JACKING PIPES

GLASSFIBER REINFORCED PLASTICS (GRP)

Strong, Superior, Sustainable

subor®

*Make a **Good Start***

SUBOR:
A GLOBAL AND RELIABLE SOLUTION PARTNER

SUBOR is a pioneer company in Glassfiber Reinforced Plastic (GRP) pipes manufacturing, founded in 1996. Having the privilege of using the Advanced Continuous Filament Winding Technology over 20 years, SUBOR offers long-term solutions for various infrastructure applications with its wide variety of product and service portfolio. As a reputable brand name with successful references in 5 continents and over 50 countries since its establishment, SUBOR continues to improve its global presence to enhance the quality of people's lives.

JAROCIN POLAND
JACKING PROJECT

WHY **SUBOR?**

PRESENCE IN 5 CONTINENTS
Reliable and long-life piping solutions enable civilizations in different territories to reach clean water and energy.

EXPERIENCE
More than 10.000 km of SUBOR Pipes in various applications are serving the development of humankind, worldwide.

FIELD SERVICE
By aiming to extend the service life of the pipe system with the correct installation in a cost-effective way, SUBOR is providing site supervision service all over the world ensuring the conformity with the technical specifications and standards.

ENGINEERING AND R&D
SUBOR's in-house engineering department delivers the design works and calculations according to piping principles in each project, develops researches and innovates new products.

HIGH PRODUCTION CAPACITY
With an installed manufacturing capacity of over 1.000 km pipes per year, SUBOR is one of the world's leading GRP pipe producers.

EFFICIENT USE OF TRANSPORTATION
Wide experience in cost-efficient transportation solutions by means of truck, container, bulk-shipment, train and their combinations, together with the lightweight of GRP pipes enable the end-user to reach attractive freight charges globally.

WIDE RANGE OF PRODUCTS IN PIPE SYSTEMS
SUBOR provides accurate solutions for a wide variety of projects by manufacturing pipes in a range between 200 mm and 4000 mm in diameter, up to 40 bar pressure and 1.000.000 N/m^2 stiffness.

