FLOWTITE GRP Potable Water Tanks
Professional Solutions for Drinking Water Storage
The AMIANTIT Group is an international, growth oriented enterprise offering pipe systems for the areas of water, sewage, gas, oil and industry along with pipe technologies and water management of high quality throughout the world.

Thanks to the experience and commitment of all employees as well as the extensive product range, AMIANTIT occupies a globally significant market position. The enterprise therefore confidently aspires to international market leadership in this sector.

In response to the global challenges AMIANTIT has considerably extended its international activities in recent years. An important area is the development of pipe solutions for different applications. Based on its experience the Group offers optimised pipe systems in different materials. Depending on customer requirements and country we supply:

- GRP pipe systems (glass reinforced polyester pipes), made using different production methods under the names FLOWTITE, VECTUS and AMIREN.
- GRE pipe systems (glass reinforced epoxy) under the name AMIPOX.
- DIP systems (ductile iron pipes) under the name SADIP.
- as well as pipes made of concrete.

The enterprise also offers water management services.

AMITECH Germany GmbH has been producing glass reinforced pipe systems (GRP pipe systems) using the FLOWTITE winding method since 1993. This principle of continuous endless production permits the manufacture of pipes in standard lengths of 3.6 and 12 m and in nominal sizes from DN 100 to DN 4000.

The production company AMITECH Germany belongs to the AMIANTIT Group. Backed by the technical and financial resources of the Group, AMITECH Germany GmbH produces and distributes GRP pipe systems under the brand names FLOWTITE and AMIREN predominantly on the Western European market.

The use of the latest technologies places AMITECH Germany GmbH in a position to offer its customers the best product for every application. Decades of experience in different pipe projects in many countries has made the company an expert in the transportation and handling of water and sewage. Modern and effective production plants produce cost-favourable products of highest quality. GRP pipe systems from AMITECH Germany are a real alternative where economic efficiency, reliability and handling advantages are required.

FLOWTITE GRP pipe systems

Since the late sixties FLOWTITE has been present on the market and an international leader in GRP pipe technologies. The GRP pipes are made using the endless winding method and are available with diameters up to 4 metres depending on plant. They are corrosion-resistant, lightweight and resistant in water and sewage systems. They are also easy and simple to handle and are manufactured to high quality standards.

The AMIANTIT Group manufactures FLOWTITE GRP pipe systems in many plants at numerous international locations.
# Index

1. **Potable water storage** .................................................................................................................................... 4

2. **Potable water storage systems made of GRP** .................................................................................................................. 4
   2.1 GRP for use in potable water ........................................................................................................................................ 4
   2.2 Approvals and certificates ........................................................................................................................................... 5
   2.3 Properties and advantages ........................................................................................................................................... 5

3. **Design of complex GRP potable water storage systems** ................................................................................................. 6
   3.1 Basic structure ................................................................................................................................................................. 6
   3.2 Potable water storage chamber ....................................................................................................................................... 8
   3.3 Service chamber ............................................................................................................................................................... 9
   3.4 Equipment ......................................................................................................................................................................... 9
   3.4.1 Pipes and fittings ......................................................................................................................................................... 10
   3.4.2 Devices and accessories ............................................................................................................................................. 10

4. **Production of complex GRP potable water storage systems** ................................................................................................. 11
   4.1 Production of GRP modules ........................................................................................................................................... 11
   4.2 Transportation and assembly ........................................................................................................................................ 11
   4.3 Landscaping ..................................................................................................................................................................... 13

5. **Supplementary systems made of GRP** ............................................................................................................................ 13
   5.1 Well heads for potable water extraction ......................................................................................................................... 13
   5.2 Fittings and water meter shafts ......................................................................................................................................... 13

Annex ................................................................................................................................................................................. 14
   Design of a complex GRP potable water tank ..................................................................................................................... 14
1 Potable water storage – the modern control element in water supply

In potable water storage large quantities of potable water are stored intermittently in suitable containers and tanks. In cases of demand they compensate for the shortfalls between water inflow and water withdrawal. The water is stored in elevated tanks, underground tanks, passage tanks or holding tanks.

The objectives of potable water storage are as follows:

- to keep the respective amounts of potable water at the ready for compensation purposes
- to cover peak withdrawals at the time of maximum water demand
- to provide a safety reserve
- to guarantee the supply pressure required in the pipe network
- to provide a reserve for extinguishing water

2 Potable water storage systems made of GRP

2.1 GRP in the potable water area

GRP stands for glass reinforced plastics and is the generic term for a large materials group. An important element is the duroplastic resin used.

The unsaturated polyester resins used for potable water have a single component base. Unlike thermoplastic, weldable plastics, they are fully cross-linked and guarantee highest potable water quality. Resin and potable water do not bond chemically or physically in any way. Glass fibres are added to the polyester to improve the mechanical properties. They are added to the GRP pipe in cut and endless form in a winding process. This counteracts any formation of tears or breaks and provides good elasticity as security against pipe breaks. To increase stiffness silica sand is introduced specially into the pipe lining core during the FLOWTITE production process as a third component.

