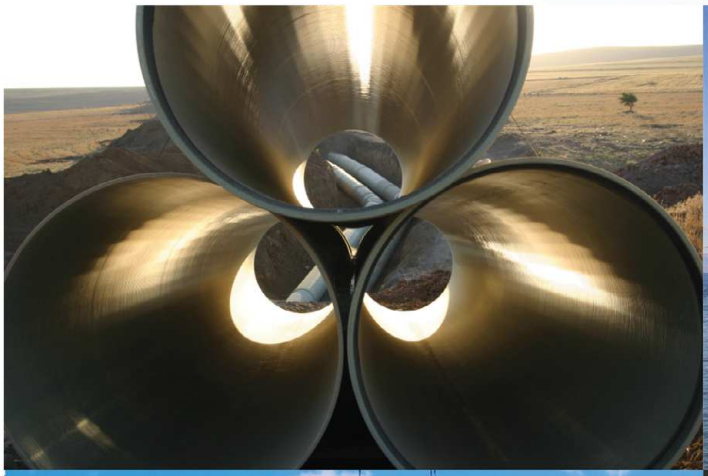
SUPERLIT®

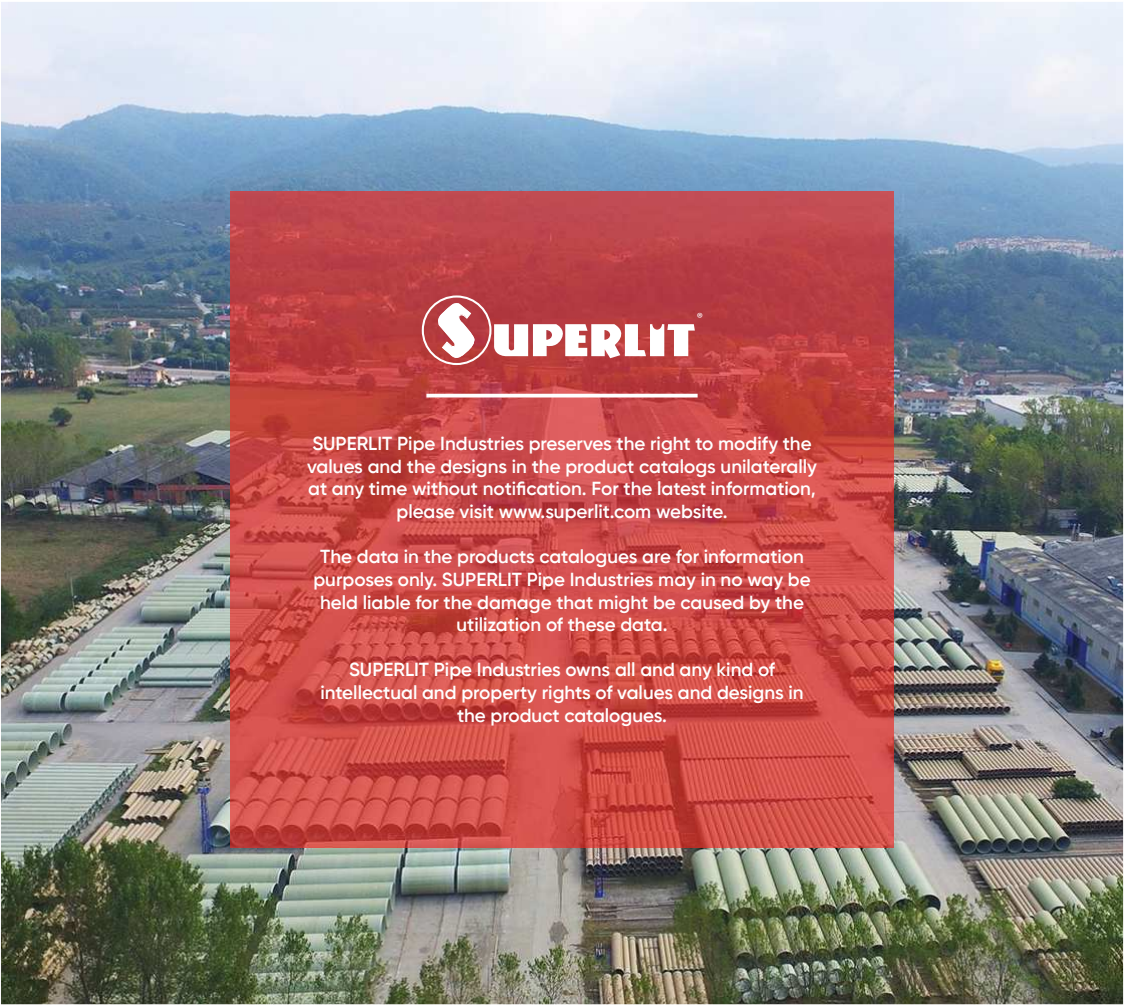


GRP PIPES & FITTINGS

PRODUCT CATALOGUE

SAMIPLAST

www.samiplast.co.id | sales@samiplast.co.id



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Company Profile

SUPERLIT, the first company of KARAMANCI HOLDING that has a prominent role in the Turkish industrial sector, was established in 1961.

SUPERLIT, which manufactures and sells pressure and non-pressure GRP (Glassfiber Reinforced Polyester) pipes in compliance with international standards, has become a favored brand on 5 continents worldwide, thanks to a wide range of products, its reliable quality and before-sales and after-sales technical / consultancy services it renders. With regards to installed capacity, SUPERLIT is one of the leading GRP pipe manufacturer in the GRP pipe sector worldwide.

The pipes, manufactured in factories located in Düzce and Malatya in Turkey, in compliance with international standards such as EN, ISO, ASTM and AWWA, with a diameter range of DN50 mm to DN4000 mm, with a stiffness of 2500 – 5000 – 10000 (and over by special design), and a pressure resistance between 1 – 32 bars (up to 40 bars by special design), are used in the following applications:


Düzce Factory

Malatya Factory

- **Clean water and potable water**
- **Irrigation**
- **Hydroelectric power plant**
- **Sewer system, stormwater**
- **Water treatment**
- **Seawater intake and discharge**
- **Jacking & trenchless technologies**
- **Water, petroleum and chemical storage tanks**
- **Industrial applications such as thermal&nuclear power plants, desalination plants, petrochemical plants etc.**

SUPERLIT is the only GRP pipe manufacturer in Turkey that has 3 different pipe production technologies: Continuous Filament Winding, Centrifugal Casting technology, Helical Filament Winding.

Integrated Management Systems Certificates (ISO 9001, ISO 14001 & ISO 45001) have been granted by the internationally recognized and reputable independent organizations.

Being one of the world's leading manufacturers in the pipe industry with an experience of more than half a century, SUPERLIT supplies pipes for projects in many regions of the world from Europe to Africa and from America to Asia and Australia.

GENERAL PROPERTIES OF GRP PIPES

Fields of Use

Application of SUPERLIT GRP pipes for underground and aboveground piping systems include;

- Potable water and clean water transportation lines
- Main conveyance and network lines for irrigation
- Rainwater and drainage lines
- Sewer lines
- Industrial wastewater lines
- Subsea piping, water intake, discharge lines and diffusers
- Piping of chemical plants
- Circulation lines of power plants
- Conveyance and penstock pipelines of hydroelectricpower plants
- Jacking pipe and relining pipelines
- Water, petroleum and chemical storage tanks

Standards:

- ISO 23856 (water supply&waste water)
- ISO 25780 (jacking)
- EN 1796 (water supply)
- EN 14364 (wastewater)
- ASTM D 3262 (wastewater)
- ASTM D 3754 (wastewater)
- ASTM D 3517 (water supply)
- ASTM D 3839 (installation)
- ISO 10465 (installation)
- ISO 10639 (clean water)
- ISO 10467 (wastewater)
- AWWA C 950 (water supply)
- AWWA M 45 (design and application)
- AS 3571.1 (wastewater)
- AS 3571.2 (water supply)
- AS/NZS 2566.2 (installation)

Fittings:

- Elbows
- Flanges
- Reducers
- Tee pieces
- Manholes
- Special design pieces
- Grp saddles
- WYE pieces

Diameters:

Products are available in the range of DN50 mm to DN4000 mm.

Pipe Length:

Although standard lengths are 6 m and 12 m, SUPERLIT GRP pipes can be manufactured with the lengths required, only limited by transportation capabilities.

Physical Properties:

GRP pipe is a flexible composite material consisting of reinforced glass fiber, thermosetting resin and silica sand. It if manufactured and installed in compliance with the following local and international standards.

Benefits of GRP Pipes

1 Long Service Life:

Pipes are designed in compliance with the international standards to serve a minimum of 50 years. Operating and maintenance costs are negligibly small.

2 Perfect and smooth inner surface:

The smooth inner surface of SUPERLIT GRP pipes reduces hydraulic losses. Thanks to its smooth inner surface, friction loss is at a minimum, and it keeps this characteristic throughout its entire service life.

3 Safe connections:

SUPERLIT GRP pipe joints are designed with the flexible connection method, and the sealing is provided by couplings having full-face integrated elastomeric seal.

4 Lightweight:

- It has approximately 1/4 the weight of steel pipes, approximately 1/5 of ductile pipes, and approximately 1/10 of concrete pipes.
- GRP pipes with varying diameters can be nested together and thus, more pipes can be transported using less vehicles. This means the cost of transportation can be lowered.
- Installation is fast and easy.
- Requires no special equipment for handling and mounting. Being lightweight means easy installation, even for longer pipe lengths.

5 Resistance against corrosion and chemicals:

- It does not corrode since it is not manufactured with metallic materials.
- As a standard, it is designed to serve in a wide pH range.
- It has insulation properties and is not influenced by electric current.
- It does not require cathodic protection.
- It does not require inner and outer coating.

6 Surge pressure absorption

Additional pressure increases occurring due to surges are far less when compared with metal pipes. They are designed to absorb 40% of the surge pressure, without increasing the pressure class.

PROJECTS/ APPLICATIONS

1

Main conveyance and network lines for irrigation
Aydın Koçarlı-Irrigation of Bağarası
DN3000-DN3400
TURKEY

2

Mestia HPP
Hydroelectric Power Plant
DN 2400 / PN 6-10-16
GEORGIA

Clean water and potable water transportation lines

Moerdijk - Nieuwe Keerleus Limmel
DN1700

3 NETHERLANDS

Rainwater, drainage and sewer lines

İstanbul Water and Sewerage Administration 5th Section, Construction of Wastewater Channel,Rain Water Channel and Stream Improvement
DN1200-DN2800

4 TURKEY

Subsea piping, water intake, discharge lines and diffusers

CENAL - Thermal Power Plant of Çanakkale Karabiga
DN300-DN4000

5 TURKEY

Main conveyance and network lines for irrigation

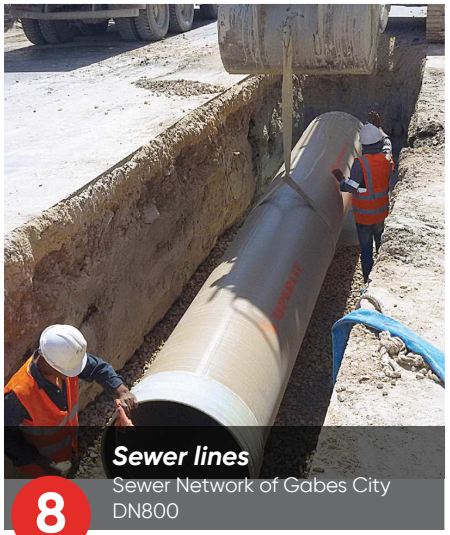
Siphon Application of Darende Gökpınar Irrigation
DN450-DN1300

6 TURKEY

Conveyance and penstock pipelines of hydroelectric power plant

Rwiwi Small Hydropower
DN1800-DN2200

7 UGANDA



Sewer lines

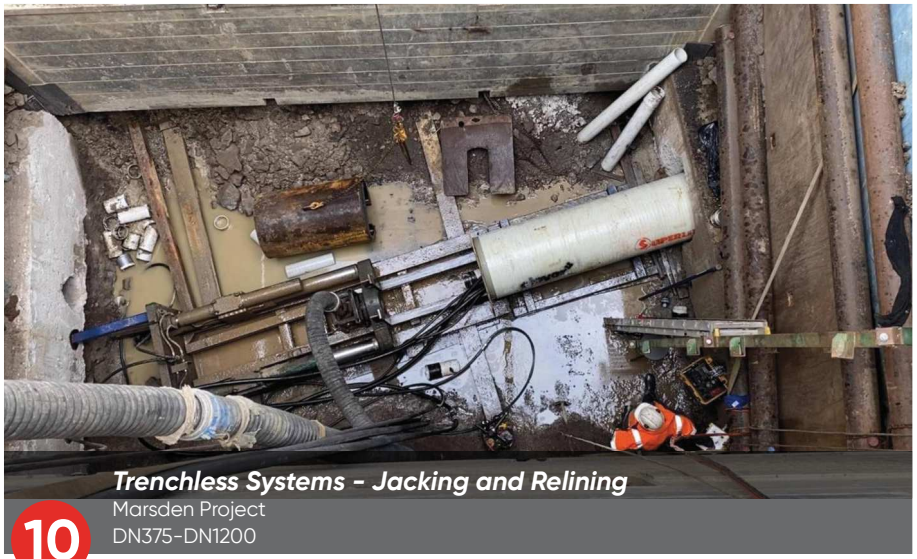
Sewer Network of Gabes City
DN800

8 TUNISIA

Piping of chemical plants

Garabogaz Fertilizer Plant
DN3100-DN3700

9 TURKMENISTAN



Trenchless Systems - Jacking and Relining

Marsden Project
DN375-DN1200

10 AUSTRALIA

DESIGN CONSIDERATIONS

Flow Rate

Recommended flow rate for the standard GRP pipe is 4m/s maximum. Pipes allowing a higher flow rate can be manufactured by special design.

