FLOWTITE Pipe Systems
For Subaqueous Installations
General

The Saudi Arabian AMIANTIT Company was established in 1968 in Dammam / Saudi Arabia and has grown and developed into a major diversified industrial group with operations spanning the globe. The Group’s core business activities comprise:

- manufacture and sale of pipe systems
- ownership and sale of pipe technologies
- the provision of water management consultancy and engineering services
- manufacture and supply of polymer products

Today, AMIANTIT markets a wider range of pipe products than any other pipe manufacturer and provides a total solution to customers’ fluid transfer needs that is designed to optimise the applied technology and costs. The Group serves municipal, civil engineering, industrial, energy, and agricultural markets worldwide, supporting global infrastructure development.

The Group comprises 30 manufacturing plants, 6 technology companies, 6 materials suppliers, and 8 supply and engineering subsidiaries in 17 countries. In addition, an extensive sales and service network caters for the needs of customers in 70 countries around the world.

FLOWTITE GRP pipe systems are the most essential part of the Group’s pipe product activities. They are highly versatile in their use for subaqueous installations. You find them installed in:

- Wastewater outfalls
- Cooling water outfalls
- Sea water intakes for cooling water supply
- Seawater intakes for desalination plants
- Submarine crossings
- Chlorination lines
Production

The basic raw materials used in FLOWTITE pipe manufacturing are resin, fibreglass and silica sand. FLOWTITE pipes are manufactured using the continuous advancing mandrel process which represents the state of the art in GRP pipe production. This process allows the use of continuous glass fibre reinforcements in the circumferential direction. For a pressure pipe, the principle stress is in the circumferential direction. Incorporating continuous reinforcements in this direction therefore yields a higher performing product at a lower cost. A very compressed laminate is created that maximizes the contribution from the three basic raw materials. Both continuous glass fibre rovings and choppable roving are incorporated for high hoop strength and axial reinforcement. A sand fortifier, placed near the neutral axis in the core, is used to provide increased stiffness by adding extra thickness.

Consistently high quality standards are an important factor of our FLOWTITE pipe systems. All manufacturing sites are periodically certified by third parties and have official certification such as ISO 9001.
Product Advantages

FLOWTITE products and accessories offer many advantages for the use in subaqueous installations:

- Corrosion resistant material - No need for linings, coatings, cathodic protection or other forms of corrosion prevention
- Unique and constant product features at extreme conditions, also in underwater environment
- Economic and easy installation and handling also in difficult terrain due to low weight (approx. 10% of concrete) and pre-assembled gasketed couplings
- Precisely manufactured couplings with flexible gaskets enable easy installation and avoid infiltration and exfiltration
- No corrosion surveys required
- Low headloss due to smooth inner surface
- Low maintenance costs
- Long service life
- Experienced field service in place
- Consistent product available all over the world
- Low operating costs

Pipe Programme

The FLOWTITE GRP product programme offers an extensive range of pipe diameters which is rounded off by an outstanding range of fittings and accessories.

Our range of standard diameters in mm:

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<tr>
<th>100</th>
<th>150</th>
<th>200</th>
<th>250</th>
<th>300</th>
<th>350</th>
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<td>2800</td>
<td>3000</td>
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Other diameters up to 4000mm are available on request.

All pipes are available in standard stiffness classes SN 2500 Pa, SN 5000 Pa and SN 10000 Pa. Additional, custom designed stiffness classes are available on request.

Depending on diameters, the FLOWTITE GRP pipes are available in nominal pressure classes between 1bar and 40bar. We feel committed to high quality standards and therefore ensure that all pipes with a pressure greater than PN1 are 100% pressure tested to twice their nominal pressure.

Our pipes are supplied in standard lengths up to 12 metres. Other, customized lengths are also available on request.
Accessories

In addition to the pipe programme, a wide range of GRP fittings and accessories are offered. This includes bends, tees, branches, flanges, reducers, diffusors, saddles, manholes or pre-assembled, custom designed spools. The high flexibility of the materials used allows the tailor-made manufacturing of fittings based on customers’ requirements.
Product Specifications

FLOWTITE GRP pipe systems provide solutions for applications with high requirements in terms of corrosion resistance. Our GRP pipes are characterised by the immense strength of the glass fibre and the high level of resistance against corrosion by the resin. This combination of mechanical and chemical properties makes them an ideal choice for subaqueous applications.

Superior Corrosion Resistance

Because of its inherent corrosive resistance, GRP provides a longer life cycle and has no scale build-ups. This makes GRP pipes virtually maintenance free. Further, it does not require any protective coatings and any inner linings.

Higher Hydraulic Efficiency

Based on tests carried out on FLOWTITE pipes in existing new installations, the Colebrook-White coefficient may be taken as 0.029 mm on site. This corresponds to a Hazen-Williams flow coefficient of approximately $C = 150$. The Manning coefficient is $n = 0.009$. In contrast to other corroding materials, the inner surface roughness of FLOWTITE pipes does not change with time, as GRP pipes display no corrosion. Velocities of up to 4 m/s can be used if the water is clean and contains no abrasive material.

The smooth interior surface provides higher hydraulic efficiencies. There is no scale build and no further degradation. Head losses will not vary significantly during pipe life as long as no sedimentation takes place. This saves pumping energy and pump costs.

GRP pipes are produced with resin rich interior layer resulting in very low fluid resistance. This either increases the discharge of the fluids compared to same diameters of pipes made of traditional material or allows reduced pipe diameters that meets the required discharge flow rate.