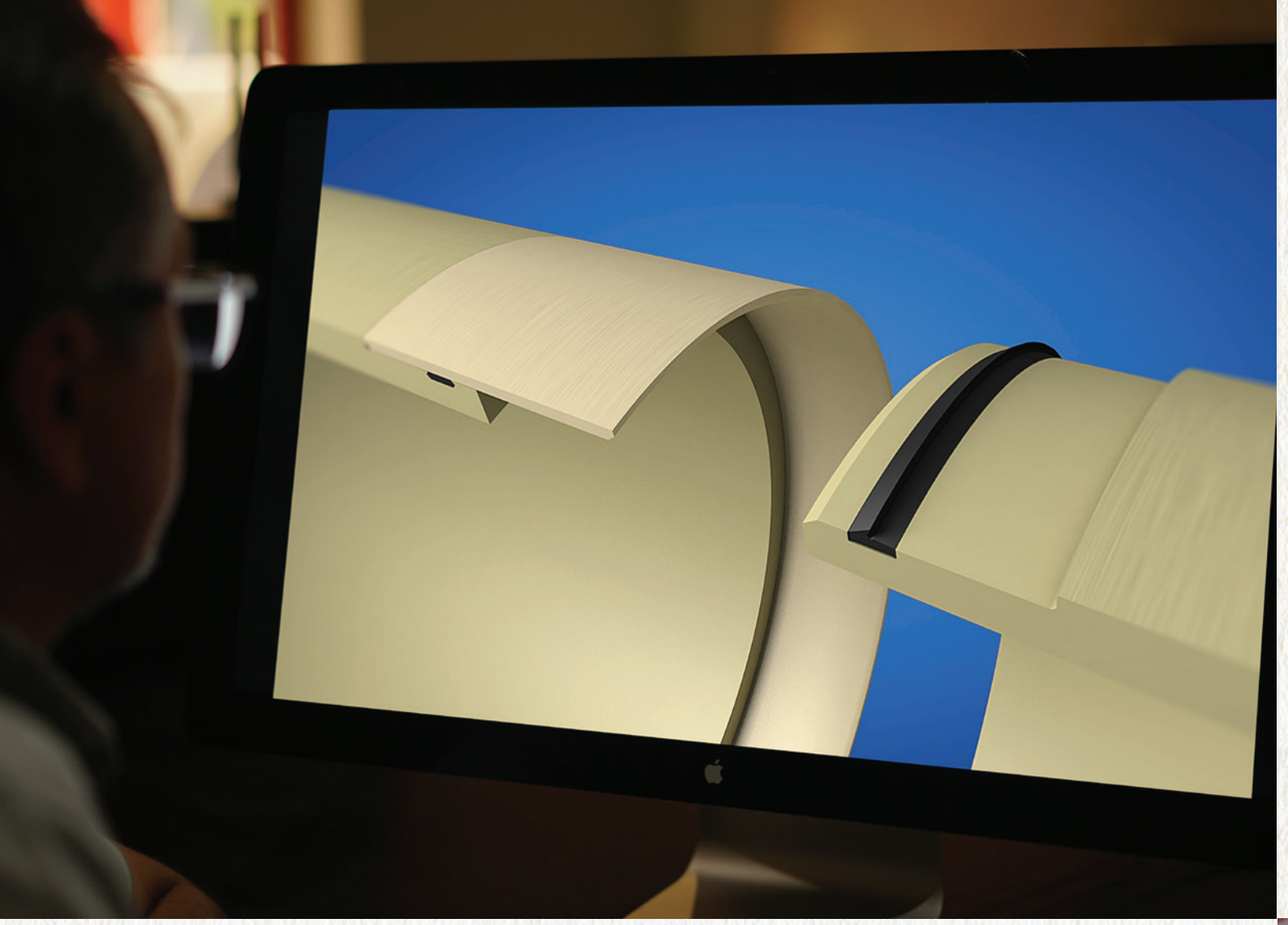
NON-CORROSIVE MATERIALS
Corrosion, the major environmental risk imposed by pipeline projects is not a problem with GRP pipes. When it comes to long term use, GRP is your go-to option for both environmental and financial impact.

ENVIRONMENT FRIENDLY
By aiming to leave a better world to the future, SUBOR accepts the principle of respecting the environment and nature in all of its processes within the awareness of environmental responsibility.

QUALITY ASSURANCE
SUBOR GRP Pipes are designed and tested in compliance with the world's fundamental and acknowledged standards such as AWWA, ASTM, ISO, EN, DIN, BS.

PROJECT FINANCE
SUBOR provides soft loan by international Export Credit Agencies to projects in order to accelerate the investment return.

SUSTAINABLE INVESTMENT
Having a very low carbon footprint due to their high level of material efficiency, SUBOR GRP products are the best choice for the environment, compared to conventional pipe technologies.



GRP:
A SOLID CHOICE FOR LONG SERVICE LIFE

SUBOR's approach is to have a more sustainable business to undertake today's projects for future generations' needs. Sustainable development must consider the effects it has on the economy, society, and environment as a whole. SUBOR, as a pipe manufacturer calculates the influence of its outputs on these elements at every step of its decision-making process for a sustainable business.

The superior properties of GRP in terms of excellent hydraulic characteristics resulting in higher energy productivity and less pumping energy, high efficient production and transportation methods together with its long life cycle enable SUBOR to offer the utmost quality with better sustainability to the future. As a result of having very low environmental impact compared to conventional pipe technologies due to its high level of material efficiency, SUBOR GRP products have low carbon footprint and offer the best choice for the environment.

