40,9	55,17	450	50,3	66.28	450	61.5	78.77	450	75.0	92.72
500	12,3	19,97	500	15,3	24,61	500	18.1	28.78	500	23.9	37.51	500	29,7	46,05	500	36,8	56,15	500	45,4	68,04	500	55,8	81.72	500	67.6	96.37	500	83.4	114.55
560	13,7	24,82	560	17,2	30,96	560	20.3	36.10	560	26.7	46.90	560	33,2	57,66	560	41,2	70,43	560	50,8	85,28	560	62,2	102.11	560	75.7	120.87	560	93.3	143.55
630	15,4	31,41	630	19,3	39,03	630	22.8	45.69	630	30.0	59.34	630	37,4	73,07	630	46,3	89,14	630	57,2	108,02	630	70,0	129.23	630	85.1	152.88	630	105.0	181.74
710	17,4	39,95	710	21,8	49,54	410	25.7	58.03	710	33.9	75.56	710	42,1	92,70	710	52,2	113,21	710	64,5	137,35	710	78,8	163.98	710	95.9	194.16	710	118.4	230.92
800	19,6	50,62	800	24,5	62,78	800	29.0	73.68	800	38.1	95.69	800	47,4	117,61	800	58,8	143,74	800	72,7	174,32	800	88,9	208.41	800	108.1	246.58	800	133.3	292.99
900	22,0	63,78	900	27,6	79,48	900	32.6	93.25	900	42.9	124.11	900	53,3	148,78	900	66,2	181,92	900	81,8	220,65	900	100,0	263.74	900	121.6	312.05	900	150.0	370.89
1000	24,5	79,02	1000	30,6	97,88	1000	36.2	115.12	1000	47.7	149.76	1000	59,3	183,91	1000	73,5	224,59	1000	90,9	272,44	1000	111,1	325.58	1000	135.1	385.22	1000	166.7	457.96
1200	29,4	113,72	1200	36,7	140,75	1200	43.5	165.77	1200	57.2	215.50	1200	70,6	262,83	1200	88,2	323,29	1200	109,1	392,37	1200	133,3	468.77	1200	162.2	554.95	1200	200.0	659.36
1400	34,3	154,72	1400	42,9	191,94	1400	50.7	225.64	1400	66.7	293.05	1400	82,4	357,74	1400	102,9	440,03	1400	127,3	534,13	1400	155,5	637.99	1400	189.2	755.24	1400	233.3	897.36
1600	39,2	202,02	1600	49,0	250,55	1600	58.0	294.71	1600	76.2	382.76	1600	94,1	467,25	1600	117,7	575,18	1600	145,5	697,70	1600	177,8	833.65	1600	216.2	986.32	1600	266.6	1171.96

SDR : STANDARD DIMENSION RATIO (=OUTER DIA/WALL THICKNESS)
DN : NOMINAL DIAMETER (OUTER DIAMETER)
S : WALL THICKNESS
Sr24= Ring stiffness daily (24 hours)
Sr50= Ring stiffness for 50 years

Standard Production
Special Production on Demand

Please demand calculations from our Sales Managers for diameters over 1.600 mm.



2

PE 80 Pipes and Fittings for Natural Gas Systems

PE 80 PIPES AND FITTINGS FOR NATURAL GAS SYSTEMS

PRODUCT IDENTITY

Product Name	DİZAYN PE NATURAL GAS PIPES AND FITTINGS
Raw Material	HDPE / MDPE = PE 80
Product Color	Yellow
Production Standard	TS EN 1555-2
Other Standards	ISO 4437, DIN 16963
Production Standard fo Fittings	EN 1555-3

PRODUCT SPECIFICATIONS

Production Range	Ø25 - Ø710 mm
Pressure Range	SDR11 - PN 12,5 (for 4 bar lines in accordance with European Norms)
Production Unit Lenghts	Ø25 - Ø90 - (Coil - 100 - 200 meters) Ø110 - Ø710 - (11,8 - 12 - 13,5 meters)

QUALITY CERTIFICATES OF DİZAYN GROUP

Turkey

Germany

Russia

TECHNICAL SPECIFICATIONS

Polymer Data	PE 80	Unit	Test Method
Density at (23°C)	0.940	g / cm^3	ISO 1183
Viscosity Number	280	cm^3 / gr	ISO 1628-3
MFR (190° / 5 kg)	0.85	g /10 dak.	ISO 1133
MFR (190° / 25 kg)	18	g / 10	ISO 1133
Mechanical Properties			
Yield Stress	18	Mpa	ISO 527
Elogation at yield	10-12	%	ISO 527
Tensile Modulus	> 600	%	ISO 527
Notched Impact strenght	600	Mpa	ISO 527
Notched Impact strenght			
+ 23 °C	17	kJ / m^2	ISO 179/1eA
- 20 °C	5	kJ / m^2	ISO 179/1eA
Other Properties			
Oxidation - Induction time at (210°C)	≥ 20	min	ISO TR 10837
Carbon Black Content	2,3±0,2	%	ISO 6964
Carbon Black Dispersion	≤ 3		ISO CD 11420
MRS minimum Required Strenght	> 8	MPa	ISO TR 9080
Resistance to S.C.P (Slow Crack Propagation) x=4,6 Mpa, 80°C Notched	> 2000	h	EN 33479
Resistance to R.C.P (Rapid Crack) Propagation S4-test 110/10 mm 0°C	-	bar	ISO DIS 13477
Linear Thermal Expansion	$1.5x10^{-4}$	$0°C^{-1}$	ASTM D 696 (20-60°C)
Specific Heat Capacity	1.9	J / g °C	BPCL
Electrical Properties			
Electric Strenght	> 20	kV / mm	BS 27 82: 201 B
Volume resistivity	$> 10^{13}$	Ωm	BS 27 82: 230A
Surface resistivity	$> 10^{15}$	Ωm	BS 27 82: 231A
Relative resistivity	2,6	-	BS 2067 (1 to 20 MHZ)
Loss tangent	$3x10^{-4}$	-	BS 2067

2.1 Dizayn Natural Gas Pipes and Fittings

Dizayn Group uses polyethylene raw material for the manufacture of gas pipes and fittings because the first priority in manufacture of natural gas pipes and fittings is ultimate safety. Because the pipe made of polyethylene raw material can easily be bent and not corroded. Polyethylene pipe is light in weight and it has a wide variety of fittings to be used in connection. The polyethylene raw material is very resistant to impacts. The characteristics make the polyethylene pipes very easy to install, no need for frequent service and maintenance as well as very long service life. These features all mean very cheap and very safe installation for gas pipe lines. Dizayn Group uses world quality raw material in production of the gas pipes.

Picture 2.1 - The safety is on the top priority for the gas pipes and fittings.

The raw material used in production of Dizayn natural gas pipes is PE 80 (MRS=8 MPa HDPE) and PE100 (MRS=10 MPa). Our company produces gas pipes in the diameter range between 20 mm – 400 mm. The fittings which are welded using electrofusion welding method ensure absolute leak proof for very long service time. The quality of a chain is dependent on the quality of the elements one by one. In the pipe lines, the weakest points are the connection places.

This becomes more vital if a long period leak proof is required. The quality of a pipe line we can say is first dependant on the quality of connection points.

The electrofusion welding method used by Dizayn Group guaranties a maximum safety in connection points of natural gas pipe lines where absolute safety is vital. Dizayn Group is aware of this fact.

Picture 2.2 - Connection by using electrofusion welding

For the gas pipes, thanks to the nature of the plastic raw material, the passage of the gas can be stopped by squeezing the pipe. After release, the pipe will remember its round shape and will return to its normal shape.

Picture 1.1.11 - The squeezing of PE gas pipe.

PE 80 PIPES AND FITTINGS FOR NATURAL GAS SYSTEMS

Table 2.1 - MDPE Dizayn PE 80 Pipes

Sr24=3,9;Sr50=1.5 SDR 41; PN 3,2			Sr24=7,7;Sr50=3 SDR 33; PN 4			Sr24=16,2; Sr50=6,4 SDR 26; PN 5			Sr24=27,4; Sr50=10,8 SDR 22; PN 6			Sr24=61,8;Sr50=24,4 SDR 17; PN8			Sr24=127;Sr50=50 SDR 13.6; PN10			Sr24=253;Sr50=100 SDR11;PN 12,5			Sr24=495;Sr50=195 SDR 9; PN 16			Sr24=966;Sr50=381 SDR 7.4; PN 20			Sr24=2027;Sr50=800 SDR 6; PN 25		
			DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)
mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m
																											16	3.0	0.13
																								20	3.0	0.17	20	3.4	0.19
																					25	3,0	0,22	25	3.5	0.25	25	4.2	0.29
																		32	3,0	0,29	32	3,6	0,34	32	4.4	0.40	32	5.4	0.47
															40	3,0	0,38	40	3,7	0,44	40	4,5	0,53	40	5.5	0.62	40	6.7	0.72
									50	2,3	0,39	50	3,0	04,7	50	3,7	0,57	50	4,6	0,69	50	5,6	0,81	50	6.9	0.97	50	8.3	1.13
						63	2,5	0,52	63	2,9	0,56	63	3,8	0,75	63	4,7	0,90	63	5,8	1,09	63	7,1	1,30	63	8.6	1.52	63	10.5	1.79
			75	2,3	0,58	75	2,9	0,70	75	3,4	0,79	75	4,5	1,05	75	5,6	1,28	75	6,8	1,51	75	8,4	1,82	75	10.3	2.17	75	12.5	2.54
90	2,3	0,67	90	2,8	0,82	90	3,5	1,02	90	4,1	1,14	90	5,4	1,51	90	6,7	1,83	90	8,2	2,20	90	10,1	2,63	90	12.3	3.11	90	15.0	3.66
110	2,7	0,98	110	3,4	1,22	110	4,2	1,49	110	5,0	1,71	110	6,6	2,24	110	8,1	2,71	110	10,0	3,25	110	12,3	3,91	110	15.1	4.66	110	18.3	5.46
125	3,1	1,29	125	3,9	1,57	125	4,8	1,91	125	5,7	2,20	125	7,4	2,86	125	9,2	3,49	125	11,4	4,22	125	14,0	5,05	125	17.1	6.00	125	20.8	7.06
140	3,5	1,61	140	4,3	1,96	140	5,4	2,41	140	6,4	2,77	140	8,3	3,59	140	10,3	4,37	140	12,7	5,27	140	15,7	6,35	140	19.2	7.54	140	23.3	8.85
160	4,0	2,07	160	4,9	2,51	160	6,2	3,17	160	7,3	3,61	160	9,5	4,68	160	11,8	5,69	160	14,6	6,90	160	17,9	8,27	160	21.9	9.83	160	26.6	11.54
180	4,4	2,59	180	5,5	3,19	180	6,9	3,92	180	8,2	4,57	180	10,7	5,91	180	13,3	7,23	180	16,4	8,71	180	20,1	10,45	180	24.6	12.43	180	29.9	14.59
200	4,9	3,16	200	6,2	3,99	200	7,7	4,87	200	9,1	5,64	200	11,9	7,29	200	14,7	8,86	200	18,2	10,75	200	22,4	12,94	200	27.4	15.38	200	33.2	18.01
225	5,5	4,01	225	6,9	4,95	225	8,6	6,11	225	10,2	7,14	225	13,4	9,25	225	16,6	11,25	225	20,5	13,61	225	25,2	16,37	225	30.8	19.45	225	37.4	22.82
250	6,2	5,03	250	7,7	6,14	250	9,6	7,57	250	11,4	8,82	250	14,8	11,33	250	18,4	13,85	250	22,7	16,80	250	27,9	20,15	250	34.2	24.00	250	41.5	28.14
280	6,9	6,20	280	8,6	7,67	280	10,7	9,43	280	12,7	11,06	280	16,6	14,23	280	20,6	17,37	280	25,4	21,03	280	31,3	25,31	280	38.3	30.10	280	46.5	35.31
315	7,7	7,79	315	9,7	9,71	315	12,1	12,03	315	14,3	14,00	315	18,7	18,02	315	23,2	21,98	315	28,6	26,67	315	35,2	32,03	315	43.1	38.11	315	52.3	44.68
355	8,7	9,90	355	10,9	12,27	355	13,6	15,17	355	16,1	17,78	355	21,1	22,94	355	26,1	27,92	355	32,2	33,80	355	39,7	40,70	355	48.5	48.34	355	59.0	56.79
400	9,8	12,54	400	12,3	15,65	400	15,3	19,25	400	18,2	22,57	400	23,7	29,00	400	29,4	35,44	400	36,3	42,93	400	44,7	51,65	400	54.7	61.42	400	66.7	72.26
450	11,0	15,79	450	13,8	19,66	450	17,2	24,33	450	20,5	28,57	450	26,7	36,75	450	33,1	44,86	450	40,9	54,42	450	50,3	65,38	450	61.5	77.70			
500	12,3	19,70	500	15,3	24,27	500	19,1	30,01	500	22,7	35,27	500	29,7	45,42	500	36,8	55,38	500	45,4	67,11	500	55,8	80,60						
560	13,7	24,48	560	17,2	30,54	560	21,4	37,57	560	25,5	44,25	560	33,2	56,87	560	41,2	69,47	560	50,8	84,12	560	62,2	100,72						
630	15,4	30,98	630	19,3	38,50	630	24,1	47,62	630	28,6	56,00	630	37,4	72,07	630	46,3	87,92	630	57,2	106,54									
710	17,4	39,41	710	21,8	48,87	710	27,2	60,50	710	32,3	71,13	710	42,1	91,44	710	52,2	116,67	710	64,5	135,48									
800	19,6	49,93	800	24,5	61,92	800	30,6	76,56	800	36,4	90,30	800	47,4	116,00	800	58,8	141,78												
900	22,0	62,91	900	27,6	78,40	900	34,4	97,57	900	40,9	114,29	900	53,3	146,75	900	66,2	179,44												
1000	24,5	77394	1000	30,6	96,54	1000	38,2	119,49	1000	45,5	141,09	1000	59,3	181,40	1000	73,5	221,53												
1200	29,4	112,17	1200	36,7	138,83	1200	45,9	172,26	1200	54,5	203,17	1200	70,6	259,25															
1400	34,3	152,61	1400	42,9	189,32	1400	53,5	234,26	1400	63,6	276,54	1400	82,4	352,87															
1600	39,2	199,27	1600	49,0	247,14	1600	61,2	306,24	1600	72,7	361,20	1600	94,1	460,89															

SDR : STANDARD DIMENSION RATIO (=OUTER DIA / WALL THICKNESS)
DN : NOMINAL DIAMETER (OUTER DIAMETER)
S : WALL THICKNESS
Sr24= Ring stiffness daily (24 hours)
Sr50= Ring stiffness for 50 years

Standard Production
Special Production on Demand

PE 80 PIPES AND FITTINGS FOR NATURAL GAS SYSTEMS

Table 2.2 - HDPE Dizayn PE 80 Pipes dimensions

Sr_{24}=3;9Sr_{50}=1.5 SDR 41; PN 3.2			Sr_{24}=7.7;Sr_{50}=3 SDR 33; PN 4			Sr_{24}=16.2; Sr_{50}=6.4 SDR 26; PN 5			Sr_{24}=27.4; Sr_{50}=10.8 SDR 22; PN 6			Sr_{24}=61.8 Sr_{50}=24.4 SDR 17; PN 8		
DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)
mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m
									50	2,3	0,39	50	3,0	04,7
						63	2,5	0,52	63	2,9	0,56	63	3,8	0,75
			75	2,3	0,58	75	2,9	0,70	75	3,4	0,79	75	4,5	1,05
90	2,3	0,67	90	2,8	0,82	90	3,5	1,02	90	4,1	1,14	90	5,4	1,51
110	2,7	0,98	110	3,4	1,22	110	4,2	1,49	110	5,0	1,71	110	6,6	2,24
125	3,1	1,29	125	3,9	1,57	125	4,8	1,91	125	5,7	2,20	125	7,4	2,86
140	3,5	1,61	140	4,3	1,96	140	5,4	2,41	140	6,4	2,77	140	8,3	3,59
160	4,0	2,07	160	4,9	2,51	160	6,2	3,17	160	7,3	3,61	160	9,5	4,68
180	4,4	2,59	180	5,5	3,19	180	6,9	3,92	180	8,2	4,57	180	10,7	5,91
200	4,9	3,16	200	6,2	3,99	200	7,7	4,87	200	9,1	5,64	200	11,9	7,29
225	5,5	4,01	225	6,9	4,95	225	8,6	6,11	225	10,2	7,14	225	13,4	9,25
250	6,2	5,03	250	7,7	6,14	250	9,6	7,57	250	11,4	8,82	250	14,8	11,33
280	6,9	6,20	280	8,6	7,67	280	10,7	9,43	280	12,7	11,06	280	16,6	14,23
315	7,7	7,79	315	9,7	9,71	315	12,1	12,03	315	14,3	14,00	315	18,7	18,02
355	8,7	9,90	355	10,9	12,27	355	13,6	15,17	355	16,1	17,78	355	20,1	22,94
400	9,8	12,54	400	12,3	15,65	400	15,3	19,25	400	18,2	22,57	400	23,7	29,00
450	11,0	15,79	450	13,8	19,66	450	17,2	24,33	450	20,5	28,57	450	26,7	36,75
500	12,3	19,70	500	15,3	24,27	500	19,1	30,01	500	22,7	35,27	500	29,7	45,42
560	13,7	24,48	560	17,2	30,54	560	21,4	37,57	560	25,5	44,25	560	33,2	56,87
630	15,4	30,98	630	19,3	38,50	630	24,1	47,62	630	28,6	56,00	630	37,4	72,07
710	17,4	39,41	710	21,8	48,87	710	27,2	60,50	710	32,3	71,13	710	42,1	91,44
800	19,6	49,93	800	24,5	61,92	800	30,6	76,56	800	36,4	90,30	800	47,4	116,00
900	22,0	62,91	900	27,6	78,40	900	34,4	97,57	900	40,9	114,29	900	53,3	146,75
1000	24,5	77394	1000	30,6	96,54	1000	38,2	119,49	1000	45,5	141,09	1000	59,3	181,40
1200	29,4	112,17	1200	36,7	138,83	1200	45,9	172,26	1200	54,5	203,17	1200	70,6	259,25
1400	34,3	152,61	1400	42,9	189,32	1400	53,5	234,26	1400	63,6	276,54	1400	82,4	352.87
1600	39,2	199,27	1600	49,0	247,14	1600	61,2	306,24	1600	72,7	361,20	1600	94,1	460.89

Sr_{24}=127;Sr_{50}=50 SDR 13; PN 10			Sr_{24}=253;Sr_{50}=50 SDR11;PN 12.5			Sr_{24}=495;Sr_{50}=195 SDR 9; PN 16			Sr_{24}=966;Sr_{50}=381 SDR 7.4; PN 20			Sr_{24}=2027;Sr_{50}=800 SDR 6; PN 25		
DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)	DN	S	Unit (Weight)
mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m	mm	mm	kg/m
												16	3.0	0.13
									20	3.0	0.17	20	3.4	0.19
						25	3,0	0,22	25	3.5	0.25	25	4.2	0.29
			32	3,0	0,29	32	3,6	0,34	32	4.4	0.40	32	5.4	0.47
40	3,0	0,38	40	3,7	0,44	40	4,5	0,53	40	5.5	0.62	40	6.7	0.72
50	3,7	0,57	50	4,6	0,69	50	5,6	0,81	50	6.9	0.97	50	8.3	1.13
63	4,7	0,90	63	5,8	1,09	63	7,1	1,30	63	8.6	1.52	63	10.5	1.79
75	5,6	1,28	75	6,8	1,51	75	8,4	1,82	75	10.3	2.17	75	12.5	2.54
90	6,7	1,83	90	8,2	2,20	90	10,1	2,63	90	12.3	3.11	90	15.0	3.66
110	8,1	2,71	110	10,0	3,25	110	12,3	3,91	110	15.1	4.66	110	18.3	5.46
125	9,2	3,49	125	11,4	4,22	125	14,0	5,05	125	17.1	6.00	125	20.8	7.06
140	10,3	4,37	140	12,7	5,27	140	15,7	6,35	140	19.2	7.54	140	23.3	8.85
160	11,8	5,69	160	14,6	6,90	160	17,9	8,27	160	21.9	9.83	160	26.6	11.54
180	13,3	7,23	180	16,4	8,71	180	20,1	10,45	180	24.6	12.43	180	29.9	14.59
200	14,7	8,86	200	18,2	10,75	200	22,4	12,94	200	27.4	15.38	200	33.2	1801
225	16,6	11,25	225	20,5	13,61	225	25,2	16,37	225	30.8	19.45	225	37.4	22.82
250	18,4	13,85	250	22,7	16,80	250	27,9	20,15	250	34.2	24.00	250	41.5	28.14
280	20,6	17,37	280	25,4	21,03	280	31,3	25,31	280	38.3	30.10	280	46.5	35.31
315	23,2	21,98	315	28,6	26,67	315	35,2	32,03	315	43.1	38.11	315	52.3	44.68
355	26,1	27,92	355	32,2	33,80	355	39,7	40,70	355	48.5	48.34	355	59.0	56.79
400	29,4	35,44	400	36,3	42,93	400	44,7	51,65	400	54.7	61.42	400	66.7	72.26
450	33,1	44,86	450	40,9	54,42	450	50,3	65,38	450	61.5	77.70			
500	36,8	55,38	500	45,4	67,11	500	55,8	80,60						
560	41,2	69,47	560	50,8	84,12	560	62,2	100,72						
630	46,3	87,92	630	57,2	106,54									
710	52,2	116,67	710	64,5	135,48									
800	58,8	141,78												
900	66,2	179,44												
1000	73,5	221,53												

SDR : STANDARD DIMENSION RATIO (=OUTER DIA/WALL THICKNESS)
DN : NOMINAL DIAMETER (OUTER DIAMETER)
S : WALL THICKNESS
Sr24= Ring stiffness daily (24 hours)
Sr50= Ring stiffness for 50 years

Standard Production
Special Production on Demand

3

HDPE Spiral Self Pipes for Non-Pressure (Gravitational) Systems

HDPE SPIRAL SELF PIPES FOR NON-PRESSURE (GRAVITATIONAL) SYSTEMS

PRODUCT IDENTITY

Product Name	DİZAYN SPIRAL PIPE
Raw Material	HDPE 100
Product Color	Black
Production Standard	TS 12132, TS EN 13476-3

PRODUCT SPECIFICATIONS

Production Range	Ø500 - Ø3600 mm
Ring Stifness	SR2 - SR64
Pressure Class	Gravitational Flow (test pressure: 0,5 bar)
Pipe Length	5,8 – 6- 11,8 – 12 – 13,5 meters (Customized lengths can also be produced by Mobile (on-site) Manufacturing method. Please contact with us for customized lenghts.)