This chemically inert additive increases wall thickness and reduces or prevents any inherent deformation of the pipes without reducing elasticity. Even large earth loads on the pipe can be compensated for in this way.

FLOWTITE GRP pipes are the base material in the fabrication of water tanks and complex modules for potable water storage. The good mechanical processing properties of GRP permits individual and customised fixtures. Steps, ladders and walk grids ensure secure access; integrated connection lines and fittings the requisite water operations. Switch and control cabinets can be accommodated in the GRP modules as can a hand washbasin for the operating personnel. All modules are delivered to the building site prefabricated or completely ready for installation.
2.2 Approvals and certificates

The GRP pipes produced using the FLOWTITE winding process are suitable and approved for the transportation and storage of potable water. All pipes, modules and storage chambers have the necessary prototype certificates based on the DVGW VP 615 for all nominal diameters produced. Further approvals exist depending on country in accordance with KIWA and ÖVGW.

Hygienic safety has been proved in accordance with the KTW recommendation and DVGW work sheet W 270.

In addition to this product approval, the production of AMITECH Germany GmbH in Mochau is subject to external monitoring by TÜV. The approval and work in accordance with the ISO 9001 standard is similarly guaranteed.

All raw materials suppliers are examined and released beforehand by the licensor FLOWTITE Technologie (www.flowtite.com) on the basis of strict requirements. Only once the proof of high quality and suitability of the raw materials has been provided may the raw materials be supplied. Every delivery is also inspected thoroughly by Quality Assurance before it is fed to the production process. After production the finished pipes are subjected to a further number of tests. The final product must comply with the factory’s own standards, those of TÜV, DIN EN 1796, EN 14364 and of the DVGW. Only once all tests have been positively completed may the GRP component, be this pipe or GRP tank, leave the factory grounds. This ensures the high standard necessary for the storage of potable water.

**DVGW approval numbers**

<table>
<thead>
<tr>
<th>Approval Number</th>
<th>Diameter Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>DW-8411AS2285</td>
<td>up to DN 300</td>
</tr>
<tr>
<td>DW-8416AQ2057</td>
<td>DN 300 to DN 800</td>
</tr>
<tr>
<td>DW-8421AQ2058</td>
<td>greater than DN 800</td>
</tr>
</tbody>
</table>

2.3 Properties and advantages

GRP pipes manufactured using the FLOWTITE winding process can be produced very economically in any lengths and diameters currently of up to 4 metres.

Despite small wall thicknesses, the material permits a very high stiffness with low weight. In addition to use in pipes, the product is also suitable for the construction of complex module units. The modules consist of a GRP pipe lining and contain all necessary fixtures. The modules can be individually designed in view of the high flexibility and ease of working. This permits optimum design in terms of transport, installation and operability.

**Advantages:**

- Constant potable water quality because no coatings and chemicals are added
- Smooth inner surface (K = 0.01 mm) reduces the attachment of contaminants
- Corrosion-resistant material
- Comparatively low weight with a large pipe volume
- Short construction time (average of 2 days for the assembly of the components, 4 days for the installation of the equipment)
- Modules constructed by assembling factory-prefabricated components on the building site
- Very variable (method of construction tailored to the local circumstances)
- Subsequent extension possible (adding of further prefabricated assemblies possible)
- UV-resistant (may be laid above ground)
3 Design of complex GRP potable water storage systems

3.1 Basic structure

Potable water storage systems made of GRP form a complex modular system consisting of:

- the potable water storage chamber
- the service and fittings chamber
- the technical equipment

The modules can be designed individually. They consist of a large number of assemblies and components depending on necessity and requirements. Prefabricated in the factory, they are fitted together on site. The chambers have a high degree of prefabrication and are made of large GRP pipe segments in which wall breakthroughs, flanges, collars and also some of the pipe connections have already been integrated in the factory. Assemblies of up to 3 m diameter and 12 m length are usually produced and supplied to be put together on site. In the case of larger dimensions the transport arrangements must be checked out beforehand. Pipes and modules are adapted precisely. The individual module structure of a GRP potable water storage system permits designs which can be optimised to suit the landscape or fitted into existing paths and angular plots. The designers therefore have a high degree of flexibility in the conception of any such system. The connection technology using plug-in sleeves on the ends of the pipes guarantees simple and extremely fast assembly. Extensive and detailed planning and design is required to optimise a complex potable water tank made of GRP. It is the key and part of the AMITECH range of services.

Photos and drawing: Construction of the potable water elevated tank in Brabecke as a single-line system
Potable water systems consist of the water tank and the service chamber.