OUR ENGINEERING SERVICES:
SUCCESS IS TEAMWORK

SUBOR provides engineering support to the customers before and after the procurement phase to ensure correct and efficient use of the products and technology offered with its in-house expert engineers by looking out for their maximum benefit.

- Stress and Flexibility Analysis of pipelines and stress isometric drawings
- Engineering drawings
  - Piping layout and isometric drawings• GRP component shop drawings
  - Conceptual support and clamp drawings
  - Connection detail with different materials
  - Calculation of pipe anchoring and support requirements
- Calculation of pipe anchoring and support requirements
- Calculation of concrete thrust blocks
- GRP tank, silo, manhole and spool design
- Buried pipe design
- Hydraulic & static calculations

JACKING PIPES
INNOVATIVE SOLUTION FOR URBAN AREAS

Jacking Pipes provide innovative solution with no need of excavation.

Installation works by this method can be carried out easily in urbanized areas without any surface disruption.

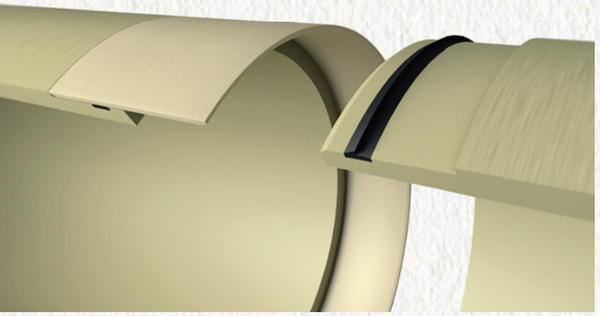
HERFORD GERMANY
JACKING PROJECT

SUBOR Jacking Pipes can be manufactured in any diameter **within the range of DN300 - DN4000**.

JACKING
SUPERIOR FEATURES

- Trenchless technology
- Adjustable pipe design
- Custom length and diameters
- High axial compressive strength
- Extra lightweight for easy lowering into the shaft
- Long service life
- Corrosion/abrasion resistance
- Superior hydraulic properties
- High UV resistance
- High chemical resistance
- High load capacity
- Simple handling
- Numerous fittings
- Fast and easy installation

JOINT TYPES



SGR JOINT

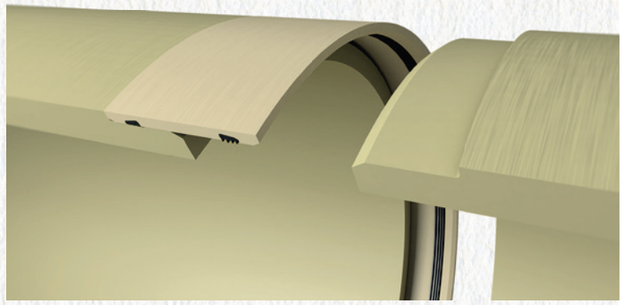
- Includes a GRP sleeve with EPDM rubber gasket that fits into the grooves in the pipe spigots.
- Suitable for use in pressure and non-pressure applications.
- Can be produced in any diameter to suit your project and installation needs.

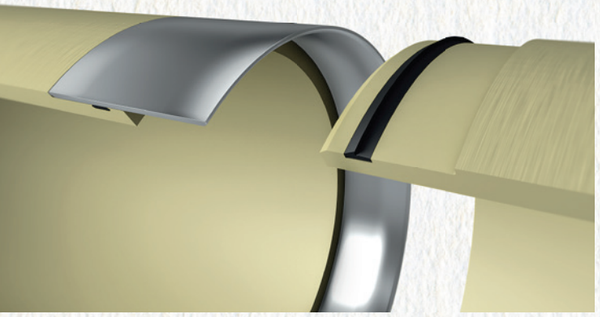
MAX. PN: 6 BAR

SPC JOINT

- Includes a GRP pressure coupling design.
- Suitable for use in pressure applications.
- Suitable for installations with lower jacking forces.