Flow Coefficient

Ratings to be used in hydraulic calculations for SUPERLIT GRP pipes:

- Hazen-William flow coefficient: C=150
- Manning coefficient: n=0,009
- Colebrook-White coefficient

k=0,029mm for the pipes manufactured by the continuous filament winding method
k=0,012mm for the pipes manufactured by the centrifugal casting method

UV Resistance

UV resistant topcoat can be applied to the outer surface of pipes in order to increase resistance to UV effects depending on the project requirements.

Poission's Ratio

Poisson ratio that can be used in standard engineering calculations for GRP pipes is between 0.22 - 0.29. Higher temperature range can be redesigned specifically in accordance with the request.

Temperature

Service temperature of standard GRP pipes is between -40°C and +35°C. For special solutions where the service temperature is above 35 °C, please consult Superlit.

Thermal Coefficient

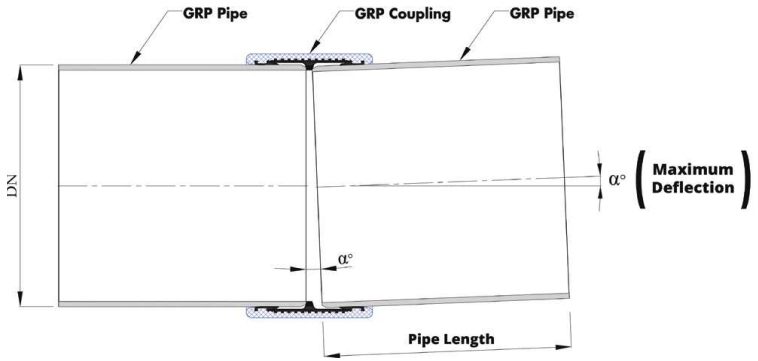
Thermal expansion and contraction coefficient of SUPERLIT GRP pipes in axial direction:

between 24 and 30 x $\frac{1}{10^6}$ mm/mm/°C

Angular Deflection on Couplings

Couplings are designed to meet the performance criteria (angular deflection, pressure, external load, and vacuum) of EN 1119, ISO 8639 AND ASTM 4161. Angular deflection ratings allowed by the standards are presented in the table below.

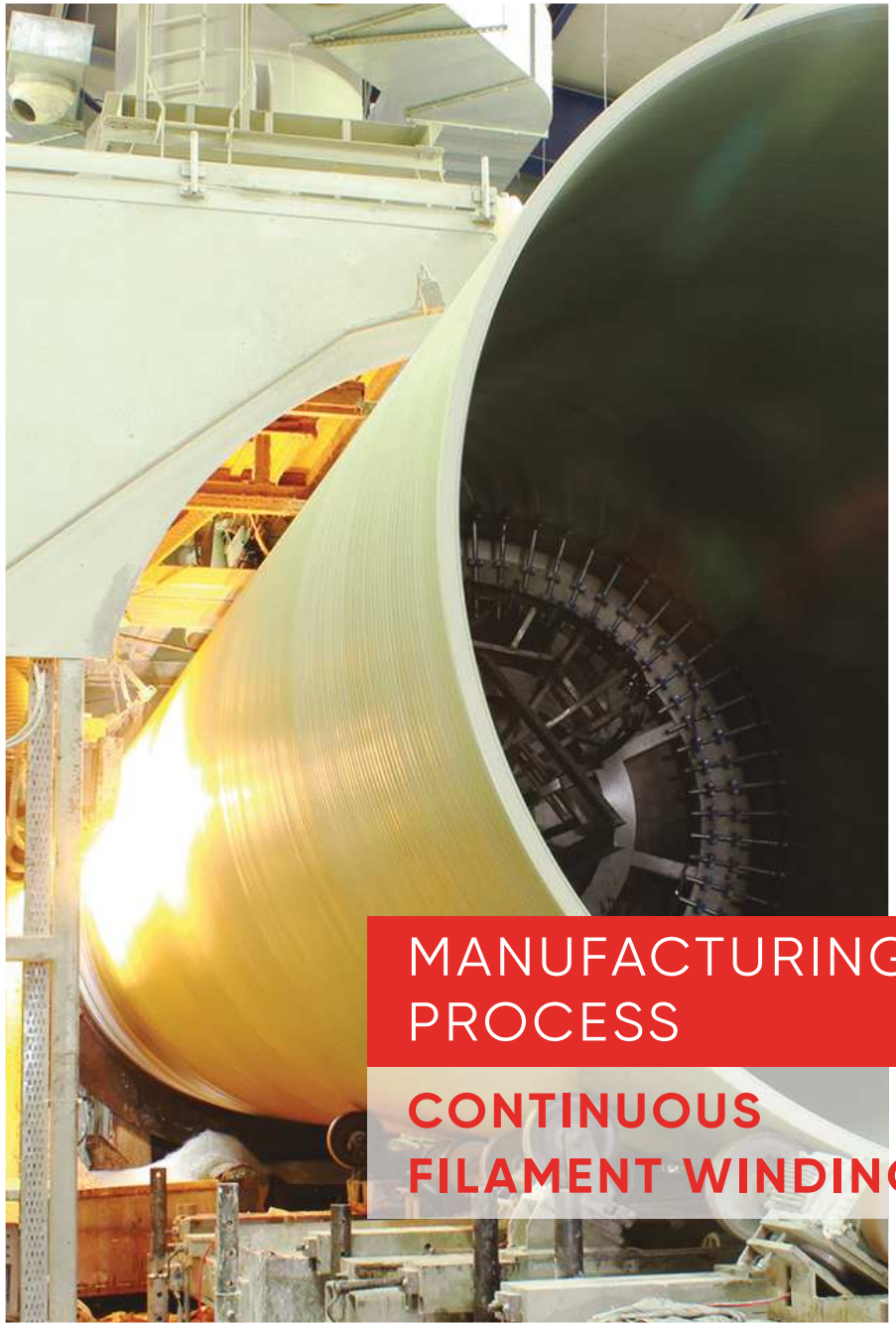
Pipe Diameter	Maximum Angular Deflection Applicable on Coupling (Degrees)
DN 300 - DN 500	3,0°
DN 600 - DN 900	2,0°
DN 1000 - DN 1800	1,0°
DN 1900 – DN 4000	0,5°



GRP Pipe Diameters

SUPERLIT GRP pipes and joints are manufactured with the standard sizes below. Intermediate diameter manufacturing is possible on request.

Pipe Nominal Diameter (mm)	Pipe Nominal Diameter (in)	Pipe Nominal External Diameter (mm)
300	12	324
350	14	376,4
400	16	427,3
450	18	475,8
500	20	530,3
600	24	633
700	28	718,5
800	32	820,5
900	36	924
1000	40	1025,5
1100	44	1125,5
1200	48	1228,5
1300	52	1331,5
1400	56	1433,5
1500	60	1536,5
1600	64	1638,5
1700	68	1739,5
1800	72	1841,5
1900	76	1944,5
2000	80	2046
2100	84	2148,5
2200	88	2250,5
2300	92	2354
2400	96	2454
2500	100	2553,5
2600	104	2657,5
2700	108	2758,5
2800	112	2858,5
2900	116	2962,5
3000	120	3065
3100	124	3166,5
3200	128	3269
3300	132	3370,5
3400	136	3473
3500	140	3574,5
3600	144	3676,5
3700	148	3778,5
3800	152	3880,5
3900	156	3982,5
4000	160	4085



MANUFACTURING PROCESS

CONTINUOUS FILAMENT WINDING

Continuous Filament Winding (CFW)

Process:

The Continuous Filament Winding Process is the manufacturing of GRP pipes from continously flowing glass fiber by winding it on an automatic machine.

The inner and outer walls of the pipe are constructed by pressing glass fiber and resin together, and filling material(sand) is then added.

As a result of reinforcing a high ratio of polyester by glass fiber, the inner and outer surfaces of the pipe become extremely robust against chemicals.

Since the mid-section of the pipe is highly durable, the required stiffness is obtained and the resistance against working pressures is obtained throughout the length of the pipe.

Material:

Standard SUPERLIT GRP pipes are manufactured using orthophthalic or terephthalic unsaturated polyester resin. In the case of special design requirements to meet specific conditions of the project, it is possible to manufacture using isophthalic and vinyl ester resin too.

Manufacturing:

The main machine in the Continuous Filament Winding manufacturing process comprises of a continuous steel band supported by beams that form a cylindrical mandrel.

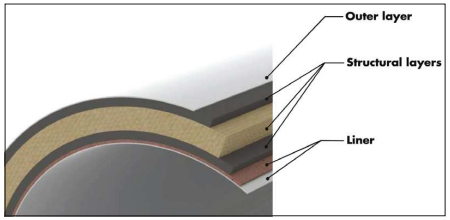
By the motion of the mandrel under the control of the Programme Logic Controller(PLC) and the computers(PC), the glass fiber, the resin, the filling material and the surface materials are applied by precision measurements. The PLC-PC modules provide an integrated process control in line with the pre-programmed designs. Basic data, such as diameter, stiffness and pressure class are entered into the program. The PC calculates all the setting values of the machine. The process parameters and the thickness of the pipe are continuously monitored and traceability is provided by storing these data.