QUALITY CERTIFICATES OF DİZAYN GROUP

Turkey

Russia

3.1 Dizayn Spiral Pipe

Dizayn Group has launched its new versatile product, Dizayn Spiral Pipe, yielded by its R&D efforts kicked off 7 years.

Recently, the Ministry of Energy has proclaimed myriad of projects aimed at extending the hydroelectric energy nationwide. In hydroelectric power plants, water supply lines stand among the vital components of the system. Correct water supply is the crucial factor that is directly decision on the plant's capacity. Pushing and exceeding the limits of fluid engineering through extraordinary methods and launching highly prestigious projects in this field, our company has developed an unparalleled alternative for the sake of seamless water supply in HPP projects. Particularly the solutions against common problems to be offered by our new product that may employed in transffering water to the turbine in HPP projects may be summarized as follows:

Choosing plastic pipes to sewage projects will undoubtely present lots of crucial advantages such as securing 100% water tightness and ultimately bringing the losses down to zero. Excessive pipe diameters reaching 2-3 meters in sewage projects add to transport costs and naturally inflate the overall project expenditure, therefore they are unfavorable. To avoid the exorbitant transport costs due to huge volume of pipes employed in sewage projects where only one pipe can fit in the truck, our company has developed the on-site manufacturing method based upon its state-of-the-art technology.

Thanks to this newly-developed technology, the manufaturing yard is erected on the territory of the power plant and the resulting on-site manufacturing process clears the transport costs. Under this technology, when water supply lines are designed with plastic pipes, competitive costs can be produced compared to traditional systems.

Another factor that makes is impossible to employ large-diameter HDPE pipes in sewage projects is that maximum length of pipe is limited meters in current manufacturing methods. As the pipes are manufactured by widing on the drum, the pipe length is limited to the drum length. In existing systems, as the manufacturing plant cannot be relocated, maximum manufacturing length is merely limited to the maximum truck length due to transport restrictions. The new technology developed by Dizayn Group eliminates such a length restriction in manufacturing. The pipes can be manufactured in any length desired. Hence, also a reduction is achieved in the number of joints.

With plenty of advantages, primarily the chemical strength, plastics offer a long service life. Thanks to the Spiral Pipes manufactured of polythene raw material, maintennance costs for sewage lines in plants are minimized.

As Spiral piping offers a quite low wall roughness coefficient, that fluid can be transported in smaller pipes compared to concrete and other systems, allowing a less excavation volume.

The pipes are joined by means of a specially developed EF welding system. This special joining method guarantees a reliable weld and 100% tightness.

Also thanks to their high ring stifness, Spiral pipe offers a high strength to any kind of aerth load under the ground or in areas receiving musch traffic load, allowing the transfer of gravity fluids such as wastewaters.

HDPE SPIRAL SELF PIPES FOR NON-PRESSURE (GRAVITATIONAL) SYSTEMS

3.2 Dizayn Spiral Pipe Advantages

Leak Tightness

Dizayn Spiral Pipe is designed as a flexible structure to minimise the effects of ground movement and deformation and prevent leakage from the pipeline or attunation structure.

Flexibility

Dizayn is unique in its ability to produce large diameter pipe and attenuation solutions to match your exact requrements and site conditions. The flexibility of our manufacturing process enables you to specify exact stifness requirements and utilise a value engineered solution that is neither under nor over specified.

Unique, patented electro-fusion joint

Dizayn offers the only large diameter plastic pipe solution with integral electro-fusion joingting. Electro-fusion wire is connected to the socket end of the pipe during manufacture and supplied with a unique barcode containing the settings and installation parameters for the pipe.

Fast Jointing

In comparison with other large diameter systems, Dizayn Spiral Pipe can be handled, jointed and installed much quicker, resulting in time and cost savings on-site.

Less joints, less leakage

Dizayn Spiral Pipe is available in standard lengths of 6 meters even according to customer request. With less joints, Dizayn Spiral Pipe significantly reduces the potential for leakage. Dizayn Spiral Pipe offers flexibility in specifying a joint that is appropriate for the project.

Safety and healt for human benefits

Electro-fusion jointing offers improved health and safety benefits over traditional jointing methods reducing the need to work within confined spaces. On-site, Dizayn Spiral Pipes can also be jointed at the side of the trench before being craned into position, reducing health and safety risks during installation.

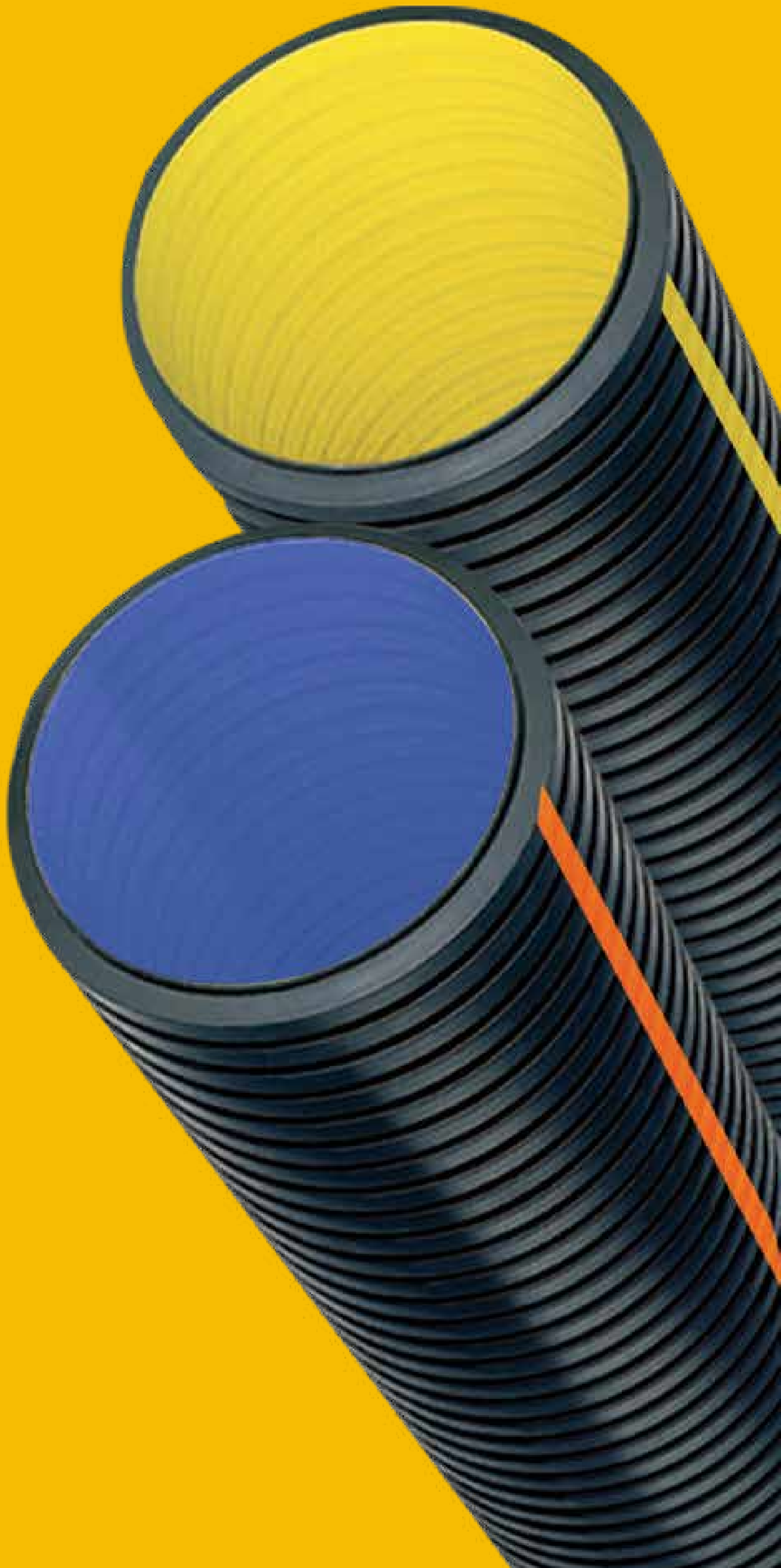
HDPE SPIRAL SELF PIPES FOR NON-PRESSURE (GRAVITATIONAL) SYSTEMS

3.2.1 Dizayn Spiral Pipe - Facts

- Fabricated tanks and manholes to any size
- Available for sewage systems, power plants and sea discharge projects
- Light weight for ease of handling and installation combined with high stifness and durability
- 100% recyclable after used life
- Ideal for use as large-scale attenuation system
- Strong yet flexible design
- Able to withstand ground movement without leakage
- Superior hydraulic performance achieved through smooth bore
- Up to 3600mm diameter
- Durable materials
- Excellent resistance to sulphate and chmical attack
- Longer pipe lengths for improved pipeline integrity and fewer joints
- Unique patented electro-fusion jointing system
- Excellent load bearing capability

4

Corrugated Pipes and Fittings for Sewage Discharge



CORRUGATED PIPES AND FITTINGS FOR SEWAGE DISCHARGE

PRODUCT IDENTITY

Product Name	SEWAGE DİSCHARGE PIPES AND FITTINGS
Raw Material	HDPE
Product Color	Black
Production Standard	TS EN 13476-1, TS 12132
Other Standards	DIN 16961, EN 155, EN 13476

PRODUCT SPECIFICATIONS

Production Range	100 mm - 450 mm
Pipe Length	6 meter

QUALITY CERTIFICATES OF DİZAYN GROUP

Turkey

Rusya

Ukranie

CORRUGATED PIPES AND FITTINGS FOR SEWAGE DISCHARGE

4.1- Advantages of Dizayn HDPE Corrugated Sewage Pipes and Fittings

- These pipes have the advantage of having light weight and being suitable for easy and quick installation. These characteristic are big advantages in places where the construction season is short and there is big traffic.
- These pipes give good result in welding which ensures perfect leak proof at welding points.
- They have high durability.
- They are flexible.
- They have perfect strength against abrasion and external impacts.
- They require less excavation area and less amount of sand filling after installation compared to the other pipe types.
- The raw material of HDPE pipes have higher resistance to the chemicals and not affected from corrosion, decaying and abrasion.
- HDPE pipes are applicable to various welding and jointing techniques which is also big plus from the side of the quick installation and cost analysis.
- HDPE pipes do adopt themselves to the shape of the land.
- HDPE pipes are not affected from the earth movements.
- Because of the Carbon Black content HDPE pipes are not affected from direct sun light for years and years (UV protection).
- HDPE pipes can be connected out of the trench because of their elastic nature which means easiness and big economy savings in the installation works.
- HDPE pipes have minimum 50 years service life and 1000 years of guarantee against decaying.
- The production facilities of HDPE pipes are movable easily to another place which gives a big economy in the transportation cost of the pipes in big pipe line projects.
- HDPE pie are manufactured in accordance to the World Standards like DIN 16961, EN 155, TS 12132, etc.

Picture 4.1.1 - A view from "İzmir İZSU Great Canal Project" application.

4.1.1 - Perfect leak – proof at connection points

Dizayn HDPE Sewage Pipes and Fittings can be connected to each other by either welding or by means of socket with o-ring. All of these are guaranteed leak-prof connection methods. As it is well known, in case of concrete pipes, at the connection points 100% leak prof never can be reached. Why is the Leak-Proof so important?

- In case of leakage from sewage piping systems, wastes will contact with underground water reservoirs which will create mortal sanitary pollutions.
- At paces where the underground water level is near to the earth surface, these clean waters will enter the sewage discharge pipes forming an extra load in these pipe systems. This fact must be taken into account when choosing the sewage pipe diameter to be installed.

Nominal Diameter	Allowable leakage per m^2 (lt)	Actual leak amount for Dizayn PE Pipes
125-250	0.6	0
300-600	0.5	0
700-1000	0.4	0
more than 1000	0.3	0

Table 4.1.1 - Allowable leakage amounts for concrete pipes.

CORRUGATED PIPES AND FITTINGS FOR SEWAGE DISCHARGE

4.1.2 Corrugated PE Sewage Pipes

It is a common practice to increase the wall thickness of the pipe in order to increase its resistance to the increasing external loads because of bigger installation depths.

This simple solution also brings the problem of increased pipe diameter and weight as well as some other parameters increasing the installation coats.

Dizayn PE Corrugated PE Sewage Pipes bring a wonderful solution to this problem that instead of increased by wall thickness of the pipe, the resistance of the pipe is increased by using a different corrugation profile on the pipe.

What are the main advantages of Dizayn PE Corrugated Sewage Pipes?

1. Since the strength of the pipe is ensured by only use of different corrugation profile type on the pipe. Instead of increased the wall thickness, it is possible to obtain ultra-light PE pipes in comparison to the other pipe types.
2. Because of their perfect internal surface smoothness, it is possible to use one size smaller PE pipe in comparison to the same diameter of concrete pipes.
3. This enables the contractors making less excavation and sand filling.
4. This characteristic brings bigger advantage where the underground water level is high and expensive erection works must be done.
5. Because of their high impact resistance value, Dizayn PE pipes are not broken easily. For this reason, during installation or in case of earth movements or earth settlements there becomes no damage on the pipe. This means minimum service and maintenance cost for the PE pipe line.
6. Because of their perfect resistance to chemical materials, Dizayn PE pipes and tanks are ideal for chemical solution transfer or storage.
7. Because of their leight unit weight, Dizayn Pe corrugated Pipes are laid down easily and quickly. This feature enables the contractors to finish the excavation works with lower costs within shorter period of time.
8. Guaranteed service life of Dizayn PE pipes is 50 years. But even butter this service life they continue to serve because the plastic raw material has a decaying time of 1000 years.
9. Dizayn PE pipes are light in weight. This feature makes them suitable for telescopic transport. By inserting the smaller diameter pipe into bigger diameter pipes, a considerable economy can made in the transport invoice for the pipes.
10. DİzaynPE pipes can be used at places where 100% leak proof is require, (like water reservoirs.)
11. Since Dizayn Pe pipes can be used in making manholes or other fitting, practical at-side solution can be done with minimum cost.

As a result of their advantage above, Dizayn PE corrugated sewage pipes fulfill the requirements of ta perfect sewage discharge system and enable city planning authorities to create a city free from every day excavations for repair works.

CORRUGATED PIPES AND FITTINGS FOR SEWAGE DISCHARGE

4.1.3 Dizayn sewage pipes are hydraulically smooth. This feature gives the advantage of using smaller diameter pipe in comparison to the concrete pipes for the same work.

Concrete Pipe			Dizayn PE Pipe		
Nominal Diameter	Flow rate % 100 Flow Flow rate	Flow rate % 60 Flow	Nominal Diameter	Flow rate % 100 Flow	Flow rate % 60 Flow
mm	l/s	l/s	mm	l/s	l/s
1000	2.309	1.524	900	2.492	1.644
800	1.492	945	700	1.505	933
400	225	148	350	237	156
300	104	69	250	97	64

Table 4.1.2 - Comparison of flow rates for Concrete and Dizayn PE Sewage Pipes.

As it can be seen from the table above, Dizayn PE sewage pipes can make the same work with a smaller diameter compared the concrete pipes.

∅1000 mm Dia Concrete Pipe **∅900 mm Dia. Dizayn PE Pipe**

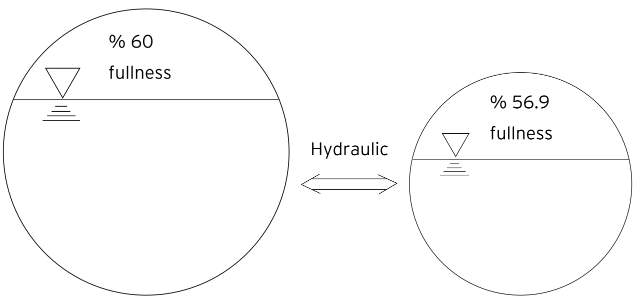


Figure 4.1.1 - The comparison for hydraulic flow rates between concrete and Dizayn PE

4.1.4 Advantage of availability of more than one connection methoddiameter pipe in comparison to the concrete pipes for the same work.

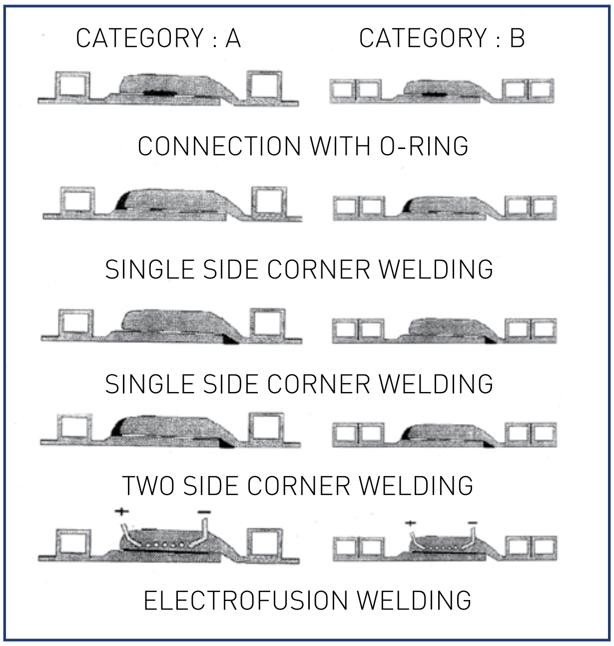
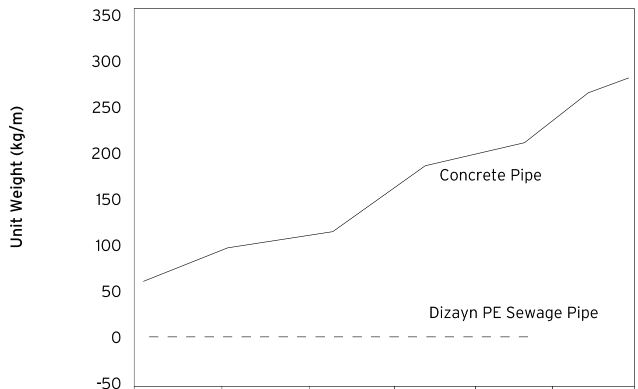


Figure 4.1.2 - Connections methods for sewage pipes.

4.1.5 Dizayn PE Corrugated Sewage Pipes are easy to install



	∅150	∅200	∅250	∅300	∅350	∅450
Concrete PIPE	56	89	109	158	196	290
HDPE PIPE	1.3	2.4	3.9	4.8	6.7	10

PIPE INTERNAL DIAMETERS (mm)

Figure 4.1.3 - Comparison of unit weights of concrete pipes and Dizayn PE Sewage Pipes

4.1.6 Advantage of weldability out of the trench

Because of the elastic nature of the PE pipes, these pipes can be welded at a suitable place near the trench. Once the tip of the pipe is bounded there will be no cracks or slipping of the pipe from the joint places. Welding of PE pipes out of the trench can be applied to all diameters.