MAX. PN: 16 BAR





SSR JOINT

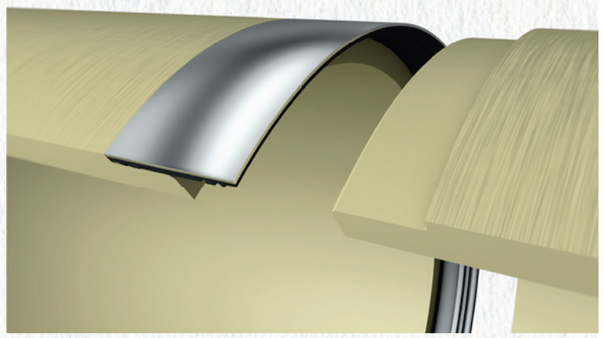
- Includes a stainless steel sleeve whose inner surface fits tightly to the EPDM rubber gasket in the groove on the pipe spigot.
- Suitable for pressure and non-pressure applications.
- Often preferred for smaller diameter pipes.

MAX. PN: 6 BAR

SSE JOINT

- Includes a stainless steel sleeve with an integrated EPDM rubber seal.
- Suitable for pressure and non-pressure applications.
- Resistant to high jacking forces during installation.

MAX. PN: 10 BAR



SUBOR JACKING PIPE SYSTEM

SUBOR GRP Jacking Pipes can be produced in standard diameter range, as well as in special diameters according to project requirements.

GROUT AND LUBRICATION INJECTION PORT

For easier installation, the pipe can be produced with grout and lubrication injection ports, which contain an insert, check valve and stopper. Usually manufactured in 25 mm diameter, but can be also produced in any required size.

TRAILING PIPE

The trailing pipe is located in an intermediate jacking station assembly, after the leading pipe, with an intermediate jacking station in between.

JACKING PIPE COUPLING

The outer diameter of jacking pipe coupling is equal to the outer diameter of the pipe. Different types of couplings are available according to application requirements.

LEADING PIPE

For intermediate jacking station arrangements, the movable structure of the leading pipe is utilized. The structure of the leading pipe is designed with a groove on one end so that it moves in accordance with the extension and retraction movements that may occur in the intermediate jacking station during assembly.

TRENCHLESS
TECHNOLOGY

SUBOR is offering an innovative and reliable solution for urban areas by special design jacking pipes. SUBOR Jacking Pipes are used for the construction and renovation of underground pipelines using trenchless methods.

MICRO-TUNNELING &
SLIP-LINING

High axial compressive strength of jacking pipes provides significant advantages compared to other pipe materials for micro tunneling and slip-lining applications.

BEST CHOICE
FOR URBAN AREAS

SUBOR Jacking Pipes are preferred in the construction of new sewer and pressure pipelines, replacement of old sewers, road culverts in transport engineering and relining using the micro-tunneling and slip-lining methods.

CUSTOMIZED
PRODUCTS

Depending on the project requirements, SUBOR Jacking Pipes are designed in custom lengths, with different joining types and up to 1.000.000 N/m² nominal stiffness.

EFFICIENT CHOICE FOR
ENGINEERS & INSTALLERS

Compared to conventional pipe materials, SUBOR GRP Pipes enable installer to use smaller capacity jacking machines, to minimize the excavation volume, to reduce energy consumption and to increase installation speed.

QUALITY MANAGEMENT SYSTEM

SUBOR's approach to the quality concept is not limited to the production process and its product. The management mindset of SUBOR in all activities is an insight that considers the satisfaction of all stakeholders, especially customers and adopts environmental awareness, occupational health and safety, and information security as the fundamental policy.

Establishing its management systems on these foundations, SUBOR has obtained **ISO 9001 Quality**, **ISO 14001 Environment**, **OHSAS 18001 Occupational Health and Safety**, **ISO 17025 Testing and Calibration Laboratories** and **ISO 27001 Information Security Management Systems** certificates as a result of the audits of international institutions.