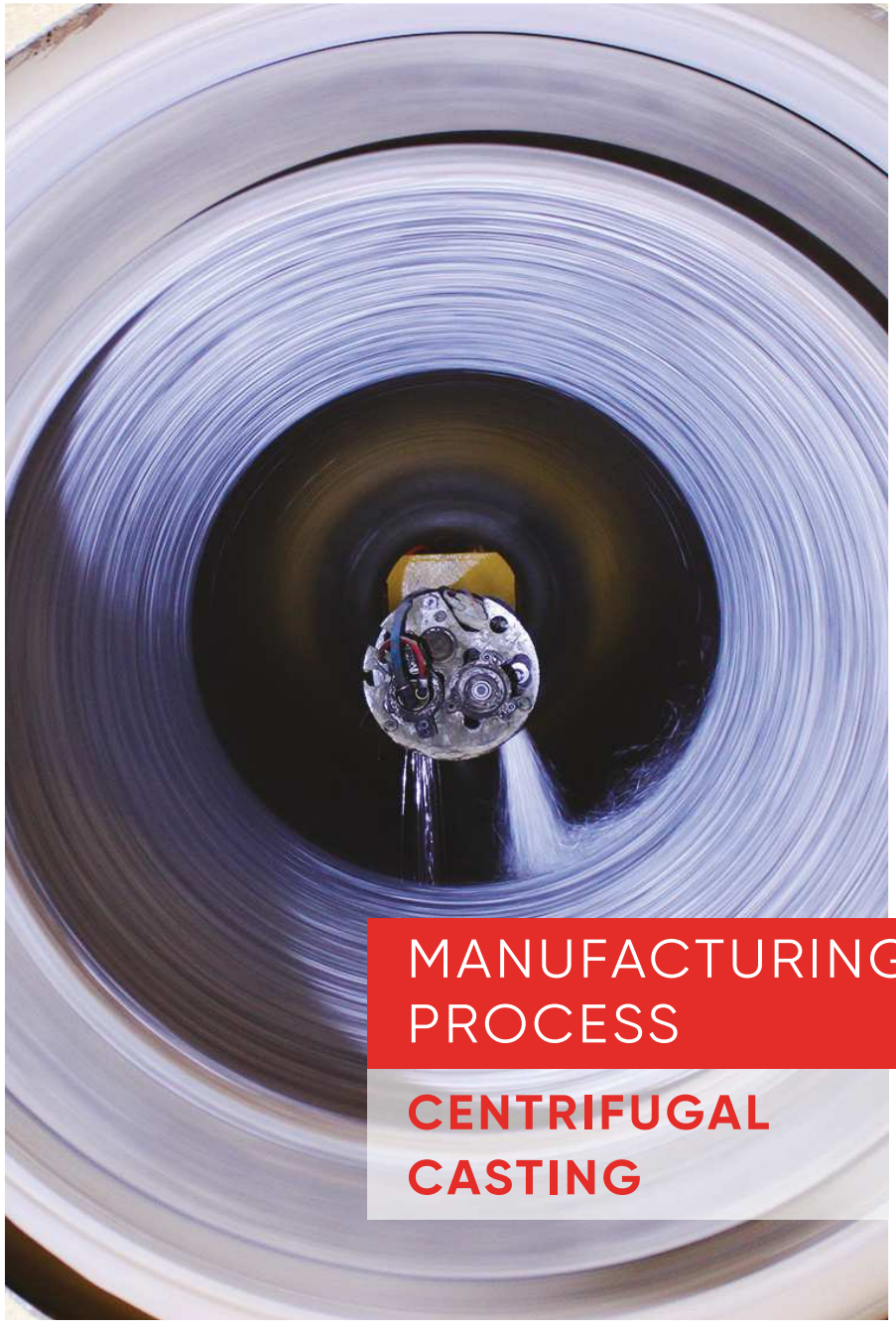
Curing of the laminate develops depending on the heat. Direct heating of the laminate ensured by heating elements. Laminate temperature is measured on the cure region from various points. Temperature distribution is monitored on the PC monitor graphically.

Extraction of resin is administrated from two different lines. Special resin for the inner layer of the pipe can be used for highly corrosive applications, while a normal resin for the body and outer layer can be utilized.

A cutting unit compatible with the pipe, which has an axial and radial stroke, enables the pipe to be cut smoothly and perpendicularly. Cutting operations take place automatically by entering the length of the pipe into the control system.

Pipes that have been cut are transferred to specifically designed lifting stands, then to the chamfering and calibration section, and from there to hydrostatic test section.





MANUFACTURING PROCESS

CENTRIFUGAL CASTING

Centrifugal Casting(CC)

By using the latest computer technology involved in GRP pipe manufacturing with SUPERLIT Centrifugal Casting, raw material distribution and raw material consumption are kept under control. Following the entry of the class and diameter of the pipe to be manufactured into the computer, all manufacturing steps are controlled by the computer until the pipe comes out of the mold.

Manufacturing:

In SUPERLIT GRP pipes manufactured by the Centrifugal Casting method, glass fiber, polyester resin, and silica sand are used.

SUPERLIT GRP pipes, in this completely automatic and electronically controlled process, are manufactured by feeding the raw materials into the rotating mold, beginning from the outer surface of the pipe until reaching a predefined wall thickness.

A feeder leaves the amount of material, which is predfined in the system, within the mold . The resin that is formulated in a way that it is not polymerized during the whole process of loading, and fibers that are cut with a length in compliance with the design are molded from the head at the end of the feeder.

Distrubution and organization of the fibers within layers are fabricated to counterbalance the resistance of the pipe in the designed circumferential and axial directions.

When the feeding of all the raw materials is completed, the cast rotation speed is increased in order to increase the compressive strength. By increasing the rotation speed of the mold, a full-compression and transition to a solid material(curing) are ensured.

By the reciprocating motion of the feeder within the mold, the wall thickness of the pipe is manufactured layer by layer. Glass fibers, which are reinforcing materials, are placed on both sides of the neutral axis on the pipe wall, and the gap remaining in between is filled by silica sand, resin, and glass fiber.

The mechanical properties of SUPERLIT GRP pipes are calibrated by changing the amounts, ratios, and direction of the material within the layers of the pipe. Thus, the flexibility of the design of the pipes enabled in a wide range of pressures, from non-pressure pipes to pressure pipes.

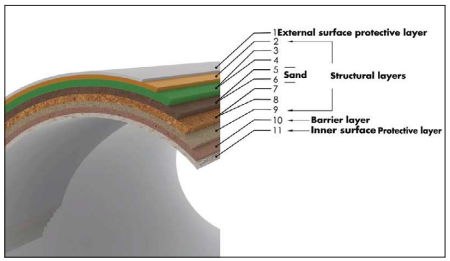
Design of Wall Thickness:

The layers of the pipes are polymerized in the form of 'solid blocks'. Glass fiber distribution in the manufacturing process is kept completely under control, in line with the requirements of the circumferential and axial strength, by the use of varying cutters and mold speeds.

Each layer, forming the wall of the pipe, has a specific function. When the interior of the pipe is examined, a flexible resin layer, having no glass fiber on the inner surface can be seen. The thickness of this layer, which is composed of a pure distinctive resin, is minimum 1 mm, and gives the pipe its hydraulic properties and a high abrasion resistance.

A barrier layer exists behind the liner layer. The liner and barrier layers, together, function to prevent the penetration of foreign substances into the structural layers of the pipe.

Behind the barrier layer is the structural layer, which differs in design according to the pressure and stiffness class of the pipe. On the external surface of the pipe there is the outer layer, which protects the pipe from impacts and scratches during the loading processes. This layer, additionally, protects the pipe against UV radiation penetration.



MANUFACTURING PROCESS

HELICAL FILAMENT WINDING

Helical Filament Winding(HFW)

SUPERLIT Helical Filament Wound glass-reinforced thermosetting resin pipe offers superior corrosion resistance and a combination of high mechanical and physical properties which have been proved in most severe operating conditions all over the world.

Production Method

Pipes are manufactured using the discontinuous filament winding process on computer-controlled machines by adjusting the relative speed of mandrel rotation with the controlled winding of the impregnated fibers on desire pattern, angle, and thicknesses over a rotating mold synchronous with glass distribution head movement.

The inside diameter of the finished pipe is defined by mandrel outside diameter and designed wall thickness is achieved by repeated winding passes and the outside diameter of the pipe is determined by the wall thickness. Following the completion of the curing, mold is separated from the cured pipe by using extraction equipment.

Field of Applications

Fields covered by SUPERLIT Helical Filament Winding GRP products are the following :

- Water distribution (civil and industrial) for pressure and gravity lines
- Sewer systems (urban and industrial)
- Irrigation networks
- Process lines for industrial plants
- Above ground fluid transmission lines
- Wastewater treatment plants
- Sub-sea pipelines
- Trenchless micro-tunneling jacking application

Raw Materials

- Resins : Ortophtalic , Teraphtalic , Isophtalic, Vinylester
- Glass Fiber Reinforcement: E-Glass or ECR

Nominal Stiffness Class

The standard SN class of the pipes are SN:10000Pa. Higher stiffness classes are available up to SN 1.000.000 Pa for jacking applications or special project design conditions.

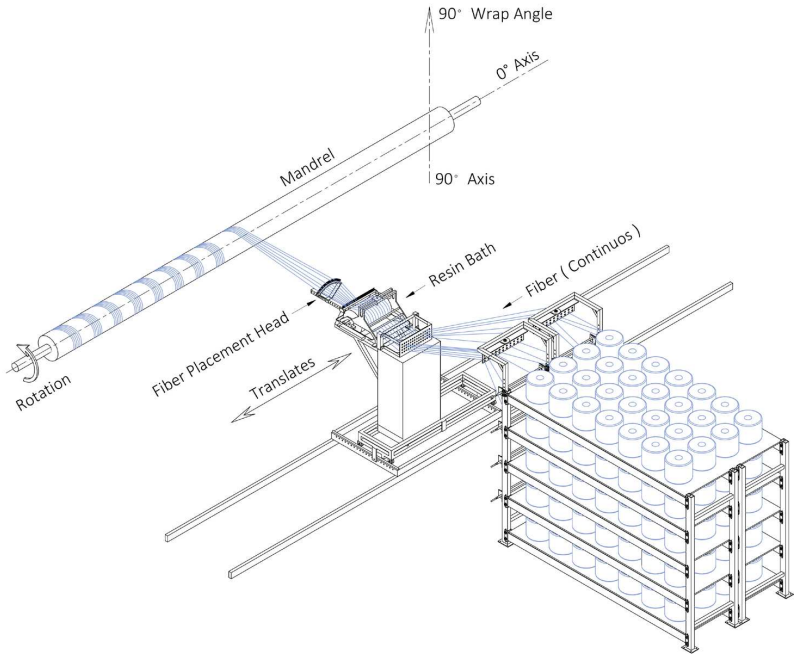
Jointing Type

There are two types of jointing is available for pipe jointing systems. Available type and jointing system details are given in the table:

- Restrained Rigid Type:
  Butt-Wrap Lamination or Locked Type
- Un-restrained Flexible Type :
  Full Face Coupling

Standard Certification

SUPERLIT Helical Filament Winding products are certified according to ASTM 3517 and ASTM 3754 standards.



Helical Winding Pipe Dimensional Parameters

Pipe Specification					Joint Details
Nominal Diameter (MM)	Pressure Class (Bar)	Stiffness Class (N/mm²)	Internal Diameter (MM)	Outside Diameter (MM	Jointing
50	6	10000	50	58.0	Butt-wrap Lamination
	10		50	58.0	
	16		50	58.0	
	20		50	59.0	
	25		50	60.0	
	32		50	61.0	
80	6	10000	80	88.0	Butt-wrap Lamination
	10		80	88.0	
	16		80	88.0	
	20		80	89.0	
	25		80	90.0	
	32		80	91.0	
100	6	10000	100	107.4	Butt-wrap Lamination or REKA Couling
	10		100	107.4	
	16		100	107.6	
	20		100	108.6	
	25		100	110.0	
	32		100	111.0	
150	6	10000	150	157.6	Butt-wrap Lamination or Full-Face Couling
	10		150	158.0	
	16		150	158.6	
	20		150	159.6	
	25		150	161.0	
	32		150	161.0	
200	6	10000	200	210.6	Full-Face Coupling
	10		200	210.6	
	16		200	210.6	
	20		200	211.0	
	25		200	211.4	
	32		200	215.0	
250	6	10000	250	262.8	Full-Face Coupling
	10		250	262.8	
	16		250	262.8	
	20		250	263.4	
	25		250	264.0	
	32		250	265.0	
300	6	10000	300	315.2	Full-Face Coupling
	10		300	315.2	
	16		300	315.2	
	20		300	315.6	
	25		300	316.0	
	32		300	316.6	
350	6	10000	350	365.6	Full-Face Coupling
	10		350	365.6	
	16		350	365.6	
	20		350	366.0	
	25		350	366.4	
	32		350	367.0	
400	6	10000	400	416.0	Full-Face Coupling
	10		400	416.0	
	16		400	416.0	
	20		400	416.2	
	25		400	416.8	
	32		400	417.2	

CLASSIFICATION OF PRODUCTS

Pressure Classes

Pressure classifications(PN) are established in the ISO standards by considering the pressure unit to be applied as bar.

Classifications of Nominal Pressures

PN 1, 4, 6, 10, 12, 16, 25, and 32 are nominal pressure classifications. Pressure classification PN 1 is for nonpressure (gravity) pipes.
GRP nominal pressures are classified in AWWA C950 as follows.
Psi: 50, 100, 150, 200, 250
SUPERLIT GRP pipes are manufactured according to following pressure classifications.