- For installation, it is enough to open a trench which is 5 cm larger than pipe diameter. This means less excavation and less sand filling -a huge economy- in installation costs.
- For each type of pipes, it is so difficult to make connection in the trench. This can be done for PE pipes very easily out of the trench with less workers and machinery.
- Connection of the pipes can be done without opening the trench. But in case of opening trench. But in case of opening trench, installation of the pipes should be done immediately just after the excavation of the trench. Because when the trench is excavated before a long time, the trench will deform and need to be cleaned.

4.1.7 Dizayn PE Sewage pipe do not affected from abrasion

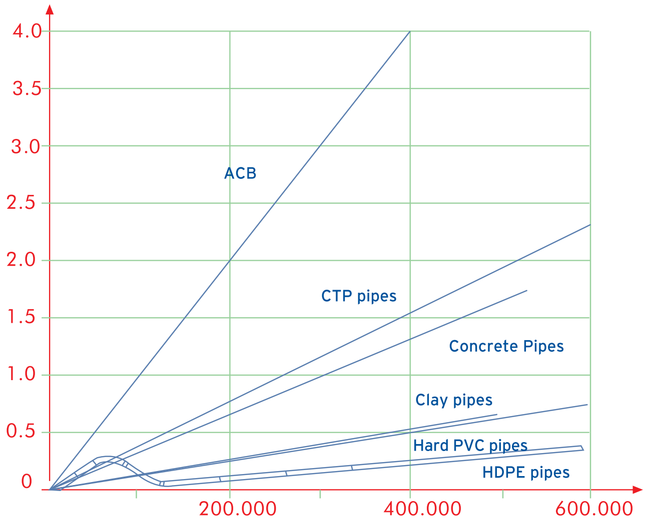


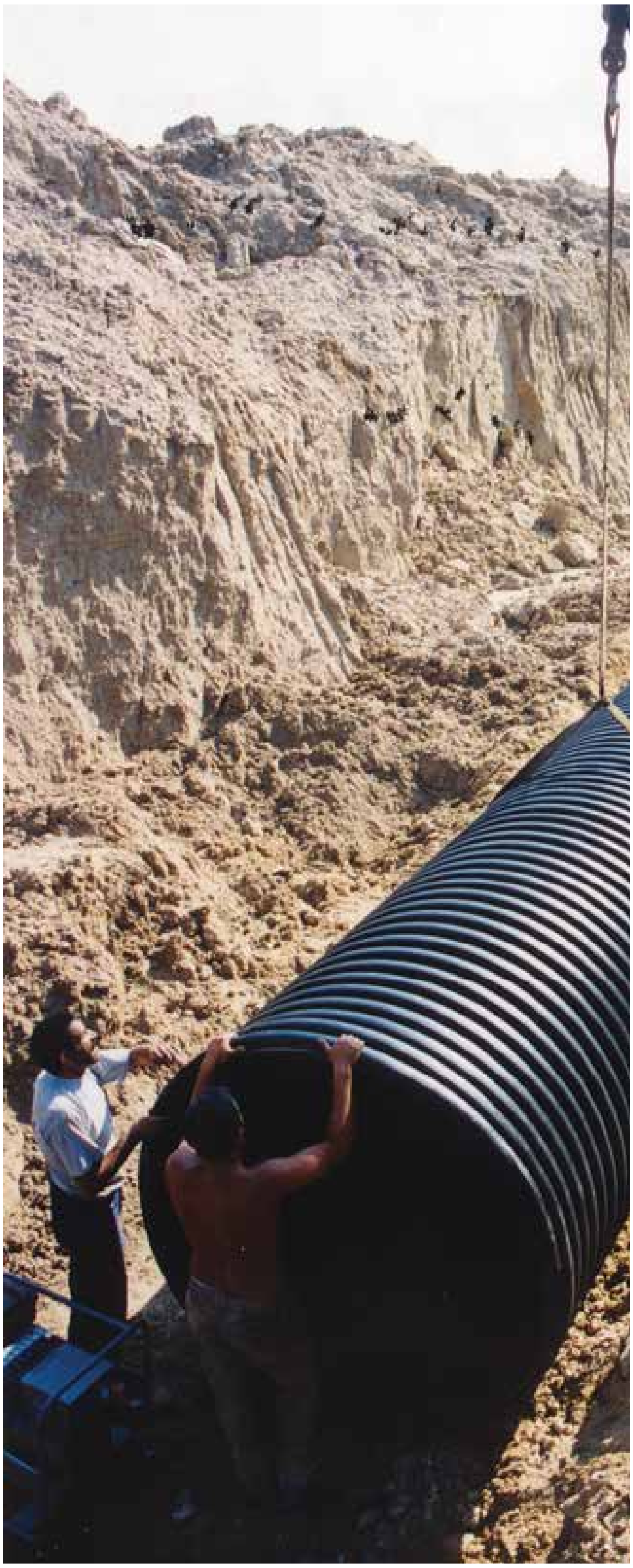
Figure 4.1.4 - The curve of obrasion test

Dizayn PE Sewage pipe have the best values for resistance to abrasion in comparison to the other pipe types. High performance of Dizayn Pe sewage pipes can be monitored the above test results the service life, the abrasion on Dİzayn PE Sewage pipes is only 0.09 mm. this research also revealed a surprising result that the abrasion on asbestos steel pipes and GRP pipes is more than that of concrete pipes. Besides it good resistance against abrasion, Dİzayn PE Corrugated Sewage pipes have also high resistance against chemical susbstances. They can be safely used for acidic, alkaline and salty fluids.

4.1.8 Less requirement of special filling sand, less need for big excavation area hence, less sand filling as a result big economy in excavation costs.

Big diameter Dizayn PE pies can be welded from inside the pipe. For these pipes there is no need to bring special filling sand. It is enough to prepare the surface with an angle 120 degree. The earth derived from excavation can be used as filling sand after a simple elimination of big and sharp stones which can damage the pipe.

Advantages
Since there isn't any need to bring special filling sand, PE pipes have big economy in installation costs.
Because of less excavation need for PE Sewage pipes, the installation invoice will still decrease.

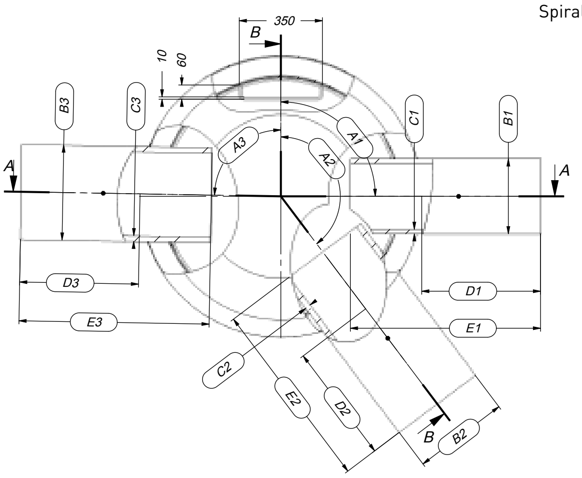


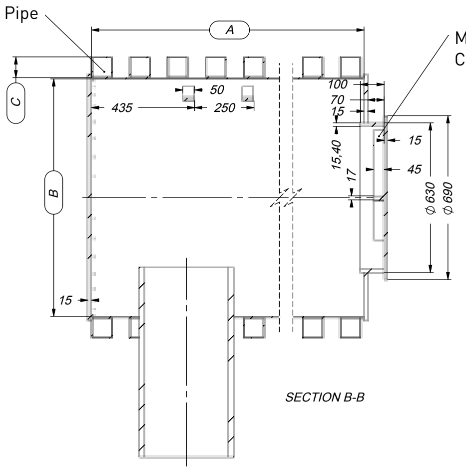
5

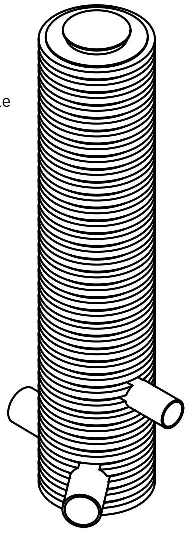
Manholes and Storage Tanks

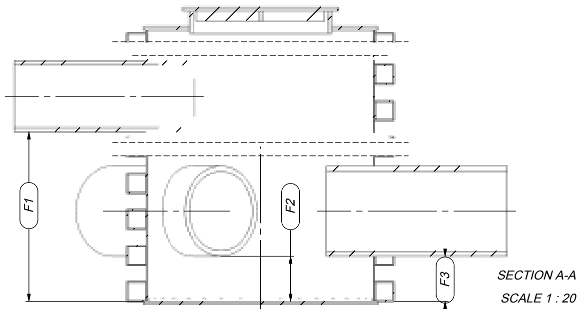
INFORMATION FORM FOR SPECIAL MANHOLE CONSTRUCTION

All the junction points will be closed.









Manhole Length (A)	
Manhole Diameter (B)	
Manhole SR (C)	
A1	
A2	
A3	
B1	
B2	
B3	
C1	
C2	
C3	
D1	
D2	
D3	

E1	
E2	
E3	
F1	
F2	
F3	

Other Info

FORM FOR DETAILED INFORMATION ON DİZAYN MANHOLES

1) PROJECT NAME

Producer
Tel:...
Fax:..

Information requested by:
Tel:...
Fax:..

2) INFORMATION ON RAW MATERIAL AND MANHOLE

Raw Material DIN 8075 ☐ PE 63 ☐ PE 80 ☐ PE 100

Raw Material :..
Internal diameter :..
Height H (m) :...
Width of bottom PE plate t_b :...
Number of branches :...
The height of branches from bottom :..
Diameters of branches :..
Type of upper cover :...

Table 5.1 - Manhole information request form

MANHOLES AND STORAGE TANKS

5.1 Dizayn PE Storage Tanks

5.1.1- Specifications

The advantages of Dizayn PE storage tank can be outlines as follows:

- Dizayn PE storage thanks have perfect strength against poisonous and acidic chemicals,
- Better physical features ensuring more filling-load capacity,
- Absolute leak proof,
- Produced from homogenious elastic raw material,
- Smooth internal surface,
- Plastic raw material inhibitin ˙the settlement of microorganisms on the internal surface,
- Perfect strength to high temperature,
- Because of its light weight, very easy transport and installation allowing the lover cost,
- Absolutely environment friendly,
- Very high durability and very long service life,
- Availability of mounting every kind of accessories on the tank,
- The availability o different connection methods because of the welding and availability of making changes in body of the tank,
- High strength against impacts,
- Absolutely hygienic for human use,
- In some special cases telescobic transport is possible,

Dizayn PE storage tanks are produced in 500 mm-3600 mm diameter range. The net volume range differs between 1-50 m3 range. The calculation for the strength are made according to the norm of instate Für Bautecknik and DVS 2205 part 1-4. The production of Dizayn storage tanks is made according to DIN 16961 standard.

For making easy service and loading into the tanks many kids of laddes or fences on the tank can be mounted.

If necessary, for the purpose of decreasing the transport cost, the completion of the tank can be made at place of installation.

In case of demand, special production can be made in different shapes and dimension.

Net capacity (Liter)	DN Internal diameter (mm)	HZ Cylinder height (mm)	H Tank height (mm)
1.000	1.200	935	1.135
1.500	1.200	1.375	1.575
2.000	1.200	1.820	2.020
2.500	1.200	2.260	2.460
2.500	1.600	1.300	1.500
3.000	1.600	1.540	1.740
3.500	1.600	1.790	1.990
4.000	1.600	2.040	2.240
4.500	1.600	2.290	2.490
6.000	1.600	3.035	3.235
7.000	1.600	3.530	3.730
8.000	1.600	4.030	4.230
8.000	2.000	2.595	2.865
9.000	2.000	2.915	3.185
10.000	2.000	3.235	3.505
12.000	2.000	3.870	4.140
13.000	2.000	4.190	4.460
14.000	2.000	4.510	4.780
15.000	2.000	4.775	5.045
15.000	2.600	2.875	3.205
20.000	2.600	3.815	4.145
25.000	2.600	4.710	5.040
25.000	3.000	3.585	3.985
30.000	2.600	5.700	6.030
35.000	3.000	5.000	5.400
35.000	3.400	3.900	4.355
40.000	3.000	5.710	6.040
40.000	3.400	4.455	4.910
45.000	3.000	6.365	6.765
45.000	3.400	5.005	5.450
50.000	3.000	7.125	7.525
50.000	3.400	5.560	6.015

Dizayn Group keeps the right to change any time the dimensions and specifications mendioned in this brochure

Picture 5.1 - Dizayn PE tanks being used for chemical storage.

TANK HDPE	Internal diameter	Height of main body	Height of tank	Total height	Walking area	
					Int. Dia.	Height
Capacity (Liter)	DN (mm)	HZ (mm)	(mm)	HG (mm)	DW (mm)	HW (mm)
6.000	1.600	3.185	3.385	4.335	2.000	2.885
7.000	1.600	3.730	3.930	4.880	2.000	3.430
8.000	1.600	4.180	4.380	5.330	2.000	3.880
8.000	2.000	2.475	2.945	3.895	2.600	2.445
9.000	2.000	3.065	3.265	4.25	2.600	2.765
10.000	2.000	3.385	3.585	4.536	2.600	3.085
12.000	2.000	4.020	4.220	5.170	2.600	3.720
13.000	2.000	4.340	4.540	5.490	2.600	4.040
14.000	2.000	4.660	4.860	5.810	2.600	4.360
15.000	2.000	4.925	5.125	6.075	2.600	4.625
15.000	2.600	3.025	3.355	4.175	3.000	2.725
20.000	2.600	3.965	4.295	5.115	3.000	3.665
25.000	2.600	4.860	5.190	6.010	3.000	4.56
25.000	3.000	3.735	4.135	4.885	3.400	3.435
30.000	2.600	5.850	6.180	7.000	3.800	5.550
35.000	3.000	5.150	5.550	6.000	3.400	4.850
35.000	3.400	4.050	4.505	5.200	3.800	3.750
40.000	3.000	5.860	6.260	7.010	3.400	5.560
40.000	3.400	4.605	5.060	5.755	3.800	4.760
45.000	3.000	6.515	6.915	7.665	3.400	6.615
45.000	3.400	5.155	5.610	6.305	3.800	5.310
50.000	3.000	7.275	7.675	8.425	3.400	7.375
50.000	3.400	5.710	6.165	6.860	3.800	5.865

Picture 5.3 - The production dimensions for flat bottomed storage tanks.

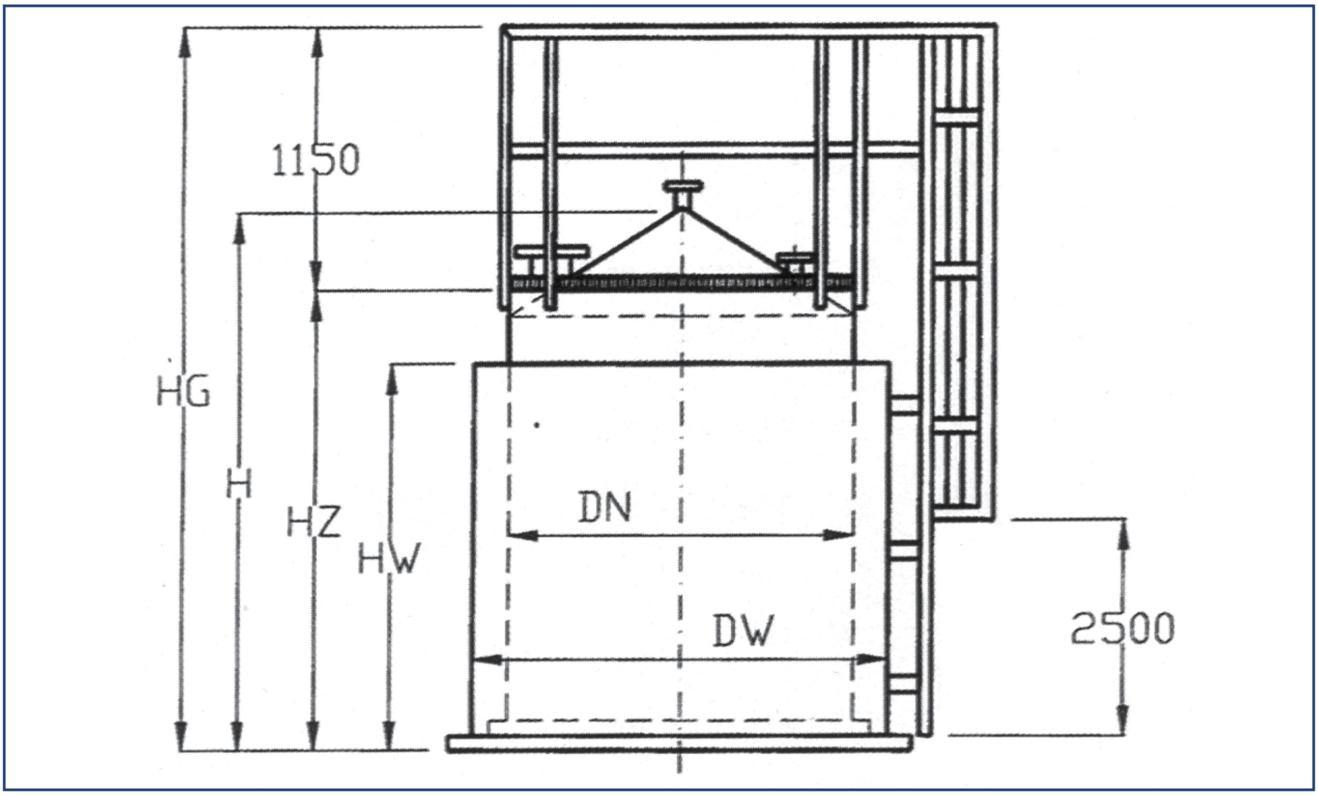


Figure 5.2 - The schematic shape of Dizayn PE and PP Storage tanks

MANHOLES AND STORAGE TANKS

Picture 5.4 - Dizayn PE tank in use.

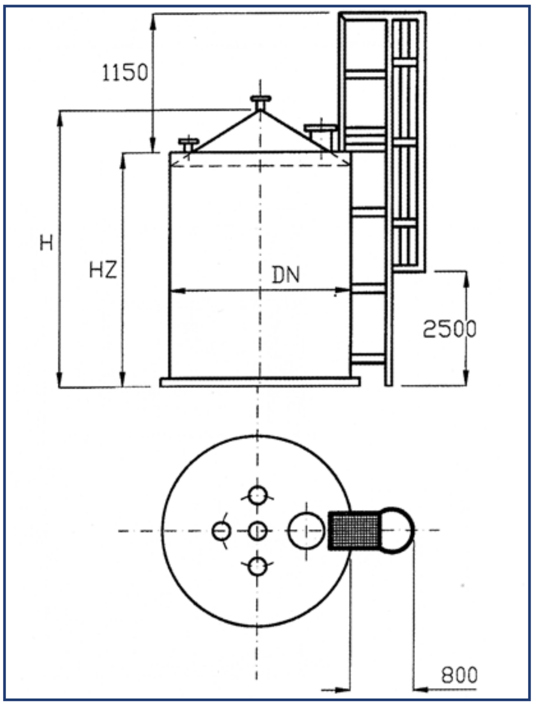


Figure 5.3 - Flat bottomed Dizayn tanks with walking area and with latter.

6

Mobile (On Site) Production Technology

MOBILE (ON SITE) PRODUCTION TECHNOLOGY

LOGISTICS ADVANTAGES			
MOBILE PRODUCTION RAW MATERIAL TRANSPORT		PIPE IN PIPE CALCULATION PIPE TRANSPORT	
TOTAL WEIGHT	1135104 kg	TOTAL WEIGHT	1135104 kg
TRUCK LOADING CAPACITY	20000 kg	TRUCK LOADING CAPASITY	12 meter
TRUCK QUANTITY	56,7552	TRUCK QUANTITY	263,5833333
MACHINE TRANSPORT	15.000.00 $		
TRANSPORT COST PER TRUCK	2.500.00 $	TRANSPORT COST PER TRUCK	2.500.00 $
TOTAL	**156.888.00 $**	**TOTAL**	**658.958.33 $**

The unique mobile production system pioneered by Dizayn Group for spiral pipes present huge advantages. Especially bringing in big amounts by deleting transportation costs almost totally, this technology also contributes substantially to the protection of the environment due to the items it subtracts from the project.

Used in different cities (Sivas, Çorum and Sinop) in Turkey before and newly being used in Ordu, contractor firms' costs are reduced in significant amounts thanks to this magnificent technology. Especially in Hydroelectric Power Plant (HPP) projects, corrugates spiral pipes are needed in big radius. By the use of our mobile production facility pipes up to 2,5 m radius can be produced on site. Thanks to Dizayn Group's on site production technology transportation costs are almost totally eliminated and project costs are reduced.