Higher Strength to Weight Ratio

GRP pipes have low thicknesses, and high mechanical properties. These pipes can withstand higher pressure compared to the same diameters of pipes made of traditional material.

Light Weight

Our GRP pipes allow easy load and unload and do not require any heavy equipment for this purpose. This also reduces transportation costs and enhances faster installation.
Higher Resistance to Surge Pressure

FLOWTITE GRP pipes are flexible in nature and have a higher elastic modulus. They absorb higher pressures and thus reduce the risk of failures due to water hammer.

Economical Solution

GRP pipes are maintenance friendly and have a long service life. That makes GRP pipe systems an economical, low cost solution based on total life cycle of the pipeline.

Chemical Resistance

FLOWTITE GRP pipe systems can be used for almost all types of fluids generally discharged in outfalls and are also suitable for intake lines from most salted seawater. The selection of resin type for GRP piping systems is based on fluid corrosiveness, coupled with the operating and design temperature. Our personnel will assist in selecting the ideal resin.

Worldwide Availability

AMIANTIT GRP pipe systems are manufactured all over the world and are available locally for all countries. The high quality and manufacturing standards defined by FLOWTITE technology guarantees that the pipes are manufactured based to the same standards and specifications. It enables the compatibility of diameters coming from different manufacturing sites. This ensures great flexibility in supply and diameter availability for projects all over the world.
Installation

Based on more than 20 years of experience in subaqueous installations and various projects, GRP is among the best suited materials for intakes and outfalls. It offers a wide variety of possibilities and variations based on fluid characteristics, type of installation and the nature of local conditions.

Jointing

All FLOWTITE GRP pipe solutions have a proven jointing system that ensures that the system works through its whole estimated service life. The system also offers solutions for transitions to other materials such as connection to valves or other accessories. Our pipes are usually used with the following type of joints in intakes and outfalls. In addition to these joints, various other types of joints are available and need to be selected based on project requirements.

- Double Bell Coupling Joints with Marine Harness Lugs
- Key lock Joints
- Laminated Joints
- Flanged Joints

Double Bell Coupling Joints with Marine Harness Lugs

This system is suitable for large diameter piping discharges. It provides flexibility in installation and accommodates the effects of sea without hampering the performance. It is a coupling with rubber gaskets which prevent proper ex-filtration and infiltration. The additional marine harness lugs are used to keep preassembled pipe strings of several pipes together during loading, transferring, and sinking operations and also to assist divers with the jointing operation under water. It also compensates angular deflections due to differential settlement between the pipes and joints in the event of sea bed erosion. Depending on pipe diameter two, three or four pieces of marine harness lugs are fixed around the ends of the pipes. The steel lugs are fixed using glassfibre and resin.

On request a special test system can be installed for testing the tightness of all joints.

Keylock Couplings

Another method involves using biaxial pipes and/or key lock joint systems which reliably absorb the axial forces. These joints are based on key lock which can be easily installed onshore and then laid by divers underwater. If necessary they can also be used in combination with double bell joints.

Laminated Joints

Butt and strap joints or laminated joints also absorb these additional forces. These are permanent joints which consist of a laminate of glass mats and tissues with resin. Predominantly used directly at the jobsite, this type of joint guarantees a safe and long-lasting connection that accommodates all axial strengths.

Flanged Joints

Flanged joints offer the same safety and allow the dismantling of the installation at a later stage. Flanges are also a good solution for connections with other pipe materials, valves and accessories. They are available as fixed and loose flanges.
Installation Methods

Depending on project requirements and site or weather conditions different installation techniques are used.

• Single pipe installation
  With this method the pipes are lowered to water and joined under water one by one

• Multiple pipe installation
  Two or three section of pipes are preassembled on land or barge then lowered to water and joined under water

• Multiple pipe installation, providing pipe strings (towing)

Long pipe sections (100m - 300m - 500m - ...) are preassembled on land or barge and lowered to water and joined under water. They will be designed with adequate axial and bending strength and joined as described previously. This type of installation is fast, economical and can be used for pipes up to 2000mm diameter. Depending on the sea bottom, weather conditions and adequacy of equipment, different tow methods are selected.

Surface tow:

- float and sink
- sub surface tow

Controlled depth tow:

- off-bottom tow
- bottom pull

GRP pipes can be installed by dredging the sea bed and burying the pipe. This method is recommended for big diameters. The pipes are embedded in selected bedding and backfill material which will be evaluated by our experts. GRP pipes with appropriately selected joints can also be installed on the sea bed by anchoring at required locations.

For joining the pipes under water, different methods are used. Usually come along jacks with steel clamps are used. But depending on marine conditions, marine harness lugs are also used to join the pipes under water.
While jointing, the pipes need to be aligned. Depending on project requirements, marine and weather conditions, different equipment is used for the alignment of pipe ends to join. Some solutions are shown in the pictures below.

Throughout the world, specialists in our field and sales offices offer a wide range of products and support. They will assist you in all questions and support you in project study and the selection of the most suitable GRP pipe material.
Due to the worldwide product availability, the AMIANTIT group has established subaqueous installations all over the world. The list below only represents a small extract of the available references. Many subaqueous installations have been made during the last two decades and various extended case studies are available on request.

For further information please visit our reference page at [www.amiantit.com](http://www.amiantit.com)

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<thead>
<tr>
<th>Project</th>
<th>Country</th>
<th>Diameters (mm)</th>
<th>Length (m)</th>
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<td>Spain</td>
<td>3200-3500</td>
<td>185</td>
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<tr>
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<td>Romania</td>
<td>1500</td>
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<tr>
<td>ZAWIA Cycle power plant</td>
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