STANDARDS AND QUALITY

ISO 25780	Plastics piping systems for pressure and non-pressure water supply, irrigation, drainage or sewerage – Glass reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin – Pipes with flexible joints intended to be installed using jacking techniques.
ISO 10467	Plastics piping systems – Glass reinforced thermoplastics (GRP) systems based on unsaturated polyester (UP) resin: Pressure and non-pressure drainage and sewerage.
ISO 10639	Plastics piping systems – Glass reinforced thermoplastics (GRP) systems based on unsaturated polyester (UP) resin: Pressure and non-pressure water supply.
EN 1796	Plastics piping systems for water supply with or without pressure – Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP).
NS-EN 14364	Plastics piping systems for drainage and sewerage with or without pressure - Glass-reinforced thermosetting plastic (GRP) based on unsaturated polyester resin (UP) – Specifications for pipes, fittings and joints“.
ASTM D3262	Standard Specification for Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.

TECHNICAL DATA FOR GRP JACKING PIPE

MAIN MATERIALS	Resin, glass fibre, silica sand
MATERIAL DENSITY	1800 - 2200 kg/m³
LONGITUDINAL COMPRESSIVE STRENGTH	min 90 MPa
HOOP FLEXURAL MODULUS	12.000 - 18.000 MPa
AXIAL MODULUS	7.000 - 9.000 MPa
OPERATING TEMPERATURES	-50 °C / +70 °C
CORROSION PROTECTION	Not required
ABRASION RESISTANCE	Abrasion resistant liner, water jet cleaning

PIPE CLASSIFICATION

STANDARD DIAMETER RANGE (OD)	300 - 4.000 mm
STIFFNESS RANGE (SN)	10.000 - 1.000.000*
PRESSURE RANGE (PN)	up to 16 bar
ALLOWABLE JACKING FORCE	up to 18.000 kN*

*Please get in contact with SUBOR for further information.

JACKING PIPES
BEST CHOICE FOR TRENCHLESS APPLICATIONS

SUBOR offers the product you need for urban projects with Jacking Pipe that enables trenchless technology.

Jacking Pipes are preferred in the areas where it is inapplicable to open trench excavations, without disrupting the surface condition.

TECHNICAL SPECIFICATION OF
SUBOR JACKING PIPE

Pipe Structure
SUBOR Jacking Pipes, manufactured using Continuous Filament Winding Technology, consist of different layers that form a sandwich structure.

Liner
Jacking Pipes have increased thickness and a resilient flexible liner that can resist water jet cleaning applications. While the liner provides high circumferential strength against internal pressure, chopped roving provides axial reinforcement and durability against external impacts.

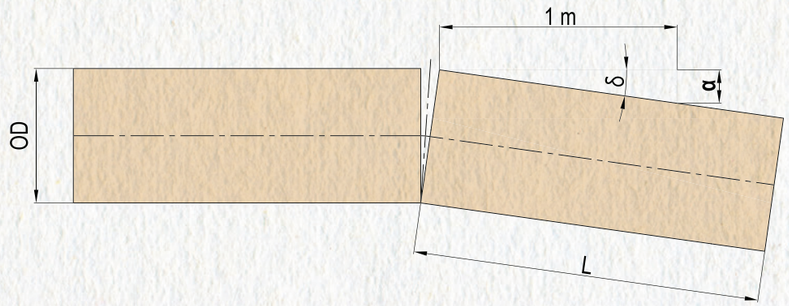
Structural Wall
To ensure optimum bending rigidity, the structural laminate consists of super-reinforced coatings separated by a compact, reinforced silica filled core. The structural wall consists of a resin system manufactured using a suitable unsaturated thermoset polyester resin.