One other important advantage presented by Dizayn Group mobile production facility to project owners and contractors is the reduction in assembly costs. Corrugated spiral pipes, which can be produced at most up to 10 meters long because of the transportation limitations, can be produced up to 100 meters long thanks to Dizayn Group mobile production system. Thus, costs for assembling each pipe decreases significantly.

These products also have the fragility of being diminished while transported. By mobile production system this risk is eliminated. Hundreds of hours and labor power that needed for the upload and unload of tens of trucks is saved.

MOBILE (ON SITE) PRODUCTION TECHNOLOGY

Constantly leading innovation in its sector by its focus to serve humanity, Dizayn Group makes a great contribution to the project owners and to the environment by its mobile production technology.

Another important saving from expense items in this type of projects is the lesser usage of petroleum. Tons of oil to be used on hundreds of kms roads by tens of trucks is saved by this system. Additionally, by excluding those trucks from the roads, both the possible traffic load and the exhaust of toxic gases to the air by them are prevented.

Dizayn Group Mobile Production technology strengthens both the employer's and the contractor's hand. Dizayn Group, produces the future by its Mobile Production facility, which multiplies its importance also by its contribution to the environment.

7

New Products

7.1 Dizayn RTP Pipes

Thermoplastic based Dizayn RTP Pipes are as stronger as steel pipes but they are more durable as opposed to them. Corrosion, the biggest trouble for metal pipes, is no longer a problem. Moreover, necessity of using steel pipes where there is a need of high pressure resistance is overcomed by Dizayn technology. Dizayn RTP Pipes present pressure resistance up to 200 bars even up to 315 mm diameter. Yet for bigger diameters, RTP Pipes still provides better solutions.

Combining the advantages of plastic pipes for flexibility, chemical resistance, corrosion resistance and easy application features with high pressure and high temperature resistance by Dizayn technology, Dizayn RTP Pipes are the best solution for special projects.

Designed as 3-layered, Dizayn RTP Pipes can be produced from PN 15 to PN 200 thanks to its inner layer of continuous reinforced glass fiber. Dizayn RTP Pipes also decreases the project costs and shortens the project durations by lowering the time needed production and assembling.

7.1.1 Basic Technicals

1. Are RTP pipes fully compatible with Steel Pipes?
Thermoplastic based Dizayn RTP Pipes are as stronger as steel pipes but they are more durable as opposed to them. Corrosion, the biggest trouble for metal pipes, is no longer a problem. Moreover, necessity of using steel pipes where there is a need of high pressure resistance is overcomed by Dizayn technology. Dizayn RTP Pipes present pressure resistance up to 200 bars even up to 315 mm diameter. Yet for bigger diameters, RTP Pipes still provides better solutions.

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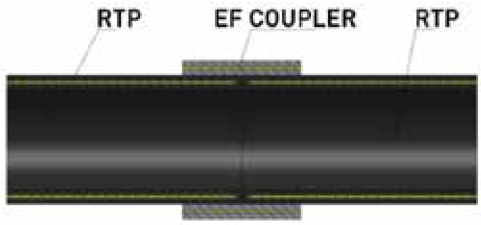
2. Are RTP Pipes resisting at the same temperature/ pressure conditions like Steel Pipes?
RTP pipes are resistant to high pressures like steel pipes. The decrease in pressure strength with the rise of temperature for RTP pipes is less than temperature resistance decrease.

3. How is welding performed RTP to RTP?
The fusion of RTP Pipes is done through electrofusion welding method.



Only with Dizayn!

Fields of Application for RTP Pipes

- Main Drinking Water and Utility Water Lines with High Pressure
- Geothermal Water Transportation Lines
- Hydro Electric Power Plant Applications
- Natural Gas Transmission Lines
- Petroleum Transmission Lines
- Industrial Facilities
- Offshore Applications

COMPARISON OF RTP, STEEL AND THERMOPLASTIC PIPES			
Feature	Steel Pipe	Thermoplastic Pipe	RTP Pipe
Flexibility	–	+	+
Corrosion Resistance	–	+	+
Chemical Resistance	–	+	+
Resistance for High Pressure	+	–	+
Lightness	–	+	+
Welding Easiness	–	+	+
Friction Coefficient for Inner Wall	–	+	+
Temperature Resistance	+	–	⊤
Bigger Inner Diameter	+	–	+
Less Elbow Need	–	+	+
Deprection Time	–	–	+
Bending, Coiling (up to 125 mm)	–	+	+

RTP PIPES

4. How is welding performed RTP to Steel Pipe?
The fusion of RTP pipes and steel pipes is done through flange joint method. After the RTP Pipe is covered with flange, the welding is done through electrofusion flange adaptor and it becomes ready to fuse with steel pipe.

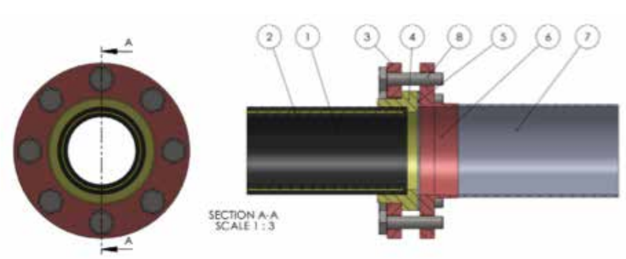
5. RTP Pipes can be used with actual valves that RADET use?
Steel Pipes are mostly used with steel valves with sphere system and also direct flow valves made from steel.

Flange connection can be done with RTP pipe valves.

6. How is the mounting procedure of RTP pipes? Do they require special mounting or is the same mounting system as Steel Pipes?
RTP Pipes should be mounted by technical staff who has taken RTP Pipe Mounting Training. The technical staff applying current EF welding methods can do the application after a brief period of training. The infrastructure and equipment in hand are used. There is no need of special equipment.

7. Can RTP Pipes be mounted upper ground and underground?
RTP pipes might be mounted both inside and outside of channel. For mounting outside of channel, the pipes must be linked just beside the shore of the channel or on the carriages put over the channel and by using proper appliances they must be put down on the channel.

8. Is it possible for RTP pipes to be connected with flanges?
Flange connection of RTP pipes, elements of facility (valve, check valve, counter etc.) being connected to the line is preferred in shift to steel pipes. Steel flange connection can be applied to RTP-RTP connection, however, it isn't preferred.



1	RTP Pipe
2	Fiber
3	Steel Flange
4	Flange Adaptor
5	Gasket
6	Steel Flange
7	Steel Pipe
8	Bolt

DIAMETER - WEIGHT - PRESSURE CLASS VALUES FOR RTP PIPES																										
Outer Diameter (mm)			Outer Diameter (mm)			Outer Diameter (mm)			Outer Diameter (mm)			Outer Diameter (mm)			Outer Diameter (mm)			Outer Diameter (mm)			Outer Diameter (mm)			Outer Diameter (mm)		
90			110			125			160			180			225			250			280			315		
Inner Diameter (mm)	Weight (kg/m)	Pressure Class (PN)	Inner Diameter (mm)	Weight (kg/m)	Pressure Class (PN)	Inner Diameter (mm)	Weight (kg/m)	Pressure Class (PN)	Inner Diameter (mm)	Weight (kg/m)	Pressure Class (PN)	Inner Diameter (mm)	Weight (kg/m)	Pressure Class (PN)	Inner Diameter (mm)	Weight (kg/m)	Pressure Class (PN)	Inner Diameter (mm)	Weight (kg/m)	Pressure Class (PN)	Inner Diameter (mm)	Weight (kg/m)	Pressure Class (PN)	Inner Diameter (mm)	Weight (kg/m)	Pressure Class (PN)
70	2,62	50	88	3,58	42	103	4,12	36	136	5,83	30	154	7,06	25	199	8,94	20	220	11,37	19	250	12,83	17	281	16,26	15
68	3,00	100	86	4,05	84	101	4,66	72	134	6,54	60	152	7,85	50	197	9,94	40	218	12,47	38	248	14,07	34	279	17,66	30
67	3,37	150	85	4,52	126	100	5,19	108	133	7,23	90	151	8,62	75	196	10,92	60	217	13,58	57	247	15,30	51	278	19,05	45
65	3,75	200	83	4,98	168	98	5,73	144	131	7,93	120	149	9,41	100	194	11,92	80	215	14,68	76	245	16,54	68	276	20,44	60

For our solutions for bigger diameters, please ask for information: info@dizayngroup.com

PRODUCT IDENTITY

Product Name	Reinforced Thermoplastic Pipe (RTP)
Material	Polymer+ Constant High Resistant Fiber Glass+ Polymer (Composite Structure)
Diameter Range	90 – 1200 mm
Pressure Category	16 – 200 Bar
Temperature Strength	Standard Max. 90°C (Other Temperature Conditions Shall Be Evaluated)
Standards	API RP 15S, ISO TS 18226, TSE K 166, TS EN 15874

PRODUCT SPECIFICATIONS

Manning	0.009
Hazen & Williams	150

TECHNICAL SPECIFICATIONS

Ambient Temperature	20˚C	10˚C	50˚C
Minimum Bending Radius	50 x D	70 x D	100 x D

9. Is it possible to use a monitoring system (for leakage and other purposes) on RTP pipes?
There isn't a special monitoring system for RTP pipes. The monitoring system in hand can be used.

10. Which tests have been done to RTP Pipes? Do they meet EU standards and certifications?
In the manufacture of RTP Pipes and their testing, the standards mentioned below are used. There isn't an international certificate for RTP Pipes yet. The process of certification is still on. However, all the tests have been done in Dizayn laboratories and some tests are still on.

For TSE K 166 Thermoplastic Composite Pipes - Polyethylene Based, Constant Fiber Supported, Spiral Wound –pressure drinking and usage water

For TS EN 15874 Plastic Pipe Systems - hot and cold water

ISO TS 18226:2006 Reinforced Thermoplastics Pipes (RTP) for High Pressure Gas Applications (up to 40 bars)
API RP 15S, Recommended Practice for the Qualification of Spoolable Reinforced Plastic Line Pipe, published by the American Petroleum Institute (API) 2006.

Product features

Steel pipes used in streaming have high pressure strength whereas they have low corrosion strength. Plastic pipes, on the other hand, have high corrosion strength and limited pressure strength. High corrosion strength and high pressure strength are both necessary for pipes in high pressure drinking and usage water, geothermal water carriage lines, hydro electrical power plants, petrol transmission lines, industrial facilities etc.

RTP Pipes with their composite structure provide pressure strength with their constant fibers in the middle layer which is much more resistant than the steel. The polymer raw material over and under the fiber layer provides high corrosion strength.

RTP Pipes' design concept belongs to the composite product segment which has improved fast in recent years and stood out especially in aviation, automotive, space, construction etc. Different materials have strong and weak sides With composite design, it is possible to bring together the strong points of different materials. In RTP Pipes, continuous fibers' high tensile strengths is combined with high corrosion strength. The combination method provides a structure in which the constant fiber layer and polymer layer can work together due to advanced technology.

7.1.2 Application

• Field installation of RTP Pipes can only be carried out by personnel who had received RTP Pipe Installation and Welding Training. Installations and applications made by unqualified personnel are out of warranty.
• RTP Pipe welding and application trainings will be scheduled to dates to be jointly decided by Dizayn Group and the client.
• The end sections of RTP pipes are subjected to front covering process in the factory which ensures continuous strands in the middle layer to retain elasticity. When pipes are cut during installation, front covering shall be mounted again in the field.
• Installation of RTP pipes shall be carried out within the channel or adjacent to the channel.
• Fully installed RTP pipes shall be subjected to hydrotest.
• Welding process for RTP pipe shall be carried out in accordance with Dizayn Group guidelines.
• RTP Pipes shall be installed using additional parts specially fabricated and made of the same material with RTP Pipes.
• RTP Pipes shall not be forced to bend in lower values than bend radius indicated in Table.1. In temperatures lower than 5°C,welding process and field actions requiring the pipes to bend shall be suspended.

Ambient Temperature	20°C	10°C	50°C
Minimum Bend Radius	50xD	70xD	100xD

7.1.3 Shipping

- Measures shall be taken by those in charge to prevent damage to RTP Pipes during loading and unloading.
- RTP Pipes of PPR origin become more fragile in cold weathers (temperatures of 5°C and lower) due to the nature of polymer material. Loading and unloading shall be carried out with a higher diligence in such temperatures and pipes shall be kept safe of collision and impact.
- Use of woven fabrics or gunny sack is encouraged while loading and unloading RTP pipes.
- Pipes shall be visually examined while being loaded and unloaded and damaged pipes (fracture, scratches deeper than 30% of section width, puncture, etc.) shall be separated as shrinkage.
- Health and Safety measures shall be taken during loading and unloading.
- While shipping RTP Pipes, the pipes shall not be carried by dragging due to frictional damage.

7.1.4 Storage

- Black RTP Pipes can be stored without a cover (6 months maximum), necessary steps for preventing sunlight exposure shall be taken for pipes with other colours.
- Storage area for the pipes shall be cleared of sharp, abrasive and corrosive items.
- Pipe stacking height shall comply with Table-2. Triangle or square formats may be preferred for the stacking of pipes.

Table. 2 RTP Pipes Maximum Stacking Height

RTP Pipe Outside Diameter (mm)	Maximum Stacking Height Units
110	15
125	12
140	10
160	10
180	8
200	8
225	6
250	6
280	5
315	5

The Technical Features of PPR Raw Material

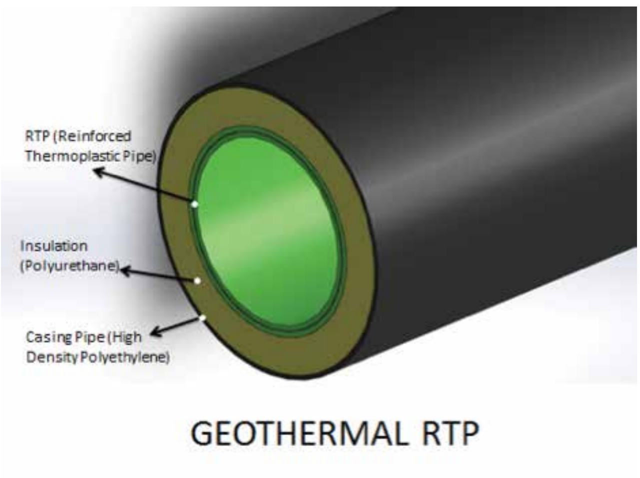
Standard	TS EN ISO 15874-2
MRS (The Desired Lowest Resistance) Value	8 Mpa. at minimum
Additives	No additives except antioxidants, UV-stabilizer and colorants
Density	Approximately ≥ 900 ± 5 kg/m3 when tested according to TS EN ISO 1183-1
MFR (Melting Flow Rate)	≤ 0,5 g/10 min. when tested according to ISO 1133 (2,16 kg, 230 °C)
The Change ratio between MFR values	≤ 30% - between the sample taken from the raw material and the RTP Pipe made of it
Color	Green, grey etc. If UV protection is required, they can be produced with UV resistance.
Diameters and Wall Thickness	90 mm – max. 315 mm
Length	Between 4 – 13,5 m (based on project needs) RTP Pipes can be produced for coiling up to 125 mm and coil length for this type is 200 m.
Pressure Resistance	Between PN15-PN200 (bars)
Heat Resistance	The heat resistance for RTP Pipes is shown in the table below. The pressure resistance of RTP Pipes decreases by heat increase.

7.2 Modern solid waste collection centers

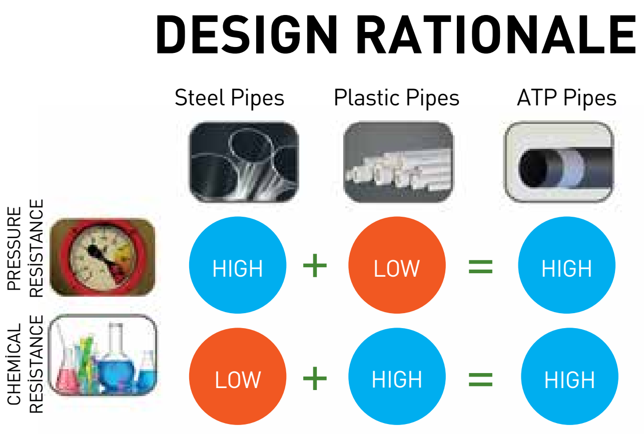
Geothermal RTP Pipes are developed to be used for liquid transfer applications where heat isolation is important (heating or cooling).
Geothermal RTP Pipes, as can be viewed in the diagram below, with their composite structure feature the high pressure resistance of steel pipes and high chemical resistance of plastic pipes.

1. RTP Pipe
Showing resistance to heat and pressure of liquids, RTP Pipes are thermoplastic composite pipes for liquid transfer. While continuous fiber glass in the middle layer provides resistance against heat and pressure; protection for the continuous fiber glass layer, operating capability for the composite structure, high chemical resistance, convenience for assembling etc. features are gained with the thermoplastic layers on and under the fiber glass layer.

2. Polyurethane (Isolation Layer)
By means of the polyurethane layer in the middle of the geothermal pipe system, minimum heat loss (for heating systems) or gain (for cooling systems) is ensured while liquid transfer. Nevertheless, isolation layer can be constituted from rock wool, glass wool or other different materials based on project requirements. In Geothermal Pipe System, depending on customer needs special pipes with thicker isolation layers, rather than with standard thickness, can also be produced.



3. Casing Pipe (HDPE)
The casing pipe is a protection layer made of polyethylene in order to keep the isolation material and the transporter (service) pipe away from ground water, humidity and mechanical damages.



TECHNICAL FEATURES

RTP Pipe Features
The thermoplastic raw material used in RTP Pipes can be chosen from different polymers (PPR, PPh, HDPE, PERT etc.) based on the project requirements. For PPR (Polypropylene Random Copolymer), the features below have to be provided.