Pressure Classes (PN)	Pressure (BAR)	Pressure (Psi)	Pressure (MPa)	Pressure (atm)	Pressure (kPa)
1	1	14,5	0,1	1	100
6	6	87	0,6	6	600
10	10	145	1	10	1000
16	16	232	1,6	16	1600
25	25	362,5	2,5	25	2500
32	32	464	3,2	32	3200

Stiffness Classes

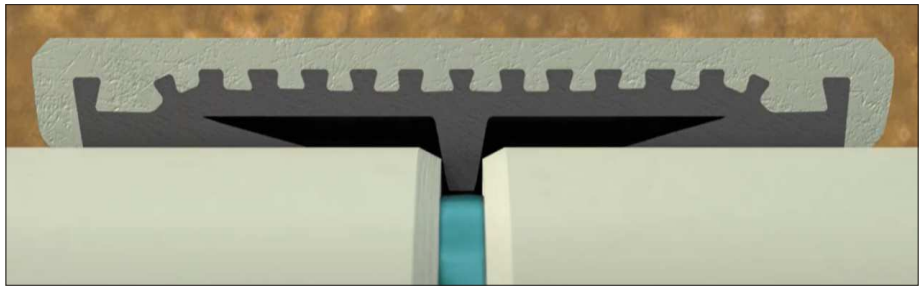
SUPERLIT GRP pipes are manufactured according to following stiffness classifications. It is possible to manufacture with intermediate values or stiffness value of greater than SN10000.

Stifness (SN)	N/m² (Pa)	AWWA C950 (Psi)
2500	2500	18
5000	5000	36
10000	10000	72

GRP Full-Face® Coupling

The inner surfaces of the SUPERLIT Full-Face® GRP Couplings are coated completely by EPDM sealing, which maintains a safer joining tightness when compared with similar systems and ensures water-tightness under high pressure.

Since the seal is integrated into the coupling, it does not dislocate and does not require to be installed on the worksite.



Whether they are produced by the continous filament winding method or centrfungal casting, the pipes with identical nominal diameter have identical outer diameter. Therefore, regardless of the manufacturing method, the same SUPERLIT GRP couplings can be used on pipes with the same nominal diameters.

Nominal Diameter	Coupling Width	Coupling External Diameter De (mm)					
DN (mm)	W (mm)	PN (1-10)	PN 12	PN 16	PN 20	PN 25	PN 32
300	220	360	365	370	375	380	385
350	220	410	415	420	425	430	435
400	242	460	465	470	475	480	485
450	242	510	515	520	525	530	535
500	242	565	570	575	580	585	590
600	242	670	675	680	685	690	695
700	260	760	765	770	775	780	785
800	260	860	865	870	875	880	885
900	260	965	970	975	980	985	990
1000	260	1070	1075	1080	1085	1090	1095
1100	260	1170	1175	1180	1185	1190	1195
1200	260	1275	1280	1285	1290	1295	1300
1300	260	1375	1380	1385	1390	1395	1400
1400	275	1480	1485	1490	1495	1500	1505
1500	275	1585	1590	1595	1600	1605	1610
1600	275	1690	1695	1700	1705	1710	1715
1700	275	1790	1795	1800	1805	1810	-
1800	275	1895	1900	1905	1910	-	-
1900	275	1995	2000	2005	-	-	-
2000	275	2100	2105	2110	-	-	-
2100	275	2200	2205	2210	-	-	-
2200	275	2305	2310	2315	-	-	-
2300	275	2405	2410	2415	-	-	-
2400	275	2510	2515	2520	-	-	-
2500	330	2605	2610	2615	-	-	-
2600	330	2710	2715	2720	-	-	-
2700	330	2815	2820	2825	-	-	-
2800	330	2915	2920	2925	-	-	-
2900	330	3020	3025	3030	-	-	-
3000	330	3125	3130	3135	-	-	-
3100	330	3230	3235	3240	-	-	-
3200	330	3330	3335	3340	-	-	-
3300	330	3435	-	-	-	-	-
3400	330	3540	-	-	-	-	-
3500	330	3645	-	-	-	-	-
3600	330	3745	-	-	-	-	-
3700	330	3850	-	-	-	-	-
3800	330	3955	-	-	-	-	-
3900	330	4060	-	-	-	-	-
4000	330	4160	-	-	-	-	-

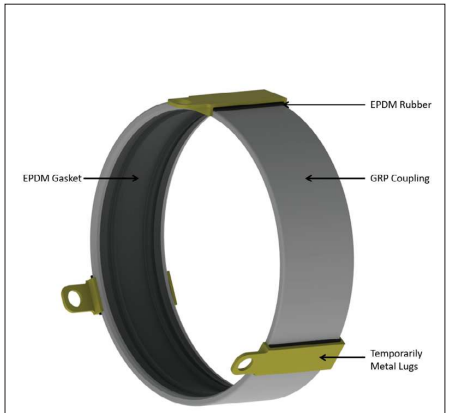
** Values above are for general information purposes. For the most current information, please visit the www.superlit.com*

GRP Slip on Coupling

SUPERLIT Full-Face® GRP Slip-On Coupling developed product as a result of Superlit R&D studies.

New designed gasket profile allows sliding of the coupling on both direction over pipe surface, provides a technical solution to the repair of damaged pipe line section and tie-in problems of pipelines with corrosion free GRP composite structure. Full-Face® GRP Slip-On Couplings are completely covered from inside with EPDM integrated gasket profile bonded in factory condition.

Thanks to new designed rubber profile which allows new "Slip-On GRP Coupling" to slip over along with it's complete width on pipe spigot while complying all required performance criterias (angular deflection, pressure, external load and vacuum) as per related international standards.



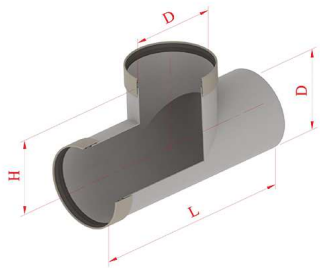
SUPERLIT Slip On Coupling

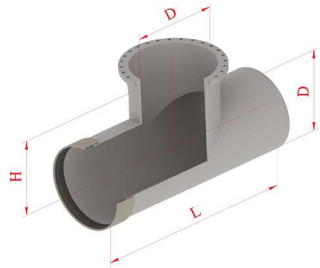
GRP Jacking Coupling

New developed GRP jacking coupling is taking place as an alternative to steel joints which are used in trenchless applications. It provides unique solutions to corrosion issue of agressive soil environment where metal couplings have limit of service life under corrosion attack.

New composite jacking coupling has minimum 50 years of service life in similar and even higher conditions. Special designed full face rubber profile ensures leak tigthness by help of its GRP structure of body and fully comply with the performance requirements of ISO 25780 standard.

Tee Pieces/ Equal Tees

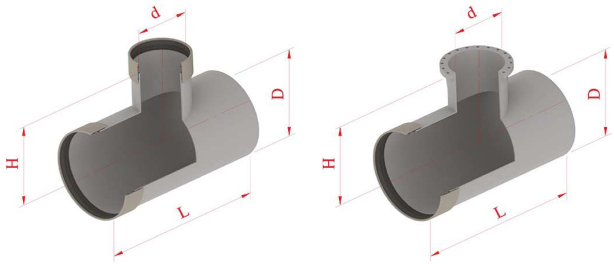




D	PN (1-6)		PN 10		PN 16	
	L	H	L	H	L	H
300	1000	450	1000	450	1200	550
350	1200	530	1200	530	1400	630
400	1300	610	1300	610	1500	690
450	1400	660	1400	660	1600	740
500	1500	720	1500	720	1700	820
600	1700	790	1700	790	1800	870
700	1900	870	1900	870	2100	990
800	2100	970	2100	970	2400	1120
900	2200	1050	2200	1050	2600	1250
1000	2400	1150	2400	1150	2800	1350
1100	2600	1220	2600	1220	3000	1450
1200	2800	1320	2800	1320	3200	1550
1300	2900	1400	2900	1400	3500	1680
1400	3100	1480	3100	1480	3700	1780
1500	3300	1590	3300	1590	3900	1890
1600	3400	1660	3400	1660	4100	2010
1700	3600	1740	3600	1740	4300	2110
1800	3700	1810	3700	1810	4500	2210
1900	3900	1890	3900	1890	4800	2340
2000	4000	1970	4000	1970	5000	2470
2100	4200	2040	4200	2040	5200	2540
2200	4300	2120	4300	2120	5300	2620
2300	4500	2190	4500	2190	5600	2740
2400	4600	2270	4600	2270	5700	2790
2500	4800	2370	4800	2370	5900	2900
2600	5000	2450	5000	2450	6100	3000
2700	5100	2520	5100	2520	6200	3070
2800	5300	2600	5300	2600	6400	3150
2900	5400	2680	5400	2680	6600	3250
3000	5600	2750	5600	2750	6700	3300
3100	5700	2830	5700	2830	6900	3400
3200	5900	2900	5900	2900	7100	3500
3300	6100	3010	6100	3010	-	-
3400	6300	3130	6300	3130	-	-
3500	6500	3230	6500	3230	-	-
3600	6600	3280	6600	3280	-	-
3700	6800	3380	6800	3380	-	-
3800	7000	3460	7000	3460	-	-
3900	7100	3540	7100	3540	-	-
4000	7300	3610	7300	3610	-	-

** Values above are for general information purposes. For the most current information, please visit the www.superlit.com*

Tee Pieces/Unequal Tees



D	d	PN (1-6)		PN 10		PN 16	
		L	H	L	H	L	H
300	150	800	400	800	400	800	430
	200	900	430	900	430	1000	480
	250	900	430	900	430	1000	480
350	150	800	430	800	430	800	450
	200	900	450	900	450	1000	500
	250	900	450	900	450	1000	500
400	150	800	460	800	460	800	490
	200	900	490	900	490	1000	540
	250	900	490	900	490	1000	540
450	150	800	480	800	480	800	510
	200	900	510	900	510	1000	590
	250	900	510	900	510	1100	590
500	150	800	510	800	510	800	540
	200	900	540	900	540	1000	620
	250	1000	570	1000	570	1100	640
600	300	1000	620	1000	620	1200	720
	400	1300	720	1300	720	1500	790
	450	1400	740	1400	740	1600	820
700	200	900	660	900	660	1000	690
	400	1400	790	1400	790	1600	890
	600	1800	870	1800	870	2000	970
800	200	900	710	900	710	1000	760
	400	1500	870	1500	870	1700	990
	600	1800	940	1800	940	2100	1070
900	300	1300	870	1300	870	1500	1000
	500	1700	1000	1700	1000	2000	1120
	800	2100	1050	2100	1050	2400	1200
1000	300	1300	950	1300	950	1600	1100
	500	1800	1070	1800	1070	2100	1220
	800	2200	1120	2200	1120	2500	1300
1100	500	1800	1150	1800	1150	2100	1300
	800	2200	1200	2200	1200	2600	1370
	1000	2500	1220	2500	1220	2900	1420
1200	500	1900	1220	1900	1220	2200	1370
	800	2300	1270	2300	1270	2600	1450
	1000	2500	1300	2500	1300	2900	1300
1300	500	1900	1300	1900	1300	2300	1480
	800	2300	1350	2300	1350	2700	1550
	1000	2600	1380	2600	1380	3000	1600
1400	500	1900	1360	1900	1360	2300	1560
	800	2300	1410	2300	1410	2800	1630
	1000	2600	1430	2600	1430	3100	1680
1500	500	2000	1440	2000	1440	2400	1640
	800	2400	1490	2400	1490	2800	1710
	1000	2600	1510	2600	1510	3100	1760