ANGULAR DEFLECTION

In accordance with ISO 25780 GRP Jacking Pipes achieve a maximum allowable joint deflection as shown:

EXTERNAL DIAMETER OD (MM)	MAXIMUM ALLOWABLE INSTALLED DEFLECTION α (MM)	MAXIMUM ALLOWABLE INSTALLED DEFLECTION δ (DEGREES)
350 < OD ≤ 500	15	0.8594
500 < ≤ 1.000	10	0.5729
100 < OD	α = 10.000 / OD	Derive from α

ANGULAR DEFLECTION



δ Maximum angular deflection in degrees (°)
α Maximum angular deflection im millimeters per metre (mm/m)

REFERENCES

CROATIA	OD mm	PN bar	SN N/m²	L m
Aglomeracija Zapresic Project	1.499	1	100.000	134
Krizevci Botovo Project - 1	1.434	1	550.000	277
Krizevci Botovo Project - 2	616	1	1.000.000	154
Krizevci Botovo Project - 3	530	1	1.000.000	383
Krizevci Botovo Project - 4	324	1	640.000	315
Krizevci Botovo Project - 5	272	1	640.000	551

FRANCE	OD	PN	SN	L
Retubage FR64 Project	752	1	20.000	66

GERMANY	OD	PN	SN	L
Herford Werrestrasse Project - 1	1.099	1	48.000	74
Herford Werrestrasse Project - 2	860	1	83.000	54
Herford Werrestrasse Project - 3	650	1	189.000	130

ISRAEL	OD	PN	SN	L
Natanya Project	1.103	1	100.000	369
Ashkelon Robin Road Project	1.099	1	80.000	3.000
Yefet Road Tel Aviv Project	1.020	1	120.000	300
Ofakim Project	1.020	1	110.000	370
Ben Zvi Road Project - 1	1.020	3	100.000	670
Ashdod Project	1.020	1	85.000	144
Dolphin Haifa Project - 1	1.020	1	50.000	60
Ashkelon Menachem Begin Blvd. Project	760	1	180.000	90
Dolphin Haifa Project - 2	760	1	85.000	77
Hashmonaim Project	650	1	200.000	200
Nes Ziona Project	650	1	200.000	50
Ben Zvi Road Project - 2	560	3	70.000	300

NEW ZEALAND	OD mm	PN bar	SN N/m²	L m
Swaffield & Aotea Wastewater Project - 1	960	1	65.000	100
Swaffield & Aotea Wastewater Project - 2	705	1	300.000	150
Swaffield & Aotea Wastewater Project - 3	501	10	368.000	100

POLAND	OD	PN	SN	L
Jarocin Project	3.000	1	32.000	204
Kornik Project - 1	752	1	100.000	2.016
Lublin Project - 1	650	1	100.000	112
Kornik Project - 2	616	1	128.000	86
Lublin Project - 2	550	1	100.000	64
Lodz Droga G Project - 1	427	1	640.000	95
Lublin Project - 3	427	1	100.000	28
Lodz Droga G Project - 2	323	1	200.000	45

SERBIA	OD	PN	SN	L
Makis Project - 1	820	1	50.000	50
Makis Project - 2	718	1	60.000	90
Makis Project - 3	616	1	55.000	195
Makis Project - 4	550	1	60.000	24
Jedinstvo Project	478	1	65.000	24

USA	OD	PN	SN	L
CA N15 NAS Leemore Project	1.166	1	120.000	70
LA Regional Water Recycling Plant Project	1.090	1	128.000	677


JACKING PIPE
DN-2555 OK 1-367
NT2000621 C-02 PN-1
FSC1R255501-S-003AVASS 1/002


VOLVO


subor
JACKING PIPE
DN-650
PN-1
C-07
1--S-001SAN

5 CONTINENTS,
50+ COUNTRIES,
1000+ PROJECTS!

subor®

*Make a **Good Start***

SUBOR BORU SAN. VE TİC. A.Ş.

+90 (216) 474 19 00

subor.com.tr
subor.eu

sales@subor.com.tr
info@subor.com.tr

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