GEOTHERMAL RTP PIPES

RTP PIPES - DIMENSIONS AND PRESSURE RATINGS											
Outer Diameter/OD		Wall Thickness		Inner Diameter/ID		Maximum Ovality	Pressure Class (PN) 20°C, 20 YEARS	Pressure Class (PN) 40°C, 20 YEARS	Pressure Class (PN) 60°C, 10 YEARS	Pressure Class (PN) 75°C, 10 YEARS	Pressure Class (PN) 95°C, 5 YEARS
OD (mm)	Tolerans (mm)	Wall Thickness (mm)	Tolerans (mm)	ID Max. (mm)	ID Min. (mm)	(mm)					
90	+0,6	10,9	+2	68,8	64,2	1,8	50,0	36,5	25,0	18,0	10,0
90	+0,6	11,8	+2	67,0	62,4	1,8	100,0	73,0	50,0	36,0	20,0
90	+0,6	12,7	+2	65,2	60,6	1,8	150,0	109,5	75,0	54,0	30,0
90	+0,6	13,6	+2	63,4	58,8	1,8	200,0	146,0	100,0	72,0	40,0
110	+0,7	10,9	+2	88,9	84,2	2,2	42,0	30,7	21,0	15,1	8,4
110	+0,7	11,8	+2	87,1	82,4	2,2	84,0	61,3	42,0	30,2	16,8
110	+0,7	12,7	+2	85,3	80,6	2,2	126,0	92,0	63,0	45,4	25,2
110	+0,7	13,6	+2	83,5	78,8	2,2	168,0	122,6	84,0	60,5	33,6
125	+0,8	10,9	+3	104,0	97,2	2,5	36,0	26,3	18,0	13,0	7,2
125	+0,8	11,8	+3	102,2	95,4	2,5	72,0	52,6	36,0	25,9	14,4
125	+0,8	12,7	+3	100,4	93,6	2,5	108,0	78,8	54,0	38,9	21,6
125	+0,8	13,6	+3	98,6	91,8	2,5	144,0	105,1	72,0	51,8	28,8
160	+1	11,9	+3	137,2	130,2	3,2	30,0	21,9	15,0	10,8	6,0
160	+1	12,8	+3	135,4	128,4	3,2	60,0	43,8	30,0	21,6	12,0
160	+1	13,7	+3	133,6	126,6	3,2	90,0	65,7	45,0	32,4	18,0
160	+1	14,6	+3	131,8	124,8	3,2	120,0	87,6	60,0	43,2	24,0
180	+1,1	12,9	+3,5	155,3	147,2	3,6	25,0	18,3	12,5	9,0	5,0
180	+1,1	13,8	+3,5	153,5	145,4	3,6	50,0	36,5	25,0	18,0	10,0
180	+1,1	14,7	+3,5	151,7	143,6	3,6	75,0	54,8	37,5	27,0	15,0
180	+1,1	15,6	+3,5	149,9	141,8	3,6	100,0	73,0	50,0	36,0	20,0
200	+1,2	12,9	+4	175,4	166,2	4,0	24,0	17,5	12,0	8,6	4,8
200	+1,2	13,8	+4	173,6	164,4	4,0	48,0	35,0	24,0	17,3	9,6
200	+1,2	14,7	+4	171,8	162,6	4,0	72,0	52,6	36,0	25,9	14,4
200	+1,2	15,6	+4	170,0	160,8	4,0	96,0	70,1	48,0	34,6	19,2
225	+1,4	12,9	+4	200,6	191,2	4,5	20,0	14,6	10,0	7,2	4,0
225	+1,4	13,8	+4	198,8	189,4	4,5	40,0	29,2	20,0	14,4	8,0
225	+1,4	14,7	+4	197,0	187,6	4,5	60,0	43,8	30,0	21,6	12,0
225	+1,4	15,6	+4	195,2	185,8	4,5	80,0	58,4	40,0	28,8	16,0
250	+1,5	14,9	+4	221,7	212,2	5,0	19,0	13,9	9,5	6,8	3,8
250	+1,5	15,8	+4	219,9	210,4	5,0	38,0	27,7	19,0	13,7	7,6
250	+1,5	16,7	+4	218,1	208,6	5,0	57,0	41,6	28,5	20,5	11,4
250	+1,5	17,6	+4	216,3	206,8	5,0	76,0	55,5	38,0	27,4	15,2
280	+1,7	14,9	+4	251,9	242,2	9,8	17,0	12,4	8,5	6,1	3,4
280	+1,7	15,8	+4	250,1	240,4	9,8	34,0	24,8	17,0	12,2	6,8
280	+1,7	16,7	+4	248,3	238,6	9,8	51,0	37,2	25,5	18,4	10,2
280	+1,7	17,6	+4	246,5	236,8	9,8	68,0	49,6	34,0	24,5	13,6
315	+1,9	16,9	+4	283,1	273,2	11,1	15,0	11,0	7,5	5,4	3,0
315	+1,9	17,8	+4	281,3	271,4	11,1	30,0	21,9	15,0	10,8	6,0
315	+1,9	18,7	+4	279,5	269,6	11,1	45,0	32,9	22,5	16,2	9,0
315	+1,9	19,6	+4	277,7	277,7	11,1	60,0	43,8	30,0	21,6	12,0

GEOTHERMAL RTP PIPES

PRODUCT IDENTITY

Product Name	Regional Heating and Geothermic Pipes
Material	Polyurethane, Polyethylene
Carrier Pipe	Steel, PPR, PEX
Insulation	PUR40, PUR60, PUR80
Cover Pipe	HDPE
Product Color	Black
Productions Standart	TS-EN 253
Other Standarts	EN 253
Fitting Standarts	EN 448

PRODUCT SPECIFICATIONS

Production Limits	Ø3/4" - Ø40" (Carrier Pipe) Ø75 - Ø1200 mm (Cover Pipe)
Pipe Lengths	6m ÷ 12m

QUALITY CERTIFICATES

TECHNICAL SPECIFICATIONS

		Polyol	Isocyanate
OH number	mg KOH/g	323	-
HCFC 141B Convert	By weight %	22,4	-
NCO Convert	%	-	31
Viscosity 20/25 °C	mPa.s	-	200
Gravity 20 °C	g/ml	1,15	1,23
Storage Temperature	°C	0-20	20-25
Storage Life (2)	mounth	6	6

GEOTHERMAL RTP PIPES

The Technical Features of Casing Pipe

Density	> 944 kg/m
Color	Black (carbon black) > 2.5% (±0,5) by mass
Elongation at rupture	> 350%
Density	Approadmately ≥ 90±5 kg/m^3 when tested according to TS EN ISO 1183-1
MFR (Melting Flow Rate)	0,2 ≤ MFR ≤ 1,4 g/10 min (5 kg 190°C)
Thermal Stability (at 200°C)	> 20 min.

The Technical Features of Polyurethane (Pur)

Standard	EN 253
Heat Transfer Coefficient	≤ 0,032 W/m°K
Density	60 kg/m^3 at minimum
Density	Approadmately ≥ 90±5 kg/m^3 when tested according to TS EN ISO 1183-1
MFR (Melting Flow Rate)	0,2 ≤ MFR ≤ 1,4 g/10 min (5 kg 190°C)
Thermal Stability (at 200°C)	> 20 min.
Average cell size	< 0.5 mm
Closed cell	> 88%
Water absorption at high temperature	< 10% - when tested according to TS EN 253 (April 2004) 5.3.5, it shouldn't exceed 10% of its original volume
Squeezing resistance at 10% relative deformation	≥ 0.3 N/mm^2
Axlal cut resistance	≥ 0.12 N/mm^2
Isolation lifespan based on continuous service temperatures	30 years at 120°C
Thermal Stability (at 200°C)	< 0.5 mm

GEOTHERMAL RTP - CASING AND PUR THICKNESS

RTP Outside Diameter (mm)	Casing Pipe Outside Diameter (mm)	Casing Pipe Min. Wall Thickness (mm)	PUR Isolation Thickness (mm)
90	160	3	35,0
110	200	3,2	45,0
125	200	3,2	37,0
140	225	3,4	42,0
160	250	3,6	45,0
180	280	3,9	50,0
200	315	4,1	57,5
225	315	4,1	45,0
250	355	4,5	52,5
280	400	4,8	60,0
315	450	5,2	67,5

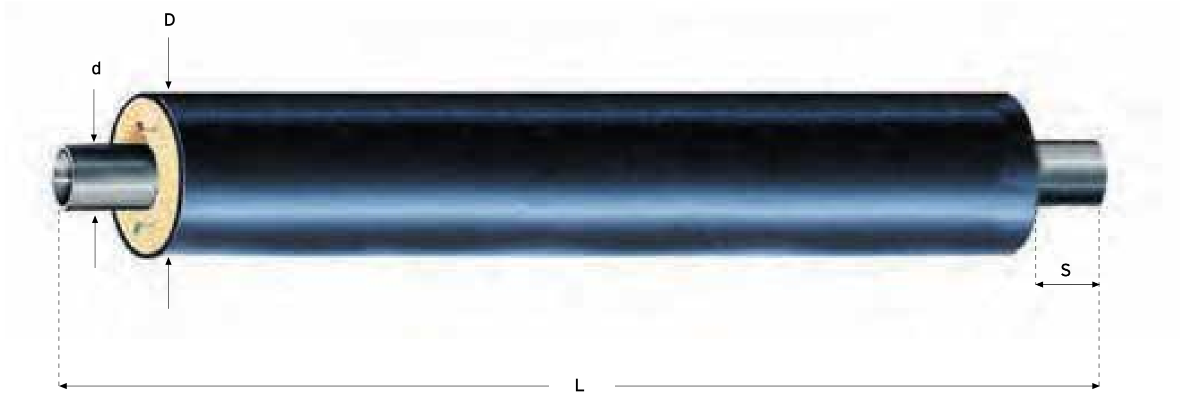
Internal Steel Pipe				Jacket Pipe						
Nominal Diameter d mm	Outer Diameter d mm	Inches d mm	Wall Thicknes t mm	Diameter D mm	Wall Thicknes T mm	İzolation Thickness mm	The weight of Polyurethane kg/mm	Water Intake Capacity lt/mm	The lenght of weld making place S mm	Unit lenght L m
20	26,9	3/4	2,0	90	2,2	29,35	0,46	0,21	200	6
25	33,7	1	2,3	90	2,5	25,65	0,42	0,32	200	6
32	42,4	1/4	2,6	110	2,5	31,30	0,64	0,4	200	6
40	48,3	1/2	2,6	110	2,5	28,35	0,60	0,46	200	6
50	60,3	2	2,9	125	2,5	29,85	0,74	0,65	200	6
65	76,1	2 1/2	2,9	140	3,0	28,95	0,84	0,84	200	12,6
80	88,9	3	3,2	160	3,0	32,55	1,09	1,08	200	12,6
100	114,3	4	3,6	200	3,2	39,65	1,69	1,56	200	12,6
125	139,7	5	3,6	225	3,5	39,15	1,94	2,06	200	12,6
150	168,1	6	4,0	250	3,9	37,05	2,10	2,45	200	12,6
200	219,1	8	4,5	315	4,9	43,05	3,12	3,04	200	12,6
250	273	10	5,0	400	6,3	57,20	5,22	4,21	200	12,6
300	323,9	12	5,6	450	7,0	56,05	5,89	5,6	200	12,6
350	355,6	14	5,6	500	7,8	64,40	7,48	6,16	200	12,6
400	406,4	16	6,3	560	8,8	68,00	8,92	7,92	200	12,6
450	457	18	6,3	630	9,8	76,70	11,32	8,93	200	12
500	508,8	20	6,3	710	11,1	89,50	14,80	9,95	200	12
600	609,6	24	7,1	800	12,5	82,70	15,83	13,44	200	12
800	813	32	8,8	1000	14,0	79,50	19,62	22,24	200	12
1000	1016	40	8,8	1200	16,0	76,00	22,94	27,85	200	12

Table 7.1 - Preinsulated pipe (with standard isolation)

GEOTHERMAL RTP PIPES

Internal Steel Pipe				Jacket Pipe						
Nominal Diameter d mm	Outer Diameter d mm	Inches d mm	Wall Thicknes t mm	Diameter D mm	Wall Thicknes T mm	İzolation Thickness mm	The weight of Polyurethane kg/mm	Water Intake Capacity lt/mm	The lenght of weld making place S mm	Unit lenght L m
20	26,9	3/4	2,0	110	2,5	39,05	0,71	0,21	200	6
25	33,7	1	2,3	110	2,5	35,65	0,68	0,32	200	6
32	42,4	1/4	2,6	125	2,5	38,80	0,87	0,4	200	6
40	48,3	1/2	2,6	125	2,5	35,85	0,83	0,46	200	6
50	60,3	2	2,9	140	3,0	36,85	0,99	0,65	200	6
65	76,1	1/2	2,9	160	3,0	38,95	1,24	0,84	200	12,6
80	88,9	3	3,2	180	3,0	42,55	1,55	1,08	200	12,6
100	114,3	4	3,6	225	3,5	51,85	2,38	1,56	200	12,6
125	139,7	5	3,6	250	3,9	51,25	2,71	2,06	200	12,6
150	168,1	6	4,0	280	4,4	51,55	3,13	2,45	200	12,6
200	219,1	8	4,5	355	5,6	62,35	4,85	3,04	200	12,6
250	273	10	5,0	450	7,0	81,50	7,99	4,21	200	12,6
300	323,9	12	5,6	500	7,8	80,25	8,97	5,6	200	12,6
350	355,6	14	5,6	630	9,8	127,40	17,01	6,16	200	12,6
400	406,4	16	6,3	630	9,8	102,00	14,34	7,92	200	12,6
450	457	18	6,3	710	11,1	115,40	18,26	8,93	200	12
500	508,8	20	6,3	800	12,5	133,10	23,62	9,95	200	12
600	609,6	24	7,1	900	14,0	131,20	26,87	13,44	200	12
800	813	32	8,8	1200	16,0	177,50	48,61	22,24	200	12

Table 7.2 - Preinsulated pipe (plus)



Internal Steel Pipe				Jacket Pipe						
Nominal Diameter d mm	Outer Diameter d mm	Inches d mm	Wall Thicknes t mm	Diameter D mm	Wall Thicknes T mm	İzolation Thickness mm	The weight of Polyurethane kg/mm	Water Intake Capacity lt/mm	The lenght of weld making place S mm	Unit lenght L m
20	26,9	3/4	2,0	125	2,5	46,55	0,95	0,21	200	6
25	33,7	1	2,3	125	2,5	43,15	0,92	0,32	200	6
32	42,4	1 1/4	2,6	140	3,0	45,80	1,12	0,4	200	6
40	48,3	1 1/2	2,6	140	3,0	42,85	1,08	0,46	200	6
50	60,3	2	2,9	160	3,0	46,85	1,39	0,65	200	6
65	76,1	2 1/2	2,9	180	3,0	48,95	1,69	0,84	200	12,6
80	88,9	3	3,2	200	3,2	52,35	2,04	1,08	200	12,6
100	114,3	4	3,6	250	3,9	63,95	3,15	1,56	200	12,6
125	139,7	5	3,6	280	4,4	65,75	3,73	2,06	200	12,6
150	168,1	6	4,0	315	4,9	68,55	4,48	2,45	200	12,6
200	219,1	8	4,5	400	6,3	84,15	7,05	3,04	200	12,6
250	273	10	5,0	500	7,8	105,70	11,07	4,21	200	12,6
300	323,9	12	5,6	630	9,8	143,25	18,50	5,6	200	12,6
350	355,6	14	5,6	630	9,8	127,40	17,01	6,16	200	12,6
400	406,4	16	6,3	710	11.1	140,70	21,28	7,92	200	12,6
450	457	18	6,3	800	12,5	159,00	27,08	8,93	200	12
500	508,8	20	6,3	900	14,0	181,60	34,66	9,95	200	12
600	609,6	24	7,1	1200	16,0	279,20	68,60	13,44	200	12

Table 7.3 - Preinsulated pipe (plus&plus)

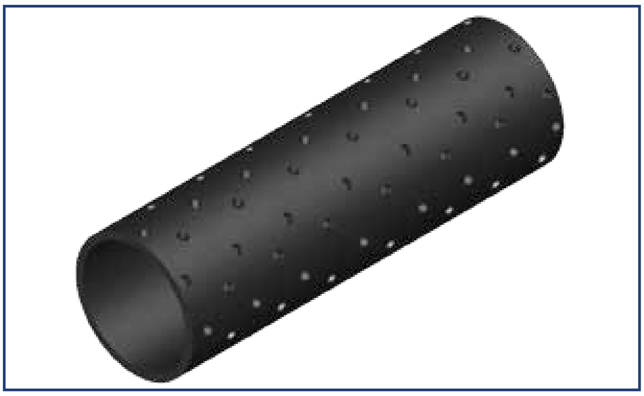
PE DRAINAGE PIPES FOR SOLID WASTE COLLECITON CENTERS

7.2 Modern solid waste collection centers

The water accumulating at the bottom of the waste collection centers will create important troubles during service of these centers. For this reason, this bottom water must be taken away. In calculation of the resistance criteria for these collection areas only the load of the wasted and the other external load are considered. If it can not be taken away, the water accumulating at the bottom of the collection area will create another important load on the surroundings. Even after a certain time this bottom water may cause some collapses. The drainage system means vital role for the service life of these collection centers. The drainage pipes must not be of fragile nature. Because this may cause cracks and collapses in horizontal lines.

Different leak sluts are selected for drainage pipes currently used in the applications. According to the standards DIN 19666 and DIN 19667, the sluts are opened as 240 degree around the pipe. The closed part at the bottom of the pipe is enough for the flow of the water inside the pipe.

Dizayn Group controls the production and strength of the drainage pipes in accordance with ATV – 127 norm.



Picture 7.1 - Pipe with holes.

7.3 Drainage pipes for solid waste collection centers

1. Concepts- Descriptions:
1.1 Drainage; Drainage is the name of operation for taking out the water collecting in the drain layer of the waste collection centers. Drainage pipes have sluts or holes which will allow passage of the water inside the pipe for taking it out of the collection center.

1.2 Drain Layer; is a permeable layer with filter which collects the water leaking from the wastes.

1.3 Protection layer; is a layer for protecting the bottom surface of the waste collection center from leakage and damage.

2. Principles of planning;
2.1 Pipe diameters

2.1.1 Pipe raw material must be High Density PE 100.
The wall thickness of the drainage pipe must be chosen according to the standards ATV A 127 and its sub standard ATV M127. These pipes can be either with sluts or with holes

2.1.2 Water entry plates.
For leaking pipes, for each meter of pipe water inlet plate must be at least 100 cm2. On the leaking pipes of solid waste collection centers, there must not be any water entry holes or sluts.

2.1.3 Water entry sluts (or holes)
For the leaking pipes, the width of the slut must be 5 mm and the length of the slut must be at least 25 mm measured from internal side of the pipe. For the pipe with holes, the diameter of the holes must be at least 12 mm.

2.2 Drain Layer
Drain Layer must have the from that can make filtering. The drain layer material must be at least 300 mm thick and can be sand of 16/32 granule group or any other granule material which suits the requirements of DIB 4226- part 1. The permeability of the drain layer must be minimum. k= 1.0x10-3 m/s.

2.3 Protection layer
The dimensions of the protection layer are determined according to the granule group of the drain layer and the loads on the production layer as well as the construction method and conditions.

2.4 Resistance to thermal conditions;
In the drain systems area, the temperature can rise up to 40 degree for 50 years, if there are different conditions, these conditions must be taken into account at the design works of drainage pipes. PE pipes are suitable for these different temperature conditions and guaranteed for a service life of 50 years under all conditions.

2.5 Resistance to chemical and bio- chemical conditions;
Drainage piping systems must have perfect resistance to severe chemical and biochemical adverse conditions. The resistance of PE pipes to chemical materials is perfect. Table 6 shows the resistance of PE pipes to chemicals.

2.6 The requirements regarding the place and security of the waste collection center and security;
The factors affecting the service life of the long term elastic modules at the surface are time (A1), the effect of environment (A2) and temperature (A3). The service life can be found with the following formula;
Eoeff = Ekurz x A1 x A2 x A3
The positions of water entry holes must be determined according to the static calculations.
The wasted on the drain layer are of light weight and the relative weight of the wastes is, 20 Kn/m3 for the house waste. If there are some other loads on the drain layer, then these loads also must be taken into account in the calculation.

2.7 Flow of water from drainage pipes.
The water leaking from the wastes must not be allowed to form a reservoir at the bottom of the collection center. For being able to say a drainage system to be affective, the following values must be supplied.
Water discharge capacity: 6 L/s
K = 1.0 x 10-3 m/s
Drain layer thickness must be minimum 300 mm
The slope of the surface leaking layer must be at least 3%.
The slope of the surface impermeable layer must be at least 1%.

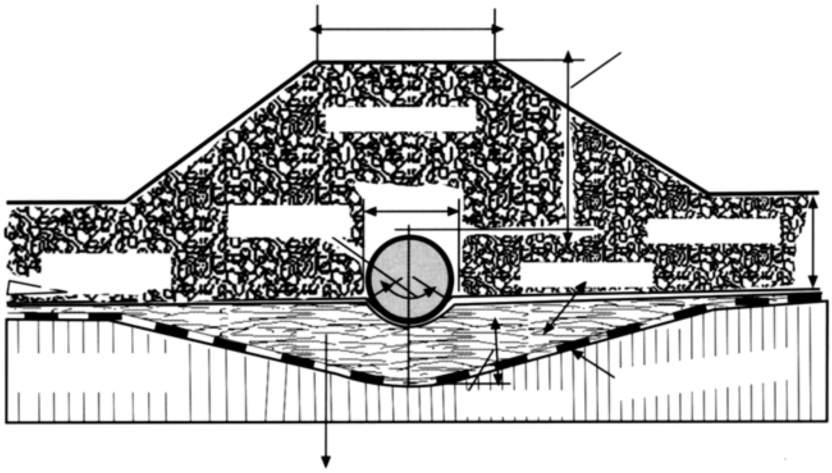


Figure 7.1 - Shematic description ofsolid waste drainage system.

3. Construction

3.1 Pipe line

The pipe line must be designed in a manner to control all drain systems. Drainage and the normal water transfer pipe lines must be at the same level from the surface. Where necessary for check and maintenance, some alterations in the level can be accepted. Pipe lines more than 300 meters flow must be avoided. Flow pipes to the drainage system must not be longer than 150 meters. The flow will be adjusted in a manner that there will be no need for opening cavity or well in the drainage collection area.

3.2 Flow area

As shown in figure 8.1 the drain pipes are located in a flow area. Figure 1 is for a combined impermeable drain system. The impermeability of the system is ensured plastic sheet at the bottom.

3.3 Drain layer

The minimum dimension of the drain layer is shown in figure 1. Mixture of materials must be avoided in construction of the layer and only one type material must be used. As stated before, 300 mm minimum thickness must be ensured at each point of the layer.

3.4 Protection layer;

If wanted, a protective layer can be built between impermeable bottom and drain layer. But this protective layer must not disturb the impermeability of the bottom.
This layer must be flat and be extended up to the upper parts of the waste collection reservoir.