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D	d	PN (1-6)		PN 10		PN 16	
		L	H	L	H	L	H
1600	500	2000	1510	2000	1510	2500	1740
	800	2400	1560	2400	1560	2900	1810
	1000	2700	1590	2700	1590	3200	1860
1700	500	2000	1560	2000	1560	2500	1810
	800	2400	1610	2400	1610	3000	1890
	1000	2700	1640	2700	1640	3300	1940
1800	500	2100	1640	2100	1640	2600	1890
	800	2500	1690	2500	1690	3000	1960
	1000	2700	1710	2700	1710	3300	2010
1900	500	2100	1690	2100	1690	2600	1960
	800	2500	1740	2500	1740	3100	2040
	1000	2700	1760	2700	1760	3400	2090
2000	500	2100	1770	2100	1770	2700	2040
	800	2500	1820	2500	1820	3100	2120
	1000	2800	1840	2800	1840	3400	2170
2100	800	2500	1870	2500	1870	3100	2170
	1000	2800	1890	2800	1890	3400	2220
	1200	3000	1920	3000	1920	3700	2270
2200	800	2600	1940	2600	1940	3100	2220
	1000	2800	1970	2800	1970	3400	2270
	1200	3100	1990	3100	1990	3700	2320
2300	800	2600	1990	2600	1990	3200	2320
	1000	2800	2020	2800	2020	3500	2370
	1200	3100	2040	3100	2040	3800	2420
2400	1200	3100	2120	3100	2120	3800	2470
	1600	3600	2170	3600	2170	4400	2570
	2000	4100	2220	4100	2220	5100	2720
2500	1200	3200	2200	3200	2200	3900	2550
	1600	3700	2250	3700	2250	4500	2650
	2000	4200	2300	4200	2300	5200	2800
2600	1200	3200	2270	3200	2270	4000	2650
	1600	3700	2320	3700	2320	4600	2750
	2000	4200	2370	4200	2370	5300	2900
2700	1000	3000	2300	3000	2300	3700	2650
	1600	3700	2370	3700	2370	4600	2800
	2000	4200	2420	4200	2420	5300	2950
2800	1000	3000	2370	3000	2370	3700	2700
	1600	3800	2450	3800	2450	4600	2850
	2000	4300	2500	4300	2500	5300	3000
2900	1000	3000	2430	3000	2430	3800	2800
	1600	3800	2500	3800	2500	4700	2950
	2000	4300	2550	4300	2550	5400	3100
3000	1000	3100	2500	3100	2500	3800	2850
	1600	3800	2580	3800	2580	4700	3000
	2000	4300	2630	4300	2630	5400	3150
3100	1000	3100	2550	3100	2550	3800	2900
	1600	3800	2630	3800	2630	4700	3050
	2000	4300	2680	4300	2680	5400	3200
3200	1000	3100	2630	3100	2630	3900	3000
	1600	3900	2700	3900	2700	4800	3150
	2000	4400	2750	4400	2750	5500	3300
3300	1000	3100	2680	3100	2680	-	-
	1600	3900	2760	3900	2760	-	-
	2000	4400	2810	4400	2810	-	-
3400	1600	3900	2830	3900	2830	-	-
	2400	4900	2930	4900	2930	-	-
	3000	5700	3010	5700	3010	-	-
3500	1600	3900	2880	3900	2880	-	-
	2400	4900	2980	4900	2980	-	-
	3000	5700	3060	5700	3060	-	-
3600	1600	4000	2960	4000	2960	-	-
	2400	5000	3060	5000	3060	-	-
	3000	5700	3130	5700	3130	-	-
3700	1600	4000	3010	4000	3010	-	-
	2400	5000	3110	5000	3110	-	-
	3000	5700	3180	5700	3180	-	-
3800	1600	4000	3090	4000	3090	-	-
	2400	5000	3190	5000	3190	-	-
	3000	5800	3260	5800	3260	-	-
3900	1600	4000	3140	4000	3140	-	-
	2400	5000	3240	5000	3240	-	-
	3000	5800	3310	5800	3310	-	-
4000	1600	4100	3210	4100	3210	-	-
	2400	5100	3310	5100	3310	-	-
	3000	5800	3390	5800	3390	-	-

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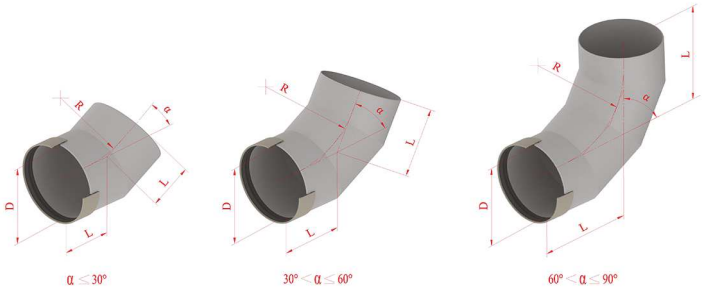
Elbows



DN	R	11.25° L	22.5° L	30° L	45° L	60° L	90° L
300	450	275	300	325	400	450	650
350	525	275	300	325	425	500	700
400	600	325	350	375	475	550	800
450	675	325	375	400	525	625	950
500	750	325	375	400	525	625	950
600	900	325	400	450	600	700	1075
700	1050	400	425	475	650	775	1200
800	1170	400	450	525	700	850	1350
900	1200	400	475	550	725	875	1400
1000	1270	425	500	575	750	925	1450
1100	1320	475	525	600	800	1000	1550
1200	1370	475	525	600	825	1025	1600
1300	1420	500	550	650	875	1075	1650
1400	1470	500	575	675	900	1100	1700
1500	1570	550	650	725	1025	1250	1900
1600	1670	600	675	800	1100	1300	2000
1700	1770	675	775	850	1200	1400	2200
1800	1870	675	775	850	1200	1400	2200
1900	1970	700	800	900	1300	1500	2400
2000	2070	700	800	900	1300	1500	2400
2100	2170	775	875	950	1400	1600	2600
2200	2270	775	875	950	1400	1600	2600
2300	2370	800	900	1000	1500	1700	2800
2400	2470	800	900	1000	1500	1700	2800
2500	2600	1000	1100	1200	1700	1900	3000
2600	2700	1000	1100	1200	1700	1900	3000
2700	2800	1100	1200	1300	1800	2000	3200
2800	2900	1100	1200	1300	1800	2000	3200
2900	3000	1200	1300	1400	1900	2100	3400
3000	3100	1200	1300	1400	1900	2100	3400
3100	3200	1300	1400	1500	2000	2200	3600
3200	3300	1300	1400	1600	2000	2200	3600
3300	3400	1400	1500	1700	2100	2300	3800
3400	3500	1400	1500	1700	2100	2300	3800
3500	3600	1500	1600	1800	2200	2400	4000
3600	3700	1500	1600	1800	2200	2400	4000
3700	3800	1600	1700	1900	2300	2500	4200
3800	3900	1600	1700	1900	2300	2500	4200
3900	4000	1700	1800	2000	2400	2600	4400
4000	4100	1700	1800	2000	2400	2600	4400

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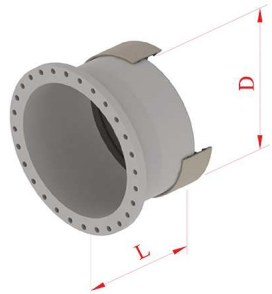
Flanges



DN (mm)	L (mm)
300	600
350	600
400	600
450	600
500	600
600	600
700	600
800	600
900	600
1000	600
1100	700
1200	700
1300	800
1400	800
1500	800
1600	900
1700	900
1800	1000
1900	1000
2000	1000
2100	1100
2200	1100
2300	1200
2400	1200
2500	1300
2600	1300
2700	1400
2800	1400
2900	1500
3000	1500
3100	1500
3200	1500
3300	1500
3400	1500
3500	1500
3600	1500
3700	1500
3800	1500
3900	1500
4000	1500

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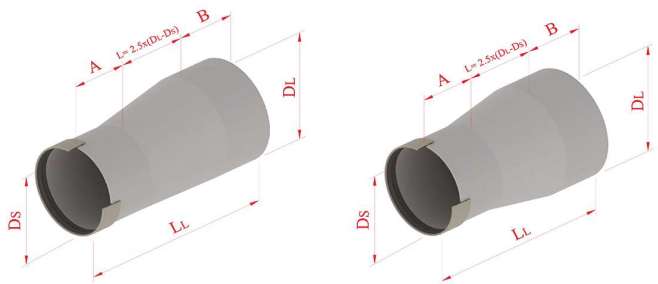
Reducers



DL (mm)	DS (mm)	A=B (mm)	L (mm)	LL (mm)
300	200	400	250	1050
300	250	400	125	925
350	250	400	250	1050
350	300	400	125	925
400	300	400	250	1050
400	350	400	125	925
450	350	400	250	1050
450	400	400	125	925
500	350	400	375	1175
500	400	400	250	1050
600	400	400	500	1300
600	500	400	250	1050
700	500	400	500	1300
700	600	400	250	1050
800	600	400	500	1300
800	700	400	250	1050
900	700	400	500	1300
900	800	400	250	1050
1000	800	400	500	1300
1000	900	400	250	1050
1100	900	400	500	1300
1100	1000	400	250	1050
1200	1000	500	500	1500
1200	1100	500	250	1250
1300	1100	500	500	1500
1300	1200	500	250	1250
1400	1200	500	500	1500
1400	1300	500	250	1250
1500	1300	500	500	1500
1500	1400	500	250	1250
1600	1500	600	250	1450
1600	1400	600	500	1700
1700	1500	600	500	1700
1700	1600	600	250	1450
1800	1400	600	1000	2200
1800	1600	600	500	1700
1900	1700	600	500	1700
1900	1800	600	250	1450
2000	1600	600	1000	2200
2000	1800	600	500	1700

DL (mm)	DS (mm)	A=B (mm)	L (mm)	LL (mm)
2100	1900	600	500	1700
2100	2000	600	250	1450
2200	2000	600	500	1700
2200	2100	600	250	1450
2300	2100	600	500	1700
2300	2200	600	250	1450
2400	2200	600	500	1700
2400	2300	600	250	1450
2500	2300	750	500	2000
2500	2400	750	250	1750
2600	2400	750	500	2000
2600	2500	750	250	1750
2700	2500	750	500	2000
2700	2600	750	250	1750
2800	2600	750	500	2000
2800	2700	750	250	1750
2900	2700	750	500	2000
2900	2800	750	250	1750
3000	2800	750	500	2000
3000	2900	750	250	1750
3100	2900	900	500	2300
3100	3000	900	250	2050
3200	3000	900	500	2300
3200	3100	900	250	2050
3300	3100	900	500	2300
3300	3200	900	250	2050
3400	3200	900	500	2300
3400	3300	900	250	2050
3500	3300	1050	500	2600
3500	3400	1050	250	2350
3600	3400	1050	500	2600
3600	3500	1050	250	2350
3700	3500	1050	500	2600
3700	3600	1050	250	2350
3800	3600	1050	500	2600
3800	3700	1050	250	2350
3900	3700	1100	500	2700
3900	3800	1100	250	2450
4000	3800	1100	500	2700
4000	3900	1100	250	2450

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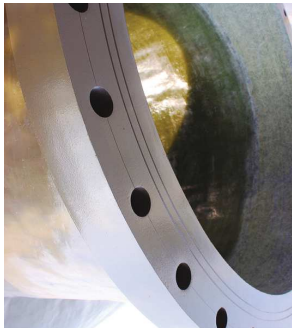


GRP Manholes

GRP Tank and Water Retention Systems

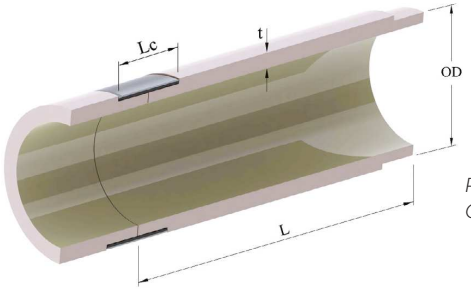
Deblin Airport
Deblin Airport

Petroleum Tanks
DN1000 - DN 2400

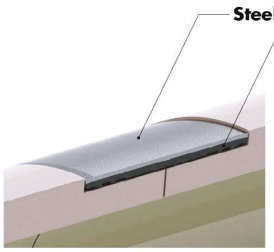
TRENCHLESS SYSTEMS

Jacking Pipes

There are no excavations in the jacking pipe installation model.
Pipes are installed inside a tunnel underground by using special purpose machines (tunnel boring machine-TBM), by jacking method.