3.5 Internal slides and collapses;

The drainage system must be designed so that in case of non regular earth conditions, these irregularities will not give any damage to the system

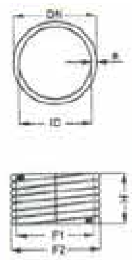
PE 100 R MULTILAYER WATER PIPES

PE 100 RC Multilayer Water Pipe

Pipe Type 1 and 2

Pipe Design	Pipe in black with blue colored stripe, or medium pipe is black with dimensionally integrated blue outer layer
Application	Drinking water for buried installation, laying possible with and ithout sand bedding.
Product Standard	EN 12201-2
Other Standards	EN 805, DIN V ENV 1046 PAS 1075
Material	PE 100 RC
Approvals	DVGW
Certification	ISO 9001, ISO 14001
Dimensions	SDR 7.4/9/11/17
Delivery Form	Straight lenght / coils

D	SDR	PN	Toplam et kalınlığı (mm)	Toplam Ağırlık m/g	Dış katman S	Dış Katman Ağırlık m/g	İç Katman Ağırlık m/g
40	SDR11	16	3,7	430	0,8	100	330
50	SDR11	16	4,6	666	0,8	126	540
63	SDR11	16	5,8	1050	0,8	159	891
75	SDR11	16	6,8	1470	0,8	190	1280
90	SDR11	16	8,2	2120	0,8	228	1892
110	SDR11	16	10	3140	0,8	279	2861
125	SDR11	16	11,4	4080	0,8	318	3762
140	SDR11	16	12,7	5080	0,8	356	4724
160	SDR11	16	14,6	6670	0,8	407	6263
40	SDR17,0	10	2,4	295	0,8	100	195
50	SDR17,0	10	3	453	0,8	126	327
63	SDR17,0	10	3,8	721	0,8	159	562
75	SDR17,0	10	4,5	1020	0,8	190	830
90	SDR17,0	10	5,4	1460	0,8	228	1232
110	SDR17,0	10	6,6	2170	0,8	279	1891
125	SDR17,0	10	7,4	2760	0,8	318	2442
140	SDR17,0	10	8,3	3460	0,8	356	3104
160	SDR17,0	10	9,5	4520	0,8	407	4113

PE 100 RC MULTILAYER PIPE	DN/OD (mm)	SDR 11 C 5 *PN16		SDR 17 C 8 *PN10	
		s (mm)	Weight (kg/m)	s (mm)	Weight (kg/m)
	25	2.3	0.171	1.8	0.137
	35	2.9	0.272	1.9	0.187
	40	3.7	0.430	2.4	0.295
	50	4.6	0.666	3.0	0.453
	63	5.8	1.05	3.8	0.721
	75	6.8	1.47	4.5	1.02
	90	8.2	2.12	5.4	1.46
	110	10.0	3.14	6.6	2.17

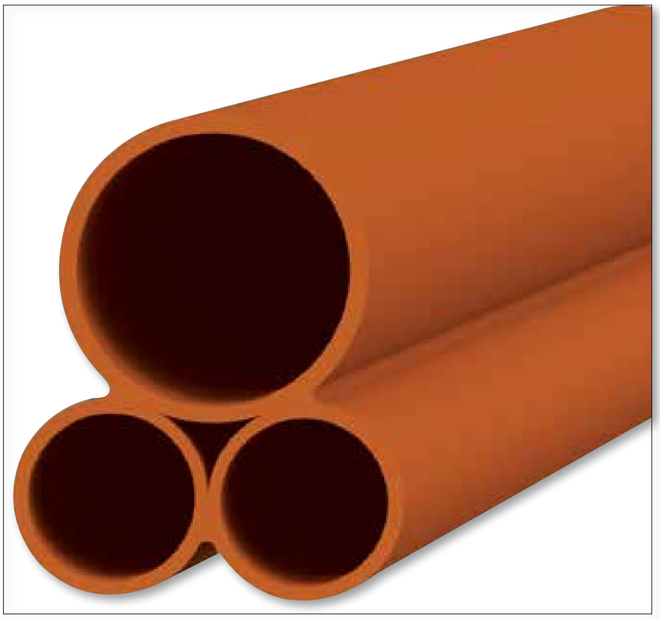
PE 100 RC MULTILAYER PIPE	DN/OD (mm)	SDR 11 C 5 *PN16		SDR 17 C 8 *PN10	
		s (mm)	Weight (kg/m)	s (mm)	Weight (kg/m)
	125	11.4	4.08	7.4	2.76
	140	12.7	5.08	8.3	3.46
	160	14.6	6.67	9.5	4.52
	180	16.4	8.42	10.7	5.71
	200	18.2	10.4	11.9	7.05
	225	20.5	13.1	13.4	8.93
	250	22.7	16.2	14.8	11.0
	280	25.4	20.3	16.6	13.7
	315	28.6	25.6	18.7	17.4
	355	32.2	32.5	21.1	22.1
	400	36.3	41.3	23.7	28.0
	450	40.9	52.3	26.7	35.4
	500	45.4	64.5	29.7	43.8
	560	50.8	80.8	33.2	54.6
	630	57.2	102	37.4	69.4
	710	64.5	130	42.1	89
	800	-	-	47.4	113

7.4 The Pipe Technology That Catches Up With The Communication Age

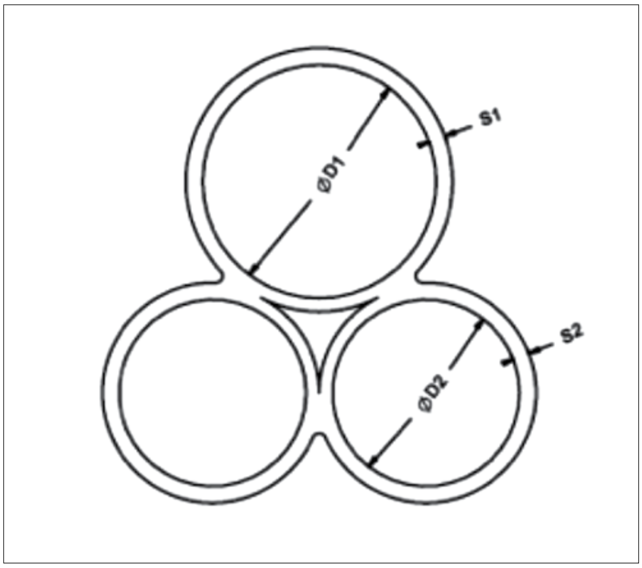
Modern world has gotten smaller with the advancement of the telecommunications sector. With enhanced communication systems, any voice, video, energy or signal can now reach from one end of the world to other in just a few seconds. Almost everyone can gain access through the Internet and telephones.

This technology has become a necessity today instead of a sign of luxury and there is high demand for it to further accelerate.

HDPE Cable Protection Pipes are used in the rapidly developing communications and data transmission piping systems. Depending on demand and specifications, they are offered in different options ranging from the single to triple. It provides a system in whole with multiple sub-duct pipes and supplementary parts.



7.4.1 Triple Pe 100 Multiplexer Pipe



Size	1st Hole		2nd and 3rd Hole	
	D1	S1	D2	S2
32*40*32	35	2,5	27	2,5
32*50*32	44	3	27	2,5
Color *Dimensions are in mm.	ORANGE - BLACK - BLUE			

Data and energy transmission must be provided without interruption in telecommunications systems. And here emerges the importance of pipes used for protection of telecommunications cables laid underground.

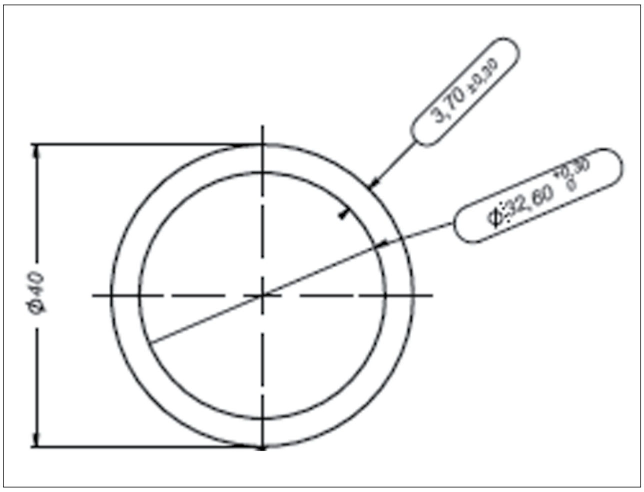
When a protection pipe that is supposed to bear the earth load cannot fulfill its duty and becomes deformed, it will cause pressure on the cable passing through it and lead to closing up of the empty holes.

7.4.2 Quality of Communication is under Dizayn assurance....

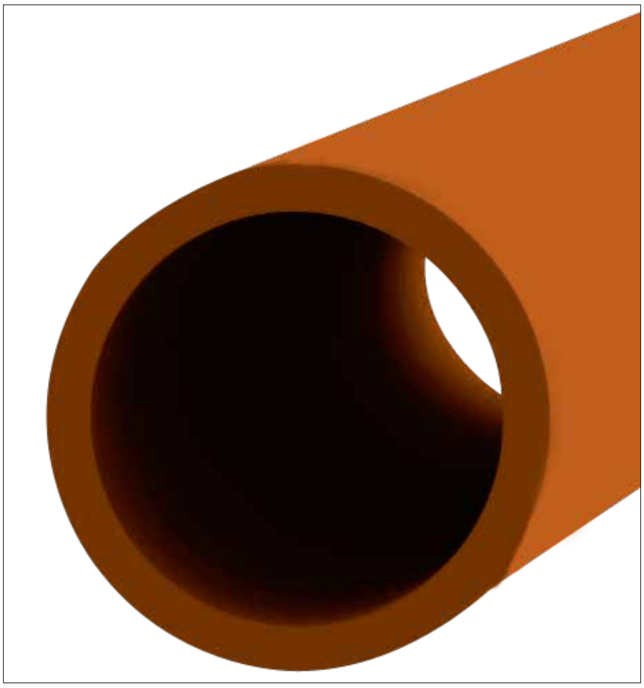
Made of high-density polyethylene, double-walled cable protection pipes protect the cables from any damage that may occur while filling up an open channel, from mechanical stress due to traffic, underground freezing, etc.; and they especially protect light guide cables from damage caused by water and icing as well as accidents that may occur in future excavations. In the event of increasing capacity required due to growing needs, the deformed protection pipes will hamper the process when current cables are to be replaced. For that reason, it is crucial to use Cable Protection Pipes and take notice of their quality. Cable protection pipes are a product group that requires meticulous care from raw material control to production, from the test stage to delivery.

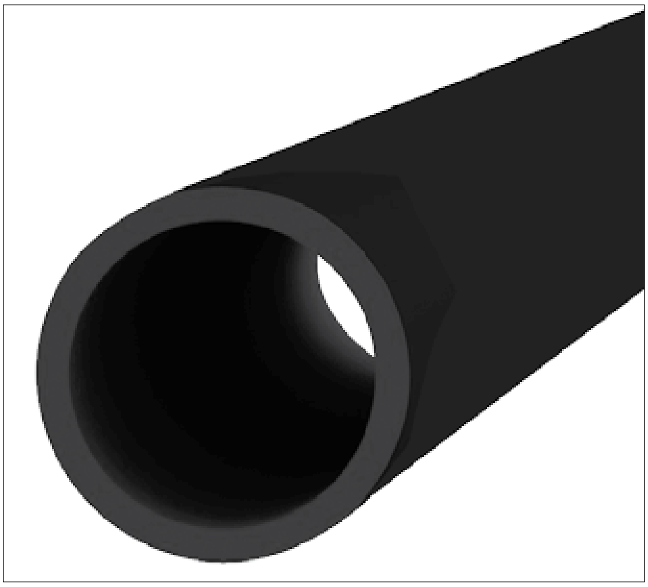
TELEKOM (MULTIPLEXER) PIPES

7.4.3 Single Telecommunications Pipe

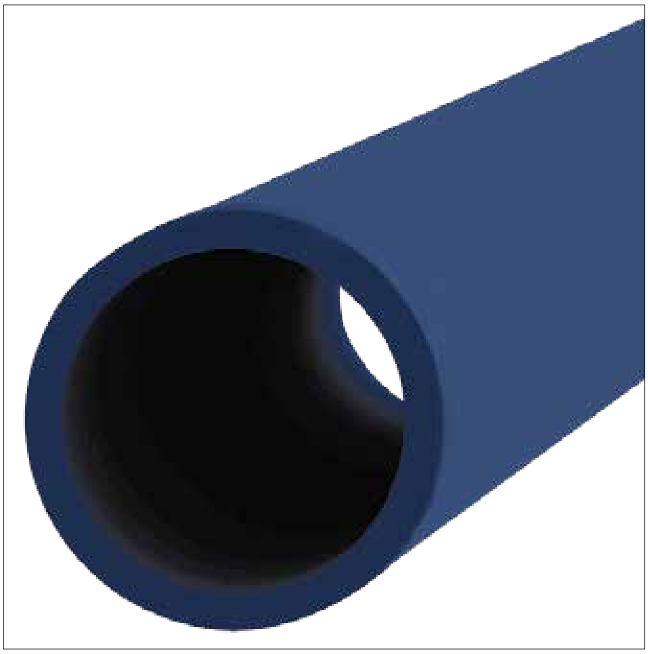


Technical Specifications	
Material	**HDPE 100**
Color	Black
Density (Raw Material)	min. 0,940 gr/cm^3
Melting Flow Rate (2,16kg yükte)	← 0,15 g/10 dak.
Tensile Strength	min. 25 MN/m^2
Flexural Modulus	min. 1.200 MN/m^2
Elongation at Break	→ 500%
E.S.C.R %10 Igepal C - 630	→ 48 h (2/10 error)





Size (mm)	Single Telecommunications Pipe	
	D1 (mm)	**S1 (mm)**
40	32,6	3,7
50	44	3
Color	ORANGE - BLACK - BLUE	



7.4.4 Our Advantages:

- It provides convenience with transport, practical application, stocking, and maintenance.
- Durable against heavy traffic and earth loads with its special design on the exterior surface.
- Does not get affected from seismic moves thanks to its flexible structure.
- Shows high strength against chemicals thanks to its polyethylene raw material.
- Provides high flow rate with smooth inner surface and low coefficient of friction.

- Shows high resistance against frictional wear.
- Totally hygienic and does not contain any toxins.
- Shows resistance up to 80°C.
- Does not get affected from chemicals in waste water, shows high resistance again corrosion.
- Performs like its first day for a minimum of 50 years.
- Thanks to its polyethylene molecular structure, it absorbs shocks by going through elastic deformation against sudden loads, and then converts back to its original form.

7.4.5 Some Of Our References

Company	Amount Used	Project Content	Year
TEKNOTEL ENERJİ TELEKOM	200.000m	**KOCAELİ MOBESE PROJECT KOCAELİ TURKEY** **MATERIAL:** 2x50x32 MULTIPLEXER PIPE **PROJECT OWNER:** KOCAELI METROPOLITAN MUNICIPALITY **IMPLEMENTING FIRM:** TEKNOTEL ENERJİ TELEKOM	2013
SUPERONLİNE İLETİŞİM HİZMETLERİ A.Ş	926.000m	**FIBER OPTIC NETWORK – THROUGHOUT TURKEY** **MATERIAL:** 32x50x32 MULTIPLEXER PIPE **PROJECT OWNER:** SUPERONLİNE **IMPLEMENTING FIRM:** LOCAL SUBCONTRACTORS	2012
GÜVENAY TELEKOMÜNİKASYON MİMARLIK M	462.000m	**VODAFONE CABLE PROJECT ANKARA TURKEY** **MATERIAL:** 40mm DATA PIPE **PROJECT OWNER:** VODOFONE **IMPLEMENTING FIRM:** GÜVENAY TELEKOMİKASYON	2012
BİNATLI TURİZM İNŞ SAN.VE TİC.LTD. ŞTİ.	71.000m	**BAŞAKŞEHİR CABLE PROJECT ISTANBUL TURKEY** **MATERIAL:** **32x50x32 DATA PIPEPROJECT OWNER:** BAŞAKŞEHİR MUNICIPALITY **IMPLEMENTING FIRM:** BİNATLI İNŞAAT	2012

8 Welding Methods

8.1 Connection Techniques

Dizayn PE 100 pipes are designed in a suitable manner that allows application of alternative connection techniques.

- Connection by using Butt-Welding method,
- Electrofusion welding
- Connection with flanges,
- Push-Fit socket method

8.1.1 Effects Of Ambiance Conditions At Time Of Welding

Excess wind at welding place plays a negative role on the quality of the welding because it causes the cooling of the heating plate and bad heat distribution throughout welding surface. For protection from the bad effect of the wind, sun light and the dust on the welding quality, ıt is recommended to cover the welding place with a suitable material. For a perfect welding quality, ıt is essential to clean the welding surface of the pipe and the heating plate of the welding machine from dust, oil or other dirty materials. For protection from the turbulence, the open ends of the pipes must be closed with a suitable material. Dirty welding surface of the pipes ends will decrease the welding quality dramatically.

8.1.2 Butt Welding Operation

Butt welding method is recommended to be applied pipes with diameter and wall thickness mare than 63 mm and 3 mm respectively. Usage of butt welding is shown in figure 2.5.1 ıf the electric power is to be supplied by a generator, the power output of the generator must be minimum 4 kW. The generator must have voltage regulator. In case of excess wind or rain, some precautions must be taken for protection of the welding place. The suitable diameters and the wall thickness at which the butt welding method will give the best result are outlined in table 2.5.1 The diameters not mentioned in this table are recommended to apply electrofusion welding

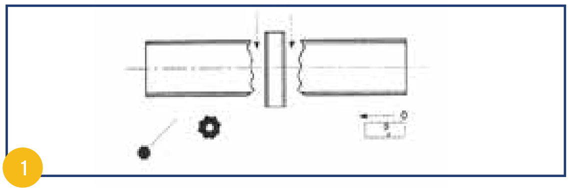
1. The pipes are inserted to the welding machine properly.
2. The tips of the pipes are trimmed with the trimmer at the same time.
3. After trimming the tips of the two pipes, the tips of the pipes are checked for that the two pipes will have 100% Contact at heating process.
4. In between the two pipes, teflon coated plate heated 200-230 C is inserted.
5. Two pipes are pushed towards each other being the Teflon heating plate in between having 200-230 C temperature with a pressure of 0.1 8-0.22 Mpa until a lip height required in the welding parameters mentioned in table 2.5.1 is achieved
6. When the required lip height is attained, the pressure on the pipes is removed and free heating is continued without pressure with a period mentioned in table 2.5.1
7. After the free heating time, the Teflon coated plate is removed and the pipes are pushed towards each other with a pressure of 0.18-0.22 Mpa.
8. The pipes are allowed to cool down under pressure for a period required in table 2.5.1 at the end of this period, the pipes are freed from pressure.

Picture 9.1 - Application of butt-welding at site

POTABLE WATER, NATURAL GAS, SEWAGE WATER, POWER PLANT AND SEA DISCHARGE APPLICATIONS

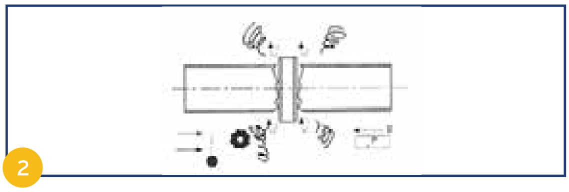
Nominal Diameter	Wall thickness	Pressure rating	Height of lip formed under pressure	Free heating period	Time for removing heating plate	Time for attaining the necessary welding temp	Cooling period under pressure	Total welding period
mm	mm	bar	mm	sec.	sec.	sec.	minute	hour
75	4.5	10	1.00	45	5	5	6	0.12
	6.8	6	1.00	68	6	6	10	0.18
90	3.3	6	0.50	33	5	5	6	0.11
	5.4	10	1.00	54	5	5	7	0.14
	8.2	16	1.50	82	6	6	11	0.21
110	4.0	6	0.50	40	5	5	6	0.11
	6.6	10	1.00	66	6	6	9	0.18
	10.0	16	1.50	100	6	6	13	0.25
125	4.5	6	1.00	45	5	5	6	0.12
	7.4	10	1.50	74	6	6	10	0.20
	11.4	216	1.50	114	6	6	14	0.28
140	5.1	6	1.00	51	5	5	7	0.13
	8.3	10	1.50	83	6	6	11	0.21
	12.7	16	2.00	127	8	8	17	0.32
160	5.8	6	1.00	58	6	6	8	0.15
	9.5	10	1.50	95	6	6	13	0.24
	14.6	16	2.00	146	8	8	19	0.36
180	6.5	6	1.00	65	6	6	9	0.17
	10.7	10	1.50	107	6	6	14	0.26
	16.54	16	2.00	164	8	8	20	0.39
200	7.2	6	1.50	72	6	6	10	0.19
	11.9	10	1.50	119	6	6	15	0.28
	18.2	16	2.00	182	8	8	22	0.43
225	8.2	6	1.50	82	6	6	11	0.21
	13.4	10	2.00	134	8	8	17	0.33
	20.5	16	2.50	205	10	10	26	0.49
250	90.1	6	1.50	91	6	6	12	0.23
	14.8	10	2.00	148	8	8	19	0.36
	22.7	216	2.50	227	10	10	28	0.53
280	10.1	6	1.50	101	6	6	13	0.25
	16.6	10	2.00	166	8	8	21	0.39
	25.4	16	2.50	254	10	10	30	0.58
315	11.4	6	1.50	114	6	6	14	0.28
	18.7	10	2.00	187	8	8	23	0.43
	28.6	16	3.00	286	12	12	35	0.66
355	12.9	6	2.00	129	8	8	17	0.32
	21.1	10	2.50	211	10	10	26	0.50
	32.2	16	3.00	322	12	12	38	0.73
400	14.5	6	2.00	145	8	8	19	0.35
	23.7	10	2.50	237	10	10	29	0.55
	36.3	16	3.00	363	12	12	42	0.81
450	16.3	6	2.00	163	8	8	20	0.39
	26.7	10	3.00	267	12	12	33	0.63
	40.9	16	3.50	409	16	16	45	0.87
500	18.1	6	2.00	181	8	8	22	0.42
	29.7	10	3.00	297	12	12	36	0.68
	45.4	216	3.50	454	16	16	46	0.89
560	20.3	6	2.50	203	10	10	25	0.48
	33.2	10	3.00	332	12	12	39	0.75
	50.8	16	4.00	508	20	20	61	1.17

Table 9.1 - Butt Welding parameters for Dizayn PE 100 pipes.



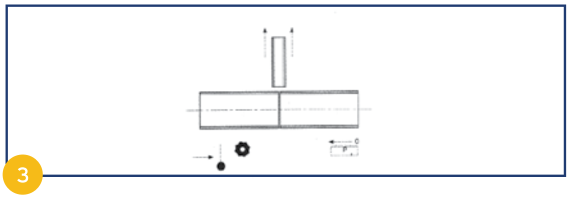
1

Trimmer is placed between the pipes to be welded.



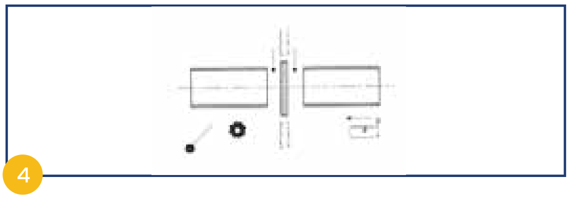
2

The ends of the pipes are trimmed so that the tips of the pipes will be 90° to the horizontal axis. This trimming also will remove the oxidized layer on the tips of the pipe



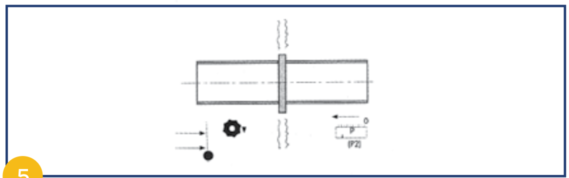
3

Trimmer is removed and the pipes are checked for 100% contact to each other.



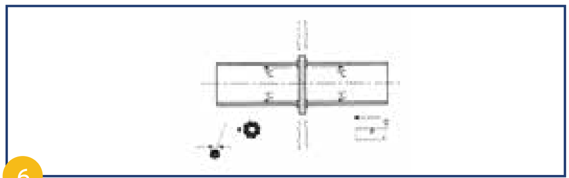
4

Teflon heating plate with 200 - 230 °C temperature is placed between the two pipe ends to be welded



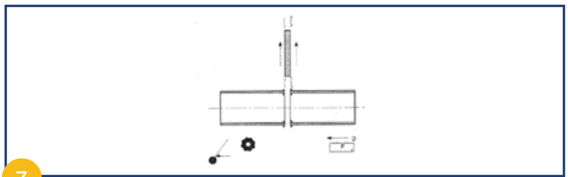
5

The pipes are pushed towards each other with constant pressure until a suitable lip height is attained.



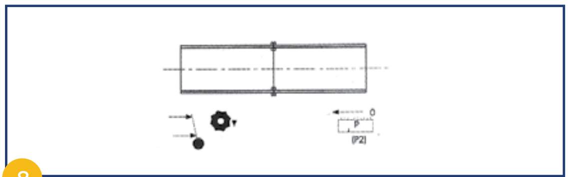
6

After having the suitable lip height, the pressure is removed and the pipes are let to be heated free from pushing to each other. 100 % contact of pipe ends to the heating plate must be ensured.



7

After elapse of free heating Period mentioned in the heating plate is removed.



8

The pipes are pushed towards each other with a constant pressure and left for free cooling time mentioned.

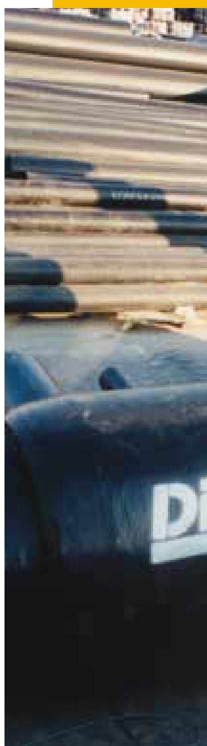
Figure 8.1 - Steps of butt-welding operation

POTABLE WATER, NATURAL GAS, SEWAGE WATER, POWER PLANT AND SEA DISCHARGE APPLICATIONS

Picture 8.1.1 - A scene from our special production; PE 100 manifold

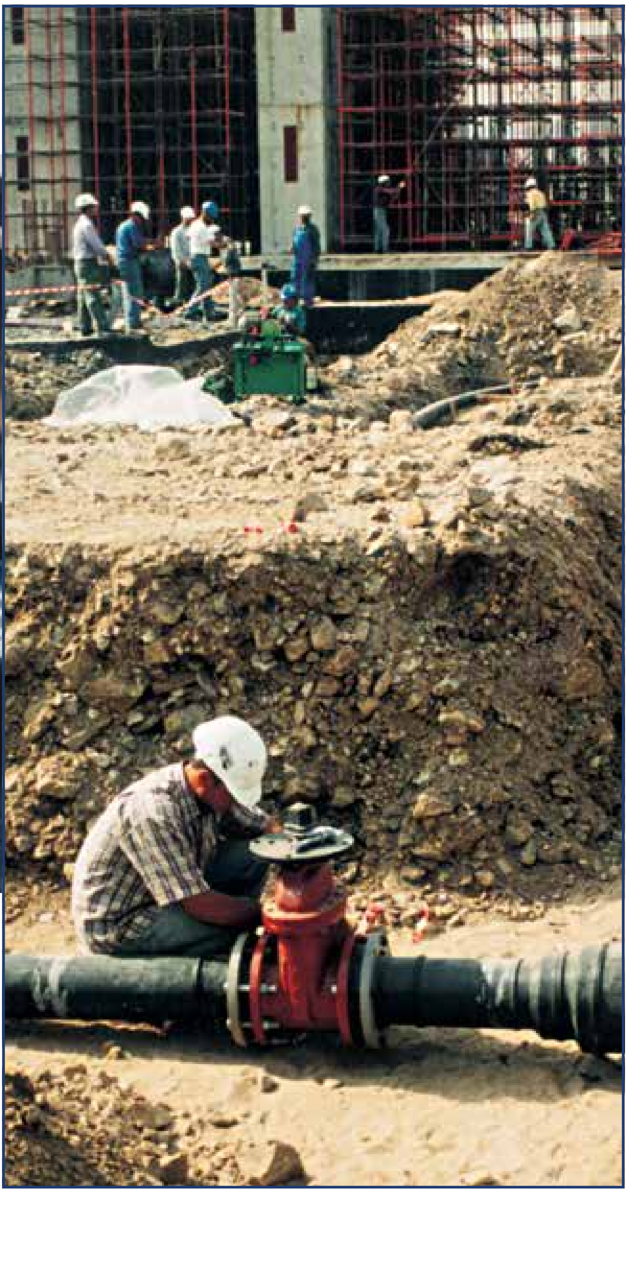
Size (mm)	No. of welding >SDR26	No. of welding >SDR22
1600	2 -3	-
1400	2 -3	-
1200	3-4	3 -4
1000	3-4	3 -4
900	4-5	4-5
800	4-5	4-5
710	5-6	5-6
630	6-8	6-8
560	7-9	7-9
500	1 - 10	7- 10
450	7- 10	8- 11
400	10- 13	10- 13
355	10- 13	10- 13
280	14- 17	14- 17
250	16-20	16-20
225	18-22	17-22
200	20- 25	18-25
180	22 -27	18 -27
160	22-27	20-27
140	22 - 28	20- 28
125	25 -30	22 - 30
110	25-30	25-30
90	25-30	25-30
75	26-30	25-30

Table 8.1 - Butt-welding capacity ***Number of welding done in 8 work hours.**



Picture 8.1.2 - A scene from our special production; PE 100 manifold

POTABLE WATER, NATURAL GAS, SEWAGE WATER, POWER PLANT AND SEA DISCHARGE APPLICATIONS



Picture 8.1.3 - A scene from İzmir Natural Gas Plant Project.

Picture 8.1.4 - A scene from water main lines application.

POTABLE WATER, NATURAL GAS, SEWAGE WATER, POWER PLANT AND SEA DISCHARGE APPLICATIONS

Picture 8.1.5 - Hartoum Potable Water Network Project

Picture 8.1.5 - Khartoum State Water Corporation

Picture 8.1.6 - Bechtel Enka MTO

Picture 8.1.6 - Bechtel Enka MTO

8.1.3 Electrofusion Welding Method

Electrofusion welding is economical to apply for small diameter pipes of 20-11 0 mm diameter. Schematic application of electrofusion welding is shown in figure 1.5.2

a) The fitting that are designed for electrofusion welding as two types;

1. Fittings having circuit wires.
2. Fittings that can be welded by means of electrofusion welding socket. For each connection points of these fittings, one electrofusion welding socket must be used.

The steps of making Electrofusion Welding;

a) The tips of the pipes are cut by using fine cutter properly.

b) The tips of the pipers are marked for specifying the point until which the pipe will enter the electrofusion socket. The pipes upper surface is peeled until the end of marking and this welding region is cleaned using alcohol. Also the electrofusion socket's internal surface is cleaned with alcohol.

c) The ends of the pipes are inserted in the electrofusion welding socket. The ovalshape of the pipe can be tolerated to some extent. If the pipe ends are very much oval, then this ovality must be removed by using some equipment.

d) Electrofusion welding socket must have barcode label. The electrofusion welding machines are produced in two types;

1. Automatic machines that can read barcode label automatically.
2. Manuel type machines where the welding time is adjusted manually.

e) The voltage input must be in between 220-240 Volts and not less than 220 Volts. If the electricity will be supplied by a generator, then the output of the generator must be at least 3.5 Kw.

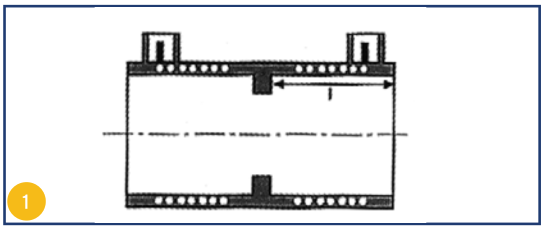
f) The welded pipes must not be moved until complete cooling and they must be protected from contact with water

DN mm	Tolerance mm	DN mm	Tolerance mm	DN mm	Tolerance mm	DN mm	Tolerance mm
20	1,2	63	1,5	140	2,8	250	5,0
25	1,2	75	1,6	160	3,2	280	9,8
32	1,3	90	1,8	180	3,6	315	11,1
40	1,4	110	2,2	200	4,0	355	12,5
50	1,4	125	2,5	225	4,5	400	14,0

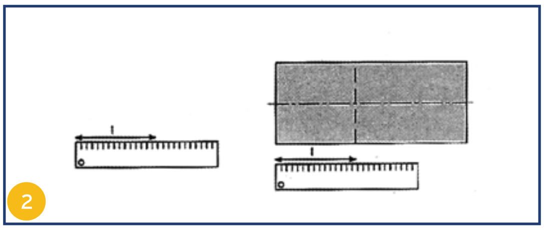
Table 8.1 - The ovality tolerances for different of PE 100 and PE 80 pipes

8.1.3.1 Operation Of Electrofusion Welding Machine

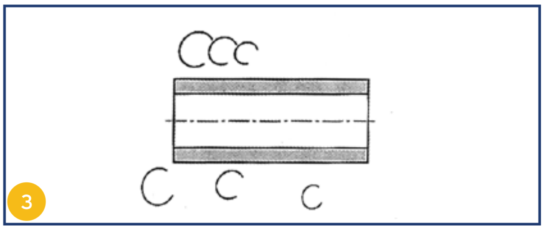
1. The "on / off" button is pressed to "on".
2. Start button is pressed.
3. The barcode label is instructed to the machine. When the machine reads the barcode label, a confirmation signal is given by the machine.
4. Again the start button is pressed two times successfully.
5. The welding period is shown on the screen of the machine and this time goes behind until it becomes zero.
6. It is important to notice that the electrofusion welding is deemed to be complete only when the welding region is cool.
7. Important Notice: It has been noticed in many site conditions that in case of low voltage electric power supply to the machine, there may be some problems in welding duration counting or the time count can be locked.
8. If this happens, the extra loads on the power supply unit must be removed or the machine must be powered using a generator which can supply a continuous 220 volts circuit.



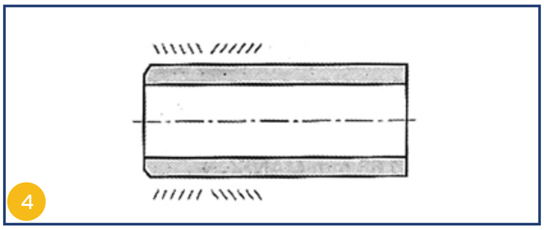
Using a ruler, the insertion depth of the pipe into the socket is determined.



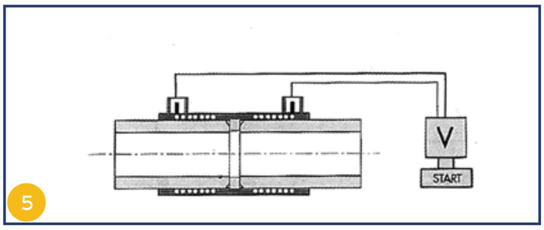
The insertion depth determined is marked on the pipe.



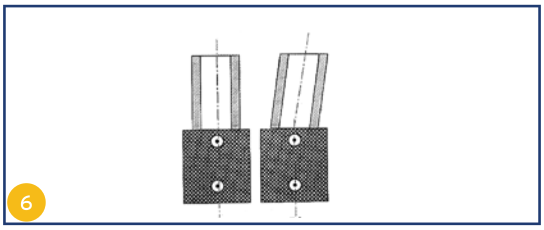
The oxidized outer layer of the pipe is cleaned using a scraper.



The remaining after cleaning of the outer layer is cleaned and the outer corners of the pipe end is broken.



The pipes to be connected are inserted into the electrofusion socket until the marking on the pipe. The pipe must be inserted completely. Then, the circuit wire is connected to the socket and hence the electrofusion welding is started.



Correct insertion of the pipe end into the socket.

Figure 8.1 - Operation of the electrofusion welding.

Important aspects of keeping stock for Electrofusion fittings;

1) Avoid any damage giving activity on the fitting during transport or sale.
2) Keep electrofusion fittings away from excess heat, direct sun light and UV rays.
3) Keep electrofusion fittings away from contacting with water and oil.

8.1.4 Connection with Push – Fit Sockets

Dizayn PE 100 pipes can also be produced as suitable for connection with o-ring. The first oring ensures the leak proof and second o-rin plays the role of lock which avoids the outgoing of the pipe easily from the fitting. For the success of this connection method, the most important point is proper cutting of the pipe ends. The external corners of the pipe ends must be rounded. A sliding agent can be used for easy insertion of the pipe into the fitting or when necessary a pulling equipment must be used for this purpose. The operation sequence for insertion of pipes into a push-fit socket is shown in figure 1.5.3

8.1.5 Connection by Using Flanges

In this method, steel flange is inserted on the flange adaptor is welded to the pie end by butt welding. The parameters in table 2.5.2 are valid also for the welding of the adaptor to the pipe.

8.1.6 How to Make Branch Connection

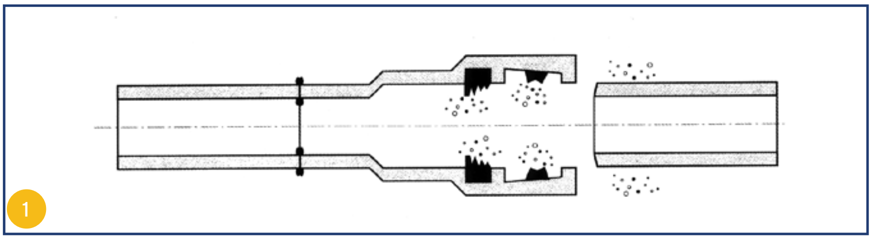
Saddles are used to make distribution from Dizayn PE 100 pipes. Materials necessary for making branch connection are the followings;

1. Saddle unit
2. Enough length of pipe for making connection,
3. Electorfusion welding socket,
4. PE Male or female nipple which will be used in connecting the pie to the counter unit,
5. Electrofusion welding machine,
6. Electric energy power supply (generator or electricity network),
7. Alcohol for cleaning the welding area on the pipe,
8. Peeling tool for cleaning the oxidized surface on the pipe,

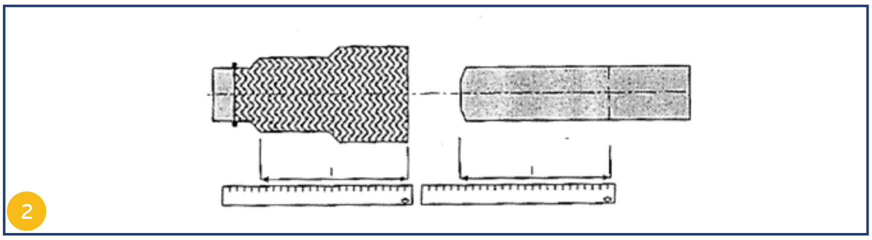
Steps of operation for making to PE 100 pipes are shown in figure 1.5.4

1. Electrofusion welding procedures and parameters mentioned before are valid here too,
2. The distribution line from the main PE 100 pipe line is installed.
3. The area on the pipe where the saddle and the ill the welded must be freed from oxidized layer by using peeling tool,
4. Internal surface of the saddle and the outer surface of the pipe where the saddle will be inserted is cleaned by using alcohol,
5. Valve is inserted on the saddle,
6. Saddle with valve is inserted on the pipe,
7. Current wire is connected to the saddle,
8. Electrofusion welding operation is done exactly as previously stated.
9. For connection of branch pipe to the valve, electrofusion welding socket is used,
10. The area to which socket will be welded is cleaned,
11. Electrofusion welding is done as previously stated,
12. The pipe is welded to the counter by using electrofusion welding male or female nipples. This connection is designed for electrofusion welding. The same of electrofusion welding is applied.
13. The hole was not opened on the main pipe. The hole is opened by the cutter on the valve. Hole opening is done by closing the valve. When closing the valve, the cutter on the valve will open the hole,
14. The line is ready for operation.

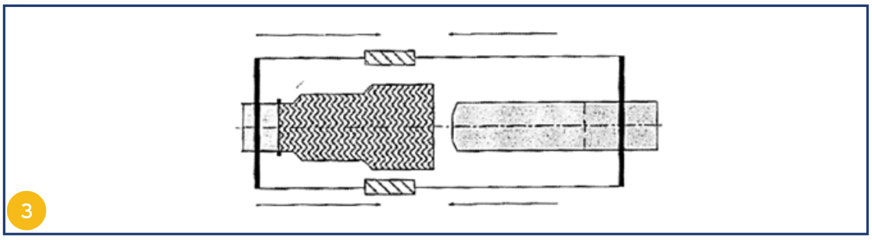
For the purpose of easy insertion of the pipe into the muffle and for not giving any damage to the o-rings inside the muffle, it is recommended to treat the o-rings with a sliding agent (like soap). This sliding agent is also applied to the extrenal surface of the pipe which will enter the muffle.



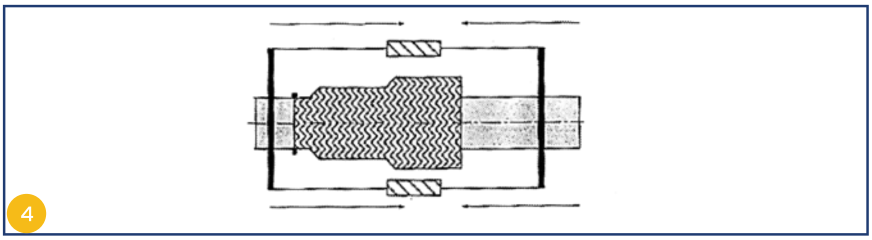
The depth of the insertion of the pipe inside the muffle is measured and this distance is marked on the pipe.



The pipe end and the muffle is brought end to end at the same horizontal axis. Using a pipe pulling Equipment, the pipe is inserted on the muffle.



Using the pipe pulling equipment, the pipe is inserted into the muffle completely until the marking. It is critical that the pipe and the muffle must be on the same horizontal axis. If not, the o-ring can be damaged.