Pipe Length (L) = 1800 or 2800mm
Coupling Width = 120mm(DN400-800)
140mm(DN900-1400)



Coupling: Stainless steel(304-316), GRP Coupling
Gasket: EPDM 60 ± 5 Shore
A steel coupling of 2mm thickness is used for PN1
A steel coupling of 2.5mm thickness is used for PN6 and PN10

GRP Coupling & FW Jacking Pipe Data Sheet

(Load Base)

JACKING LOAD Gj (tons)	OD (mm)	ID (mm)	e (mm)	Mass (kg/m)	SN (N/m²)
50	376	314,0	31,0	67	688.303
	427	371,0	28,0	70	327.874
	478	426,0	26,0	74	180.575
	515	465,0	25,0	77	126.004
	530	480,0	25,0	79	115.106
	550	500,0	25,0	82	102.446
	618	568,0	25,0	93	71.090
	650	600,0	25,0	98	60.720
	718	668,0	25,0	109	44.542
	760	710,0	25,0	115	37.334
	820	770,0	25,0	125	29.503
	860	808,0	26,0	136	28.746
	924	872,0	26,0	147	23.027
	960	908,0	26,0	153	20.466
	1.026	974,0	26,0	163	16.675
	1.099	1.051,0	24,0	162	10.557
	1.127	1.079,0	24,0	166	9.774

JACKING LOAD Gj (tons)	OD (mm)	ID (mm)	e (mm)	Mass (kg/m)	SN (N/m²)
100	427	333,0	47,0	112	1.722.594
	478	392,0	43,0	117	879.382
	515	435,0	40,0	119	543.675
	530	454,0	38,0	117	419.465
	550	476,0	37,0	119	341.581
	618	552,0	33,0	121	163.423
	650	584,0	33,0	128	139.292
	718	656,0	31,0	134	83.648
	760	702,0	29,0	133	56.844
	820	762,0	29,0	144	44.865
	860	802,0	29,0	151	38.693
	924	868,0	28,0	158	27.784
	960	904,0	28,0	164	24.687
	1.026	970,0	28,0	175	20.106
	1.099	1.045,0	27,0	182	14.546
	1.127	1.073,0	27,0	187	13.463

JACKING LOAD Gj (tons)	OD (mm)	ID (mm)	e (mm)	Mass (kg/m)	SN (N/m²)
150	515	409,0	53,0	154	1.370.088
	530	424,0	53,0	159	1.244.856
	550	448,0	51,0	160	968.848
	618	528,0	45,0	162	439.562
	650	562,0	44,0	167	347.366
	718	636,0	41,0	174	201.573
	760	682,0	39,0	177	143.627
	820	744,0	38,0	187	104.130
	860	786,0	37,0	191	82.462
	924	852,0	36,0	201	60.467
	960	890,0	35,0	203	49.162
	1.026	960,0	33,0	206	33.307
	1.099	1.035,0	32,0	214	24.480
	1.127	1.065,0	31,0	213	20.535
	1.229	1.169,0	30,0	226	14.215

JACKING LOAD Gj (tons)	OD (mm)	ID (mm)	e (mm)	Mass (kg/m)	SN (N/m²)
200	618	504,0	57,0	201	908.614
	650	538,0	56,0	209	725.852
	718	616,0	51,0	214	387.236
	760	664,0	48,0	215	265.416
	820	728,0	46,0	224	181.842
	860	769,0	45,5	233	151.009
	924	838,0	43,0	238	100.721
	960	877,0	41,5	239	79.901
	1.026	946,0	40,0	248	57.835
	1.099	1.023,0	38,0	253	39.797
	1.127	1.053,0	37,0	253	33.882
	1.229	1.159,0	35,0	262	21.819
	1.290	1.222,0	34,0	268	17.183
	1.348	1.282,0	33,0	273	13.690
	1.399	1.335,0	32,0	275	11.112
	1.434	1.370,0	32,0	282	10.300

JACKING LOAD Gj (tons)	OD (mm)	ID (mm)	e (mm)	Mass (kg/m)	SN (N/m²)
300	760	624,0	68,0	296	821.962
	820	692,0	64,0	304	525.555
	860	735,0	62,5	313	416.957
	924	807,0	58,5	318	267.491
	960	846,0	57,0	323	217.874
	1.026	918,0	54,0	330	148.534
	1.099	997,0	51,0	336	99.832
	1.127	1.028,0	49,5	335	83.986
	1.229	1.136,0	46,5	345	52.674
	1.290	1.200,0	45,0	352	40.905
	1.348	1.262,0	43,0	352	30.990
	1.399	1.315,0	42,0	358	25.683
	1.434	1.351,0	41,5	363	22.930
	1.499	1.419,0	40,0	367	17.851
	1.536	1.448,0	44,0	412	22.217
	1.638	1.551,0	43,5	436	17.589
	1.720	1.634,0	43,0	453	14.603
	1.842	1.756,0	43,0	486	11.829
	1.944	1.858,0	43,0	513	10.025

JACKING LOAD Gj (tons)	OD (mm)	ID (mm)	e (mm)	Mass (kg/m)	SN (N/m²)
400	924	774,0	75,0	400	597.178
	960	816,0	72,0	402	461.745
	1.026	890,0	68,0	409	309.794
	1.099	971,0	64,0	416	204.815
	1.127	1.003,0	62,0	415	170.911
	1.229	1.113,0	58,0	427	105.258
	1.290	1.178,0	56,0	434	80.958
	1.348	1.240,0	54,0	439	62.954
	1.399	1.295,0	52,0	440	49.837
	1.434	1.332,0	51,0	443	43.440
	1.499	1.401,0	49,0	446	33.429
	1.536	1.430,0	53,0	494	39.541
	1.638	1.534,0	52,0	518	30.531
	1.720	1.622,0	49,0	514	21.842
	1.842	1.748,0	47,0	530	15.550
	1.944	1.852,0	46,0	548	12.332
	2.046	1.954,0	46,0	578	10.540

JACKING LOAD Gj (tons)	OD (mm)	ID (mm)	e (mm)	Mass (kg/m)	SN (N/m²)
500	1.099	945,0	77,0	494	352.836
	1.127	977,0	75,0	495	298.944
	1.229	1.090,0	69,5	506	177.663
	1.290	1.157,0	66,5	511	132.467
	1.348	1.220,0	64,0	516	102.164
	1.399	1.275,0	62,0	521	82.269
	1.434	1.312,0	61,0	526	72.349
	1.499	1.382,0	58,5	529	55.256
	1.536	1.412,0	62,0	574	61.396
	1.638	1.518,0	60,0	595	45.351
	1.720	1.606,0	57,0	595	33.220
	1.842	1.734,0	54,0	606	22.727
	1.944	1.840,0	52,0	618	17.128
	2.046	1.945,0	50,5	633	13.371
	2.160	2.062,0	49,0	650	10.318

JACKING LOAD Gj (tons)	OD (mm)	ID (mm)	e (mm)	Mass (kg/m)	SN (N/m²)
600	1.229	1.067,0	81,0	584	289.790
	1.290	1.134,0	78,0	594	219.902
	1.348	1.198,0	75,0	600	168.715
	1.399	1.255,0	72,0	600	131.777
	1.434	1.292,0	71,0	608	116.612
	1.499	1.363,0	68,0	611	88.524
	1.536	1.394,0	71,0	653	93.911
	1.638	1.500,0	69,0	680	70.167
	1.720	1.590,0	65,0	676	49.980
	1.842	1.718,0	62,0	693	34.863
	1.944	1.826,0	59,0	698	25.297
	2.046	1.932,0	57,0	712	19.417
	2.160	2.050,0	55,0	727	14.716
	2.250	2.144,0	53,0	731	11.582
	2.453	2.341,0	56,0	843	11.046

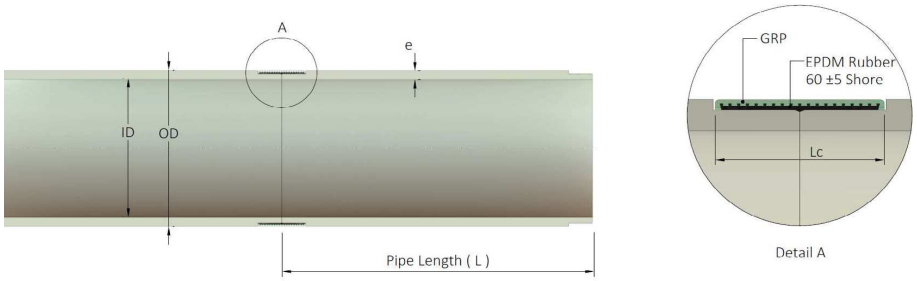
JACKING LOAD Gj (tons)	OD (mm)	ID (mm)	e (mm)	Mass (kg/m)	SN (N/m²)
700	1.399	1.234,0	82,5	682	192.875
	1.434	1.273,0	80,5	684	164.889
	1.499	1.345,0	77,0	688	124.437
	1.536	1.375,0	80,5	736	132.595
	1.638	1.484,0	77,0	755	94.068
	1.720	1.574,0	73,0	755	68.244
	1.842	1.704,0	69,0	768	46.195
	1.944	1.812,0	66,0	778	34.019
	2.046	1.918,0	64,0	797	26.388
	2.160	2.038,0	61,0	804	19.237
	2.250	2.132,0	59,0	812	15.304
	2.453	2.331,0	61,0	916	13.682
	2.553	2.431,0	61,0	955	12.100
	2.658	2.535,5	61,0	995	10.697

JACKING LOAD Gj (tons)	OD (mm)	ID (mm)	e (mm)	Mass (kg/m)	SN (N/m²)
800	1.499	1.325,0	87,0	771	183.329
	1.536	1.357,0	89,5	813	185.648
	1.638	1.466,0	86,0	838	133.351
	1.720	1.558,0	81,0	834	94.601
	1.842	1.688,0	77,0	853	65.075
	1.944	1.797,0	73,5	863	47.552
	2.046	1.904,0	71,0	881	36.413
	2.160	2.024,0	68,0	893	26.917
	2.250	2.118,0	66,0	905	21.630
	2.453	2.319,0	67,0	1.004	18.267
	2.553	2.421,0	66,0	1.031	15.419
	2.658	2.525,5	66,0	1.074	13.628
	2.758	2.628,0	65,0	1.099	11.601
	2.858	2.728,0	65,0	1.140	10.399

JACKING LOAD Gj (tons)	OD (mm)	ID (mm)	e (mm)	Mass (kg/m)	SN (N/m²)
1000	1.842	1.658,0	92,0	1.011	107.881
	1.944	1.768,0	88,0	1.026	79.143
	2.046	1.878,0	84,0	1.035	58.269
	2.160	1.998,0	81,0	1.058	43.912
	2.250	2.092,0	79,0	1.077	35.777
	2.453	2.293,0	80,0	1.192	30.030
	2.553	2.401,0	76,0	1.182	22.638
	2.658	2.509,5	74,0	1.201	18.418
	2.758	2.614,0	72,0	1.215	15.096
	2.858	2.718,0	70,0	1.226	12.405
	2.962	2.822,0	70,0	1.271	11.114
	3.065	2.925,0	70,0	1.317	10.006

JACKING LOAD Gj (tons)	OD (mm)	ID (mm)	e (mm)	Mass (kg/m)	SN (N/m²)
1200	2.250	2.070,0	90,0	1.221	53.711
	2.453	2.275,0	89,0	1.321	41.822
	2.553	2.379,0	87,0	1.347	34.416
	2.658	2.487,5	85,0	1.373	28.273
	2.758	2.592,0	83,0	1.394	23.412
	2.858	2.698,0	80,0	1.396	18.718
	2.962	2.806,0	78,0	1.413	15.505
	3.065	2.913,0	76,0	1.427	12.884

JACKING LOAD Gj (tons)	OD (mm)	ID (mm)	e (mm)	Mass (kg/m)	SN (N/m²)
1400	2.758	2.574,0	92,0	1.540	32.208
	2.858	2.680,0	89,0	1.548	26.024
	2.962	2.788,0	87,0	1.571	21.718
	3.065	2.897,0	84,0	1.573	17.536



Design Acceptance Criteria:

** Nominal pressures for the jacking pipe and couplings are PN 1, PN 6 and PN 10.*
** Jacking force safety coefficient = 3.5*
** Ultimate compressice strength = 85 N/mm²*
** Pipe wall thicknesses and stiffness values are calculated theoraticlly. All the values are obtained by calculations, and may differ from the actual product owing to the production tolerances.*
** SUPERLIT, as the manufacturer, may change the technical data without prior notice.*

You can contact us at sales@superlit.com for dimensions, jacking forces and other technical data.