If the pipe is completely inserted on the muffle until the marking, the connection is complete.

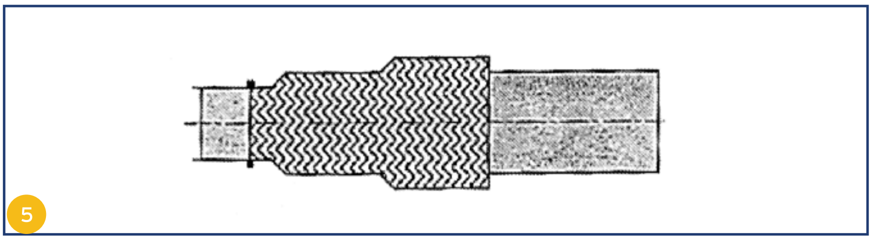


Figure 8.1.2 - Connection with push-fit muffle

Figure 8.1.3 - Installation plan for branch ditribution

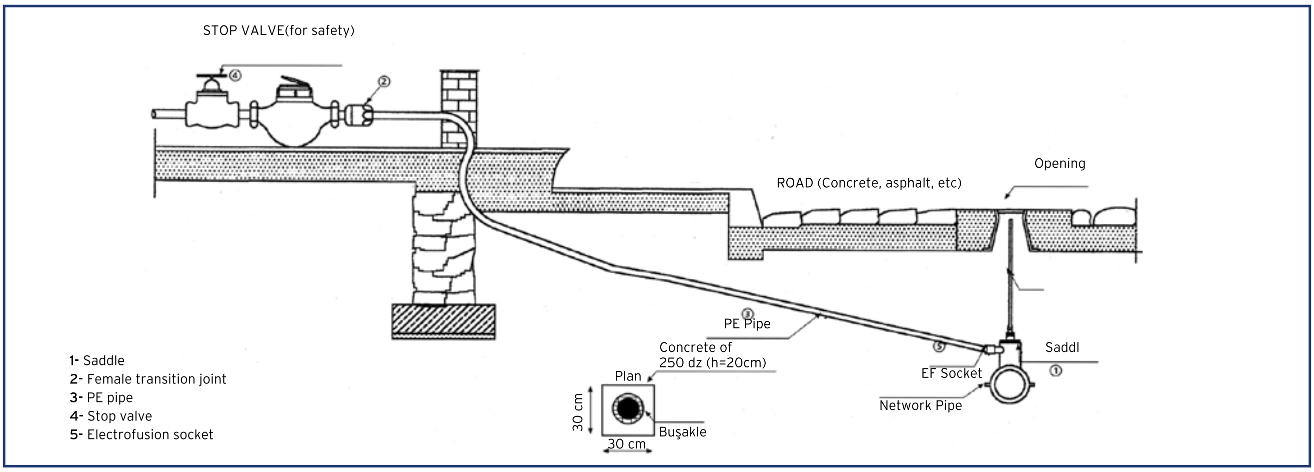
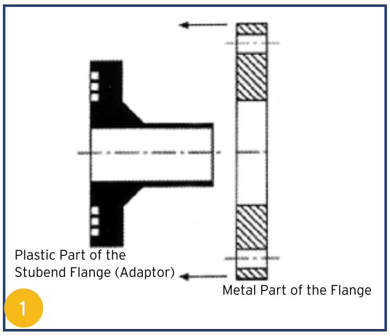
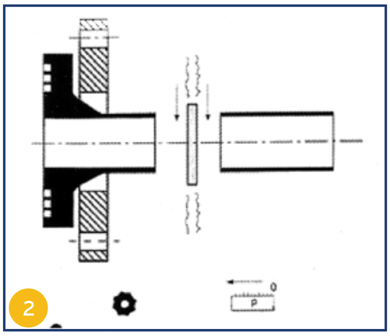


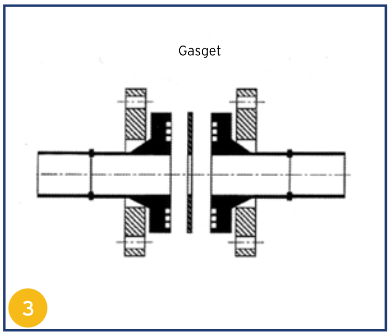
Figure 8.1.4 - Connection of Dizayn PE 100 Pipes with Flange



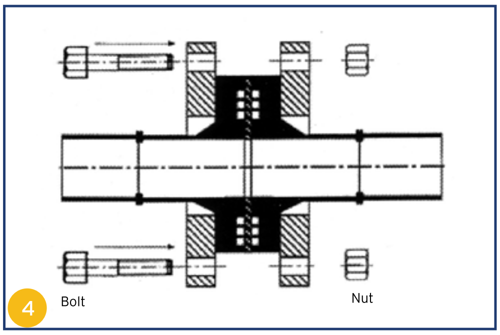
Metal part of the flange is inserted on to plastic part, (adaptor)



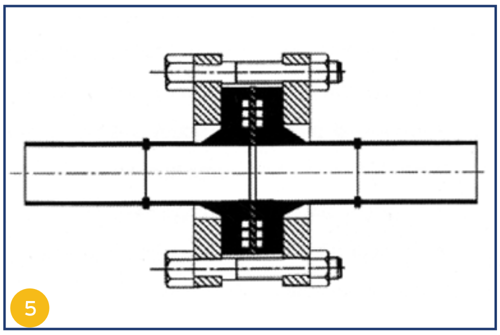
The end of the flange adaptor is welded to the pipe which is to be connected.



Another flange which is connected to a pipe, fitting or hydrant is brought opposite to the other flange to be connected and a plastic gasket is placed between the two flanges for ensuring leak proof.



For ensuring a tight connection between the two flanges, the bolts are placet to the holes on the metal parts of both of the flanges and tightened with nuts. For ensuring perfect leak proof the plastic gasket is inserted carefully between the two flanges.



The bolts are tightened further for perfect leak proof. Now, the system is ready for operation.

In this figure, in the wrong application the branch side of the saddle is at the same direction with the electrode end. In this case the length of the branch to where socket can be inserted will be shorter than the normal.

8.1.7 Repair of a damaged PE pipe

The pipe can be damaged in any case. The repair of the pipe can be done using several methods. It is necessary to choose the best of these repair methods which suits to the type and place of the damaged part on the pipe.

8.1.7.1 Making Repair Using Flange

The damaged area of the pipe is unearthed to an extend where the pipe can be moved towards each side.

The equipments necessary to make a flange connection to PE pipe end are the flowing;

- Butt welding machine
- 2 pieces flange,
- Gasket for flange,
- Screw, and bolts for flange,
- Electric power supply

Operation sequence for repair works using flange,

- The flanges of different companies may have different dimensions.
- This must be taken into consideration
- The tip of the pipe where the butt welding will be done must be trimmed well before welding.
- Following the instruction for a good butt welding quality, the stub ends are welded to the ends of the two pipes which will be connected.
- Gasket is inserted between two steel backing parts of the flange,
- Screws and bolts are inserted and fastened,
- The water should not be influenced into pipe until welding process is completed.
- The flange connection is now ready to operate.

8.1.7.2 Making Repair Using Electrofusion Welding Socket

Tis method of repair gives good results at places where there isn't a good working condition. The area of damage on the pipe is unearthed sufficiently to allow a little bending of the pipe.
The equipments, necessary for making repair with electrofusion welding socket are as follows;

- Electrofusion welding machine,
- One (if the damage is small)or two electrofusion sockets (if the damage is big),
- Electric power supply,
- Alcohol for cleaning the welding area on the pipe,
- Peeling tool for scraping the oxidized surface layer on the welding area of the pipe,
- A short piece of pipe if necessary.

The operation sequence for making repair using electrofusion welding socket;

1. If the damage is small, the pipe is cut from the point of damage but if the damage is big then the damaged area is cut and removed and a piece of pipe is welded at the same length.
2. For using the electrofusion welding socket as a sliding socket, it is necessary to break the stop jaws inside the socket.
3. Normal electrofusion welding is done following the instructions for a good quality electrofusion welding mentioned before.
4. The electrofusion welding socket is inserted properly so that the damage area will be at the middle of the socket.
5. Electrofusion welding is done properly and the repair work is completed.

8.1.7.3 Making Repair On The Pipe Line Using Sliding Socket

The equipment necessary for making repair work with sliding socket are the following;

- PE Sliding socket complete with o-ring,
- For easy insertion of the socket, a sliding agent like soap or silicon,
- If the damage is big, a piece of pipe (in this case 2 pieces or sliding socket is necessary),
- Pooling tool if necessary,
- The operation sequence of repair work using sliding socket;
- The damaged part of the pipe line is unearthed sufficiently,
- Pipe end is treated with sliding agent,
- One of the pipe ends is inserted into the socket as both of the two o-rings becomes on the pipe,
- The two pipes are brought to the same horizontal axis,
- The socket is pushed to the other pipe as half of the socket will be on the other pipe,
- Now The repair work is complete. The system is ready for operation.

8.2 The Specifications

8.2.1 Specifications of DİZAYN PE 100 Pipes

Technical specifications:

1. Specifications of Dizayn P 100 pipes must be conform to the TS418/1-prEN 12201 and must have to the design strength of minimum 8 N / mm.
2. All tests for acceptance of pipes and fittings will implement according to the standards of TS and ISO
3. Pipes will be in international dark blue color of drinking waters or black colored. Ready to extrusion granules must be included UV additives for increasing the strength against to sun light.
4. During the production process of pipes and fittings, any other chemicals will not mix to the granule raw material and raw material will utilize with its orginal from.
5. HDPE Raw Material must be conform to the following conditions:

    - Gravity must not be less than 950 kg / m_ according to the TS1310 test method.
    - Solution flowing velocity according to the test method of ISO 1133 must be between 0.40 – 0.70 g / 10 minutes at 190 C under the load of 5 kilograms.
    - Breaking point elongation must not be less than 600% according to the test method of ISO 6259.
    - Flow point strength must be 25→2 N / mm according to the ISO 6259 test method
    - According to the test method of ASTM 696; elongation coefficient must be 0.2 mm/m C at the heat values between 20-90 C.

6. Producer obliged to deliver the all raw material specifications if requested by awarding office.
7. The lot number of the raw material must be written on the pipes.
8. Service life of the pipes and fitting must be at least 50 years in use of water at 20 C and nominal inner pressure.
9. Pipes and fittings must have the unrestricted strength for -40 C according to its own standards.
10. Pipes and fittings must have high level of strength against to chemicals. Their strength reports against to the chemicals which includes raw materials specifications, must be granted to the awarding office
11. Hygiene: color, turbidity, smell, smell ondulation value at 20 C, flavor, flavor ndulation value at 20 C, foaming tendency tests must be executed (at last ne week) and the test results must be Certificated by Hifzisihha Institute. Test eports also must be granted by the producer to the request owners during the cceptance procedure of the products
12. If awarding office feels necessity for testing the pipes and fittings, can do this job to the account of the producer. In a situation like this, producer accepts to pay all testing costs in advance.
13. Producer must undertake that the all fittings of the produced pipes are available in their own stocks for every diameters.
14. Producing standard, nominal diameter of the pipe, wall thickness, norm numbers and the name of the producer must be labeled on the pipes.
15. Length of the pipes will be 11.80 meters. Pipes must be appropriate for butt welding. The pipes up to 125 mm diameter (including 125 mm), must be available to hand over as coils if requested.
16. The acceptance of the PP 100 pipes and the fittings will realize by representatives of both of the producer and the office which the owner of the request. Request owner office authorized to check to the producing process in every stages and to have raw material check to the expert organizations.
17. Dizayn PP 100 pipe producers must have to the ISO 9000 quality certification and documents.
18. Producers obliged to grant the all certificates about the raw material origins and specifications in their proposals.

CORRUGATED PIPES AND FITTINGS FOR SEWAGE DISCHARGE

8.3 Connection by muffle with rubber ring

At the production phase, the pipes which are suitable for this method of connection are processed to have muffle and also channel. The internal side of the tips of the pipe is treated with silicon, soap, etc. For easy insertion. This method of connection is applicable to the pipes having diameter between 600-1600 mm.

8.3.1 Connection by extrusion welding muffle

Steps of electrofusion welding operation For making electrofusion welding;

- At least 7 KW power generator is necessary
- The internal surface of the muffle at which electrofusion welding will be done, is cleaned using a scraper.
- The outer surface of the pipe where the electrofusion welding will be done is cleaned using a scraper then the pipe is inserted in the muffle.
- The manual extruder is connected to the power supply and heated. Thermostat of the extruder is adjusted to a temperature between 200-230 degrees Celsius. Now, the apparatus is ready for making welding.
- By using a hot air blower apparatus. The welding area is heated and melted to the temperature siitable for making welding.
- Enough amounts of melted PE raw materials is poured from the manual extruder
- onto the welding area and adequate press applied the extruder. The raw material which witch goes out of the Teflon press part of the extruder is cleaned by using a scraper.
- If the depth of welding zone could not be filled in one shot, then after making a preliminary welding inside the pipe, the area which is not welded yet is cleaned again and another shot welding is done using the hand extruder. Normally, a depth of 20 mm can be filled but this depends on the capacity of the hand extruder. There are two ways of making extrusion welding.

1) The application of 4 mm wire PE onto the welding area as melted like welding electrode by using hot air. It is better to call this method as point welding.

2) Making the welding by means of a hand extruder:

Hand extruder is exactly miniaturized size of the big pipe extruders which does the same job in miniature scale.

In method of welding by manual extruder welding raw material feeding can be either 4 mm PE wire or granulated PE raw material.

8.3.2 Implementation Steps for Connection of New Technology Spiral Pipes

The new technology spiral pipes should be connected in the field in the following order.

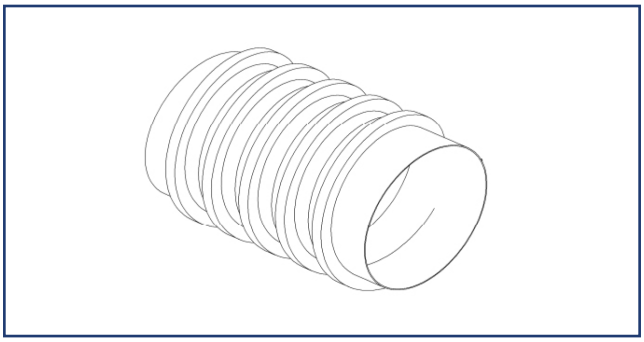


Figure 1: New technology spiral pipe

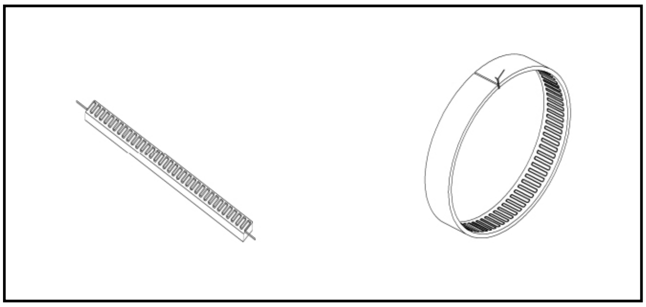


Figure 2: New technology electro fusion muff

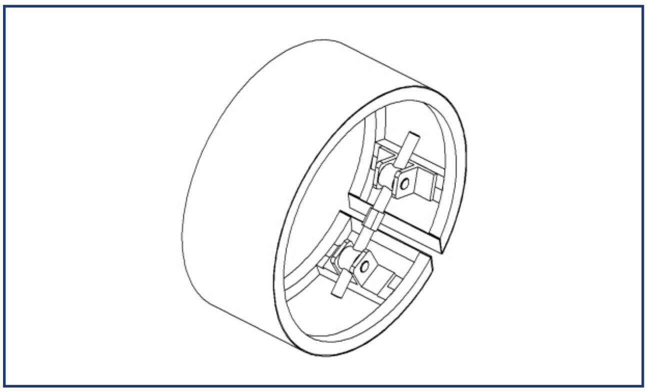


Figure 3: Internal Stay Apparatus

As it is shown in Figure 4, the internal stay apparatus (2) is placed on the edge of the pipe that will be welded. The stay apparatus is designed to centre the welding area. It would be better to put a piece of steel plate between the pipe and the stay in order to perform a better welding on the exposed part of the stay (this way accumulation of melted materials in the joint gap is prevented). One most the primary features of the stay apparatus is that it places the pipes in the same axis.

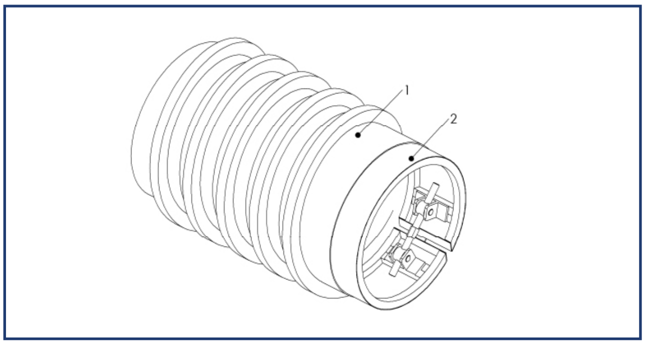


Figure 4: Installation of the Internal Stay Apparatus

Then the other pipe is installed on the internal stay apparatus and it is made sure with the stay apparatus adjustment screw that the stay firmly clutches the internal surface of the pipes. One of the points that should be paid attention is that the edges of the pipes should contact one another face to face. If the pipe edges do not contact one another, there will be gaps and the connection will not be healthy (Figure 5).

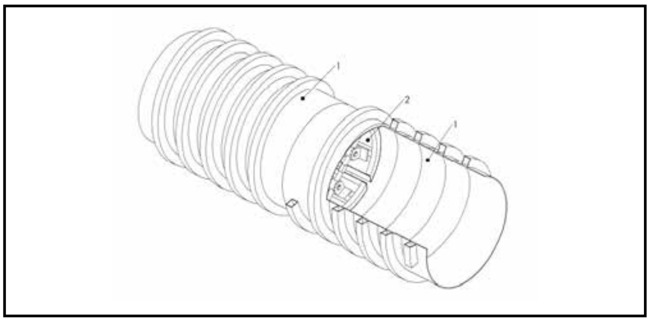


Figure 5: Internal Stay and assembly of pipes

As it can be seen in Figure 6, the electro fusion muff is positioned so that it is in the middle of the two pipe joints. A mark half as wide as the muff is put on each pipe in order to place the muff on the connection point. The electro fusion muff is placed inside the marked positions and the gap is eliminated. Ideally, the joint must be on the top. Foreign matters such as dust, dirt, oil and mud on the welding point and electro fusion muff should be cleaned so that a healthy welding will be achieved. After these foreign matters are disposed of, it is recommended to wipe the welding area with alcohol-soaked cloth.

SPIRAL SELF PIPES FOR SEWAGE WATER AND POWER PLANT PROJECTS

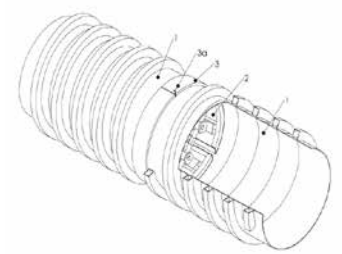


Figure 6: Placing the electro fusion muff on the pipe

As it can be seen in Figure 7, the elector fusion muff (3) whose gaps were eliminated is tightened moderately using external stay apparatus (4). The gapped parts of the muff are seated in position by tapping on the muff from bottom to top and the external stay apparatus is firmly tightened. In the meantime, it is made sure that the muff does not slip from the centring lines drawn.

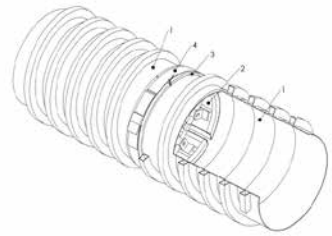


Figure 7: Using the external stay apparatus

It must be made sure that the copper wires are not damaged during the operations performed so far. The edges of the wires (Figure 6-3a) are peeled and safely attached to the grip of the welding machine before welding to achieve a better current. The contact between the grip and the pipe is prevented using an insulating (wood) material so that the grip and the wire do not melt the pipe. The required current value and welding time are selected from the table prepared according to diameters and connection is performed with a welding machine.

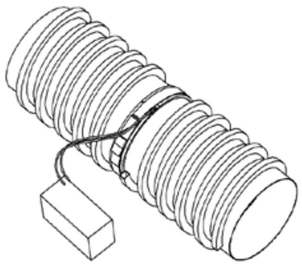


Figure 8: Performing EF welding

The external stay apparatus is removed after the welding area cools down enough. The gaps in the muff joint should be welded using a hand extruder so that it will not leak. Finally, the diameter of the stay is decreased with the adjustment screw of the internal stay apparatus and the internal stay is removed from inside the pipe.

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