GRP Coupling & FW Jacking Pipe Data Sheet

(Stiffness Base)

OD (mm)	PIPE STIFFNESS SN (N/m²)																							
	20 000				32 000				40 000				50 000				64 000				80 000			
	ID	e	Mass	F max	ID	e	Mass	F max	ID	e	Mass	F max	ID	e	Mass	F max	ID	e	Mass	F max	ID	e	Mass	F max
	mm	mm	kg / m	kN	mm	mm	kg / m	kN	mm	mm	kg / m	kN	mm	mm	kg / m	kN	mm	mm	kg / m	kN	mm	mm	kg / m	kN
345	323,0	11,0	23	11	323,0	11,0	23	11	321,8	11,6	24	24	319,4	12,8	27	50	317,2	13,9	29	74	315,2	14,9	31	96
376	352,6	11,7	27	17	352,6	11,7	27	17	350,6	12,7	29	41	348,0	14,0	32	72	345,8	15,1	34	98	343,6	16,2	37	124
427	404,0	11,5	30	12	400,4	13,3	35	62	398,0	14,5	38	95	395,4	15,8	41	130	392,8	17,1	44	166	390,2	18,4	47	201
478	452,2	12,9	38	59	448,0	15,0	44	124	445,6	16,2	47	161	442,6	17,7	51	207	440,8	18,6	54	234	436,8	20,6	59	294
515	487,2	13,9	44	98	482,8	16,1	50	171	480,0	17,5	55	217	476,8	19,1	59	270	474,6	20,2	63	305	470,4	22,3	69	374
530	501,6	14,2	46	111	497,0	16,5	53	190	494,0	18,0	58	241	490,8	19,6	63	295	487,4	21,3	68	352	484,4	22,8	73	402
550	520,4	14,8	50	137	515,7	17,2	57	220	513,0	18,5	62	268	509,2	20,4	68	335	505,8	22,1	73	394	502,6	23,7	78	449
618	584,8	16,6	63	276	579,5	19,3	72	382	576,0	21,0	79	451	572,2	22,9	86	526	568,4	24,8	92	601	565,0	26,5	98	667
650	615,0	17,5	70	277	609,0	20,5	81	403	606,0	22,0	87	466	601,8	24,1	95	553	597,8	26,1	102	635	594,0	28,0	109	713
718	679,6	19,2	84	387	673,0	22,5	98	540	669,6	24,2	105	619	664,8	26,6	115	728	660,4	28,8	125	829	656,0	31,0	134	928
760	718,0	21,0	97	454	712,6	23,7	110	587	708,8	25,6	118	679	703,6	28,2	130	805	699,0	30,5	140	916	694,4	32,8	150	1.026
820	776,0	22,0	110	485	769,0	25,5	127	670	764,6	27,7	138	786	759,2	30,4	151	927	754,0	33,0	163	1.062	749,4	35,3	174	1.181
860	814,0	23,0	121	566	806,0	27,0	141	788	802,0	29,0	151	898	796,4	31,8	165	1.052	790,8	34,6	179	1.204	785,8	37,1	192	1.340
924	874,0	25,0	141	730	866,0	29,0	163	969	862,0	31,0	174	1.087	855,6	34,2	191	1.276	850,0	37,0	206	1.440	844,0	40,0	222	1.614
960	908,0	26,0	153	822	900,0	30,0	175	1.070	895,0	32,5	189	1.224	889,0	35,5	206	1.408	883,0	38,5	223	1.590	877,0	41,5	239	1.771
1.026	971,0	27,5	172	981	962,0	32,0	200	1.279	957,0	34,5	215	1.444	950,0	38,0	236	1.673	943,6	41,2	255	1.881	938,0	44,0	271	2.062
1.099	1.046,0	29,5	198	1.196	1.030,0	34,5	231	1.552	1.025,0	37,0	247	1.728	1.017,6	40,7	270	1.987	1.011,0	44,0	292	2.217	1.004,0	47,5	314	2.459
1.127	1.066,6	30,2	208	1.279	1.056,2	35,4	243	1.658	1.051,0	38,0	260	1.846	1.043,0	42,0	286	2.134	1.036,6	45,2	307	2.362	1.029,8	48,6	329	2.603
1.229	1.163,0	33,0	248	1.624	1.153,0	38,0	284	2.021	1.146,0	41,5	309	2.297	1.138,0	45,5	338	2.611	1.130,2	49,4	366	2.914	1.123,0	53,0	391	3.193
1.290	1.220,0	35,0	276	1.875	1.209,0	40,5	318	2.334	1.202,4	43,8	343	2.607	1.194,4	47,8	373	2.936	1.186,6	51,7	402	3.254	1.178,4	55,8	432	3.587
1.348	1.275,0	36,5	301	2.094	1.264,0	42,0	344	2.573	1.257,0	45,5	372	2.876	1.248,0	50,0	408	3.263	1.240,0	54,0	439	3.605	1.231,6	58,2	471	3.961
1.399	1.323,4	37,8	323	2.295	1.311,4	43,8	373	2.837	1.304,2	47,4	402	3.160	1.295,0	52,0	440	3.571	1.286,6	56,2	474	3.943	1.278,2	60,4	508	4.312
1.434	1.357,0	38,5	337	2.420	1.344,0	45,0	393	3.022	1.337,0	48,5	422	3.344	1.327,6	53,2	461	3.774	1.318,8	57,6	498	4.173	1.310,0	62,0	534	4.570
1.499	1.418,6	40,2	368	2.699	1.405,0	47,0	429	3.358	1.398,0	50,5	459	3.695	1.388,0	55,5	503	4.173	1.379,0	60,0	542	4.600	1.369,0	65,0	585	5.071
1.536	1.453,4	41,3	388	2.413	1.439,6	48,2	450	3.098	1.432,0	52,0	485	3.472	1.422,0	57,0	529	3.962	1.412,0	62,0	574	4.448	1.402,0	67,0	618	4.931
1.638	1.550,0	44,0	440	2.757	1.536,0	51,0	508	3.499	1.527,0	55,5	552	3.972	1.516,0	61,0	604	4.546	1.506,4	65,8	650	5.044	1.496,0	71,0	699	5.579
1.720	1.628,0	46,0	484	3.240	1.612,0	54,0	565	4.130	1.603,2	58,4	609	4.615	1.592,0	64,0	666	5.229	1.582,0	69,0	715	5.774	1.572,0	74,0	765	6.315
1.842	1.743,0	49,5	557	3.898	1.726,0	58,0	650	4.910	1.717,0	62,5	698	5.442	1.705,0	68,5	763	6.146	1.694,0	74,0	822	6.788	1.683,0	79,5	880	7.425
1.944	1.839,4	52,3	621	4.476	1.822,0	61,0	721	5.569	1.812,0	66,0	778	6.193	1.800,0	72,0	846	6.937	1.787,0	78,5	920	7.737	1.774,0	85,0	992	8.531
2.046	1.936,0	55,0	688	5.079	1.918,0	64,0	797	6.269	1.907,0	69,5	863	6.991	1.894,0	76,0	940	7.839	1.882,0	82,0	1.011	8.617	1.870,0	88,0	1.082	9.389
2.160	2.044,0	58,0	766	5.794	2.026,0	67,0	881	7.051	2.014,0	73,0	957	7.883	2.000,0	80,0	1.045	8.847	1.987,0	86,5	1.126	9.736				
2.250	2.129,0	60,5	832	6.410	2.110,0	70,0	958	7.792	2.097,0	76,5	1.044	8.730	2.083,0	83,5	1.136	9.734	2.069,6	90,2	1.223	10.689				
2.453	2.321,0	66,0	989	6.977	2.300,0	76,5	1.142	8.642	2.286,0	83,5	1.243	9.743	2.273,0	90,0	1.336	10.760								
2.553	2.416,0	68,5	1.069	7.687	2.393,0	80,0	1.242	9.584	2.379,0	87,0	1.347	10.731	2.369,0	92,0	1.422	11.545								
2.658	2.515,0	71,5	1.161	8.531	2.493,0	82,5	1.334	10.421	2.478,0	90,0	1.451	11.700												
2.758	2.610,0	74,0	1.247	9.314	2.586,6	85,7	1.438	11.400																
2.858	2.704,0	77,0	1.345	10.221	2.680,4	88,8	1.544	12.402																
2.962	2.803,0	79,5	1.439	11.088																				
3.065	2.901,0	82,0	1.536	11.986																				

Design Acceptance Criteria:

** Nominal pressures for the jacking pipe and couplings are PN 1, PN 6 and PN 10.*
** Jacking force safety coefficient = 3.5*
** Ultimate compressice strength = 85 N/mm²*
** Pipe wall thicknesses and stiffness values are calculated theoraticlly. All the values are obtained by calculations, and may differ from the actual product owing to the production tolerances.*
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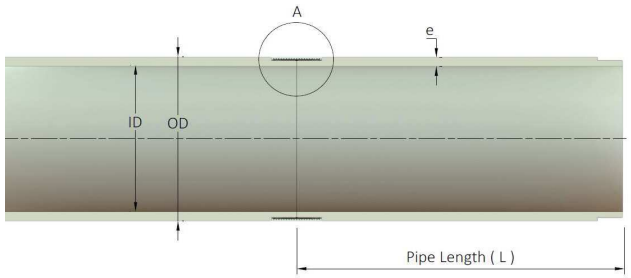
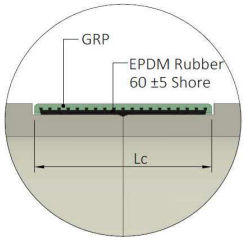
OD (mm)	PIPE STIFFNESS SN (N/m²)																									
	100 000				128 000				160 000				200 000				320 000				640 000				1 000 000			
	ID	e	Mass	F max	ID	e	Mass	F max	ID	e	Mass	F max	ID	e	Mass	F max	ID	e	Mass	F max	ID	e	Mass	F max	ID	e	Mass	F max
	mm	mm	kg / m	kN	mm	mm	kg / m	kN	mm	mm	kg / m	kN	mm	mm	kg / m	kN	mm	mm	kg / m	kN	mm	mm	kg / m	kN	mm	mm	kg / m	kN
345	312,6	16,2	33	124	310,0	17,5	36	152	306,8	19,1	39	186	304,0	20,5	42	215	296,8	24,1	49	289								
376	340,8	17,6	40	157	338,0	19,0	43	190	334,4	20,8	46	232	331,0	22,5	50	270	323,4	26,3	58	356	311,0	32,5	70	491	301,6	37,2	79	589
427	387,0	20,0	51	243	384,0	21,5	55	283	379,8	23,6	60	338	376,0	25,5	64	387	367,4	29,8	74	497	353,2	36,9	90	672	342,4	42,3	102	801
478	433,2	22,4	64	348	429,6	24,2	69	401	425,0	26,5	75	469	421,0	28,5	80	527	411,2	33,4	93	667	395,4	41,3	113	885	383,4	47,3	128	1.046
515	466,6	24,2	75	435	462,8	26,1	80	495	457,4	28,8	88	581	453,6	30,7	93	640	443,0	36,0	108	803	426,0	44,5	131	1.056	413,0	51,0	149	1.244
530	480,4	24,8	79	468	476,4	26,8	85	534	471,2	29,4	92	618	467,0	31,5	99	686	456,0	37,0	115	860	438,4	45,8	139	1.130	425,0	52,5	157	1.329
550	498,4	25,8	85	521	494,2	27,9	91	593	489,0	30,5	100	681	484,8	32,6	106	751	473,0	38,5	124	945	455,0	47,5	150	1.231	441,0	54,5	170	1.446
618	560,0	29,0	107	763	555,2	31,4	116	855	549,6	34,2	125	961	544,6	36,7	134	1.055	531,6	43,2	156	1295	511,0	53,5	190	1.664	496,0	61,0	213	1.923
650	589,0	30,5	119	814	584,0	33,0	128	915	578,0	36,0	139	1.035	572,8	38,6	148	1.137	559,2	45,4	172	1401	537,6	56,2	210	1.808	521,4	64,3	237	2.102
718	651,0	33,5	144	1.040	645,2	36,4	156	1.169	638,0	40,0	170	1.328	632,8	42,6	181	1.441	617,6	50,2	211	1767	594,0	62,0	255	2.258	576,0	71,0	288	2.619
760	688,8	35,6	162	1.159	682,8	38,6	175	1.300	675,0	42,5	192	1.482	669,6	45,2	203	1.606	653,8	53,1	236	1965	628,8	65,6	286	2.515	609,4	75,3	324	2.928
820	743,0	38,5	189	1.345	736,8	41,6	203	1.502	729,2	45,4	221	1.694	722,4	48,8	236	1.863	705,4	57,3	274	2279	678,0	71,0	334	2.930	658,0	81,0	376	3.388
860	779,6	40,2	207	1.506	773,0	43,5	223	1.682	764,4	47,8	244	1.909	758,0	51,0	259	2.076	740,0	60,0	301	2539	711,0	74,5	368	3.261				
924	837,2	43,4	240	1.810	830,2	46,9	258	2.010	821,6	51,2	281	2.254	814,0	55,0	300	2.467	795,0	64,5	348	2992	764,0	80,0	424	3.821				
960	869,8	45,1	259	1.987	862,8	48,6	278	2.195	853,6	53,2	303	2.466	845,6	57,2	324	2.699	826,0	67,0	376	3261	794,0	83,0	457	4.151				
1.026	930,0	48,0	295	2.318	922,0	52,0	318	2.572	912,0	57,0	347	2.887	904,0	61,0	370	3.136	882,4	71,8	430	3798								
1.099	995,8	51,6	339	2.740	988,2	55,4	363	2.999	977,0	61,0	398	3.377	968,6	65,2	423	3.657	945,4	76,8	493	4419								
1.127	1.021,2	52,9	357	2.906	1.013,0	57,0	383	3.192	1.002,0	62,5	418	3.572	992,6	67,2	447	3.894	969,4	78,8	519	4675								
1.229	1.114,0	57,5	423	3.538	1.104,6	62,2	456	3.896	1.093,0	68,0	496	4.333	1.082,6	73,2	531	4.722												
1.290	1.169,0	60,5	467	3.966	1.160,0	65,0	500	4.325	1.147,0	71,5	547	4.840	1.136,0	77,0	587	5.271												
1.348	1.221,6	63,2	510	4.382	1.211,0	68,5	550	4.824	1.198,0	75,0	600	5.361	1.187,0	80,5	641	5.812												
1.399	1.267,8	65,6	549	4.767	1.257,0	71,0	592	5.235	1.243,0	78,0	647	5.835	1.232,0	83,5	690	6.302												
1.434	1.299,2	67,4	578	5.054	1.289,0	72,5	620	5.507	1.274,8	79,6	677	6.131	1.264,0	85,0	720	6.602												
1.499	1.359,0	70,0	628	5.539	1.348,0	75,5	675	6.050	1.333,0	83,0	738	6.740	1.321,0	89,0	788	7.287												
1.536	1.392,0	72,0	662	5.411	1.380,0	78,0	714	5.981	1.366,0	85,0	775	6.641																
1.638	1.485,0	76,5	750	6.142	1.472,0	83,0	811	6.802	1.460,0	89,0	866	7.405																
1.720	1.559,0	80,5	829	7.013	1.546,0	87,0	892	7.706																				
1.842	1.670,0	86,0	948	8.173																								





Detail A

Design Acceptance Criteria:

** Nominal pressures for the jacking pipe and couplings are PN 1, PN 6 and PN 10.*
** Jacking force safety coefficient = 3.5*
** Ultimate compressice strength = 85 N/mm²*
** Pipe wall thicknesses and stiffness values are calculated theoraticlly. All the values are obtained by calculations, and may differ from the actual product owing to the production tolerances.*
** SUPERLIT, as the manufacturer, may change the technical data without prior notice.*

You can contact us at sales@superlit.com for dimensions, jacking forces and other technical data.

Relining Pipes

The relining model also does not require excavation.
In order to renew the old pipelines, new GRP pipes are installed by inserting them inside the existing pipes.

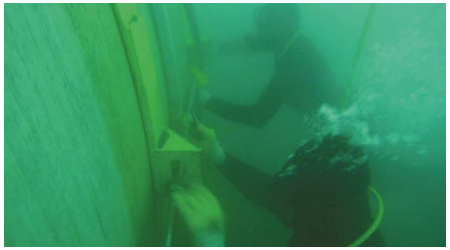
MARINE-LUG®
SYSTEM

Patented special Marine-Lug®, which has been designed by SUPERLIT engineers, is an underwater pipe mounting system for installing large diameter pipes.

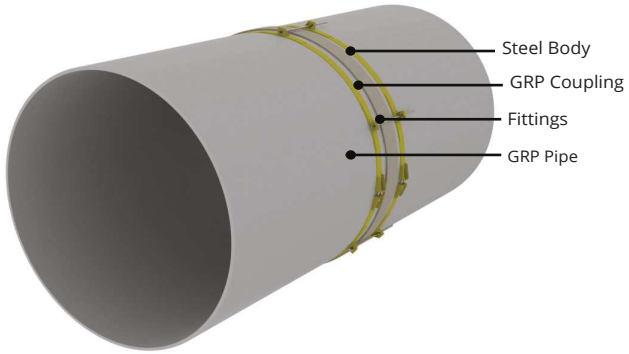
It facilitates the assembly of pipes underwater; it keeps the pipes stable until backfilling completed.

The rapid and easy installation of the newly designed Marine-Lug® can stay underwater for a limited period of time.

With the Marine-Lug® complete the installation of the pipes without taking life threatening risks, high productivity is ensured with low costs.



- Lugs located on the steel body
- Rotatable (easy to align lug holes)
- Can be removed after pipe installation
- Mounting capability as well as rapid and easy manufacturing



PERFORMANCE STANDARDS

Standards developed by EN, ISO, AWWA, and ASTM cover a series of glassfiber reinforced pipe applications including conveyance of water, domestic wastewater and chemical substances. The common ground of all these standards is that all are performance-based. In other words, the performance tests required for the GRP pipe are defined in these standards. These standards include many quality control and performance tests.

1 EN:

This product standard is applicable for GRP pipes that have the diameter of 50 mm - 4000 mm, and that are used for water and wastewater conveyance applications. SUPERLIT GRP pipes meet the requirements of this standard.

- ISO 23856 water supply, drainage and sewerage with or without pressure
- EN 1796 for water supply with or without pressure
- EN 14364 for drainage and sewerage with or without pressure

2 ISO:

This product standard is applicable for GRP pipes that have the diameter range of 50 mm - 4000 mm, and used for water and wastewater conveyance applications.It includes efficiency testing and complete product testing for pipes and couplings. It includes pipes of various stiffness clasifications up to an operating pressure of 32 bar. SUPERLIT GRP pipes meet the requirements of this standard.

- ISO 25780 water supply, drainage and sewerage with or without pressure
- ISO 10467 for pressure and non-pressure drainage and sewerage
- ISO 10639 for pressure and non-pressure water supply
- ISO 10465 for installation procedures

3 AWWA:

AWWA is one of the comprehensive standards applicable for glassfiber pipes.

Within this standarts, there are compherensive specifications focusing on quality control and performance tests for the pipes and their joints that are used in pressure water pipeline applications. SUPERLIT GRP pipes are designed to meet the performance requirements of this standard.

Design principles of GRP pipes installed underground and aboveground are defined in the AWWA M45 standard.

- AWWA C950 for fiberglass pressure pipes. Refers to clean water conveyance.
- AWWA M45 guide for fiberglass pipe design.

4 ASTM:

There are various ASTM product standards used for various glassfiber reinforced pipe applications.

- ASTM D3262 for fiberglass sewer pipe. Refers to non-pressure wastewater conveyance.
- ASTM D3517 for fiberglass pressure pipe. Refers to clean water conveyance.
- ASTM D3754 for fiberglass sewer and industrial pressure pipe.

QUALITY CONTROL AND PERFORMANCE TESTS

Quality Control

Circumferential and axial load bearing capacities of the manufactured pipes are proven by routine tests. In addition, the structure and composition of the pipe is checked and verified by tests.

Controls during manufacturing phase

- Raw material control tests
- Barcol hardness
- Wall thickness measurement
- Pipe length measurement
- Outer diameter measurement
- Hydrostatic pressure test

Controls performed on samples

- Pipe stiffness

Being a physical property of the pipe, the specific stiffness is a measure of strength against ring deformation under external loads. Initial ring stiffness is the value obtained in N/m2 that is calculated by the formula below, when the pipe is tested in accordance with ISO 7685 and EN 1228, by applying a deflection of approximately 3%.

$$S_o = F*f / L*y$$
$$f = (1860+(2500*y/dm))/100000$$

S_o : Stiffness; N/m²
F : Applied Force; N
f : Deflection Factor
L : Sample Length; m
y : Vertical Deflection; m
dm : Average Diameter ; m

Non-destructive deflection test with no structural damage

When the pipe sample is tested in accordance with ISO 10466, by implementing the following nominal defletions, it should meet the conditions in the table below.

Nominal Stiffness (SN), N/m2	2500	5000	10000
Specific ring deflection in which defects on the surface have not occurred, %	14,3	11,3	9
Specific ring deflection in which structural defect has not occurred, %	23,9	18,9	15

Hoop tensile strength

When the samples that are cut out from the pipe are tested as per ISO 8521 and EN 1394, the results should comply with the minimum rating tables ranking in the international standards.

Axial tensile strength

When the samples that are cut out from the pipe in an axial direction are tested as per ISO 8513 and EN 1396, the results should comply with the minimum rating tables ranking in the international standards. SUPERLIT GRP pipe manufacturing technology comprises a detailed quality control program. Compliance of the pipes and fittings production and their tests to international and local standarts is ensured by this program.

Quality Control Tests

Before manufacturing, the raw material is tested. Tests aim to check the compliance to the standards of the raw materials and products (pipe, coupling and fittings) manufactured. A hydrostatic pressure test simulating the operating conditions is applied to pipes with flexible connections and having diameters between 50 mm - 4000 mm.

Measured Properties	Acceptance Criteria
Pipe Wall Thickness	Wall thickness should not be less than the declared value
Pipe Length	+/- 60 mm
Pipe Diameter	EN1796, EN14364, ISO10639, ISO10467 AWWA C950(complying with the related tables of outer diameter series (Serie-B))
Pipe Hardness	Minimum 33 Barcol
Pipe Stiffness	As per EN 1228, ISO 7685, ASTM D2412
Axial Tensile Strength	As per EN 1393, ISO 8513 standards
Pipe Hoop Tensile Strength	As per EN 1394, ISO 8521 standards
Loss on Ignition Test	As per ASTM D2584 standard

Performance Tests

Coupling Performance Test

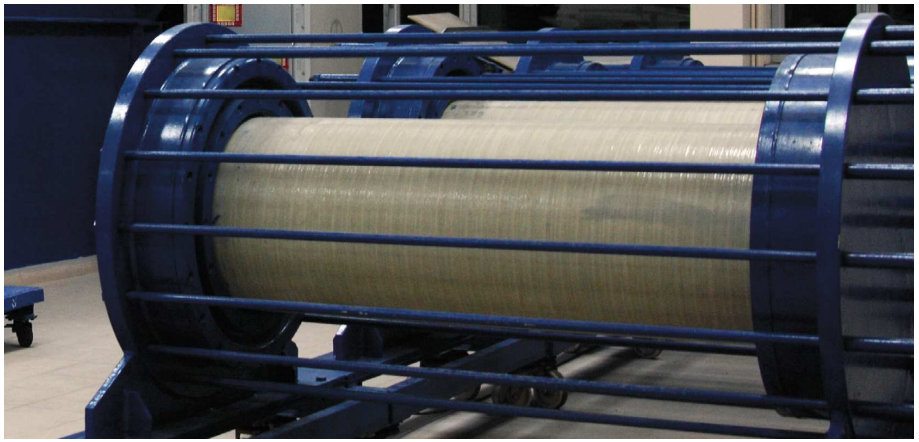
Couplings are tested under the conditions specified in EN1119, ISO8639 and ASTM D4161 standart to verify their performance.

Long-Term Tests

- Hydrostatic desing basis(HBD)
- Stress-Corrosion test
- Long-term ring stiffness(under wet condition)
- Long-term ring deflection test

Long-term tests, that take at least 10.000 hours, are performed to generate the design values and to maintain the extra polation. In other words, the required physical parameters for a defined nominal 50-year desgn period are designeted by using the ISO 10928 methods. In general, a minimum of eighteen samples are prepared and used to obtain a series of data spread over the duration of the test.

By using the least squares method, a logarithmic regression graphic is constituted from the test data. Performance values, corresponding to 50 years of service life for GRP pipes, should comply with the tables in the international standards.



SUPERLIT

GRP

Glass Fiber Reinforced Polyester
Pipes and Fittings

Authorized Distributor :

PT SAMIPLAST JOYO MANDIRI

UPVC | CPVC | PPH | PVDF | Pipes, Fittings & Valves

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