The water tank can be a single or multi-chamber system. The service chamber can be connected at the front end or cross-wise to the system. Both long straight pipe systems or angular and branched structures are produced.

1) Entrance
2) Spiral stair made of stainless steel
3) Service chamber during the installation
4) Inside the service chamber
5) Entrance to the potable water storage tank
6) Installation of the storage system
7) GRP end caps of the storage system

Photos and drawing: Construction of the potable water elevated tank in Albig, closely following with the land contours
3.2 Potable water storage chamber

Every potable water storage system has one or several potable water chambers. There is no restriction to volume from a technical point of view due to the theoretically endless extension possibilities of the chamber system.

For reasons of transportation and later access, storage pipes with a diameter of 2.50 m to 3.00 m are ideal. On special request an enlargement to 4.0 m is possible. The individual pipe lengths are usually 6 m or 12 m. The desired storage volume determines the length of the chamber. An end cap seals the system. Potable water storage pipes of the pressure level PN 6 are usually used. This also applies to the pipe joints and couplings.

The access to the water chambers is provided via the front service chamber. A pressure-tight laminated GRP wall forms the partition. Access to the water chamber is usually from the front end. A flange with a blind lid may be sufficient here but swivel type entries are also possible. These are usually manholes or complete doors made of stainless steel. This enables cleaning work to be performed in the water chamber as required. However, inspection windows are sufficient to see into the water chamber. The storage chamber itself can also be equipped with light for inspections of this kind.

<table>
<thead>
<tr>
<th>DN</th>
<th>Weight kg/m</th>
<th>max. storage volume m³/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>397.00</td>
<td>3.07</td>
</tr>
<tr>
<td>2100</td>
<td>437.00</td>
<td>3.39</td>
</tr>
<tr>
<td>2200</td>
<td>478.00</td>
<td>3.72</td>
</tr>
<tr>
<td>2300</td>
<td>524.30</td>
<td>4.06</td>
</tr>
<tr>
<td>2400</td>
<td>569.50</td>
<td>4.42</td>
</tr>
<tr>
<td>2500</td>
<td>620.16</td>
<td>4.80</td>
</tr>
<tr>
<td>2600</td>
<td>669.98</td>
<td>5.19</td>
</tr>
<tr>
<td>2700</td>
<td>721.23</td>
<td>5.59</td>
</tr>
<tr>
<td>2800</td>
<td>774.40</td>
<td>6.02</td>
</tr>
<tr>
<td>2900</td>
<td>829.22</td>
<td>6.45</td>
</tr>
<tr>
<td>3000</td>
<td>885.94</td>
<td>6.91</td>
</tr>
</tbody>
</table>

Table: Weight and storage volume of GRP potable water elevated tanks

Kinds of entrance to the potable water storage
1) Flange  2) Hatch  3) Door
3.3 Service chamber

Service chambers are the generally accessible part of the potable water tank. They are formed from upright and horizontal pipes with a diameter from 2.50 m to 3.00 m. The diameter of the service chamber need not be the same as that of the water chamber. The water chamber may be connected to it either at the front end or also from one or both sides.

The service chamber serves as a room for all systems such as fittings, switch cabinets and similar which are necessary for the control and operation of the water tank.

The access to the service chamber from outside can be freely designed to suit the land contours. The entrance can be placed at the front on the level of the service chamber or to the top with the use of a dome. For smaller chambers a ladder will be sufficient although a spiral staircase is used far more frequently.

3.4 Equipment

Breakthroughs, flanges and some of the pipes are usually preinstalled in the modules. The great weight and the sensitivity of electronically controlled systems will usually necessitate installation on site, however. This starts directly after the settling and fitting together of the first assemblies. A construction team installs the assemblies and then connects them according to their function.

A level floor made of anti-corrosive GRP elements guarantees sure footing for the operator. Lighting provides the necessary brightness. All electrical controls and devices can be directly integrated and may optionally be installed in an additional chamber.
3.4.1 Pipes and fittings

Integrated pipe lines are required for equipping, filling and draining the water tank and also for circulation in the storage tank.

Transportation is controlled using valves and pump systems. Depending on wishes and requirements, these may be installed in the system, in the service and water chamber, but also outside the system. They may run laterally along the walkway and are therefore easily accessible but may also be covered beneath a grating. The elements are usually bolted on to the GRP shaft lining.

3.4.2 Devices and accessories

Additional devices are integrated depending on the properties of the water and the function of the potable water tank. These may include water treatment systems and electronic control cabinets along with simple washbasins or soap dispensers.

The choice of devices and accessories knows no limits. The size is merely restricted by the GRP shaft diameter of 3 m and in special cases up to 4 m.
4 Production and installation of complex potable water storage systems

4.1 Production of GRP modules and assemblies

The base material for the chamber and modules is provided by pipes made of wound GRP.

The pipes are produced as an endless process, permitting the production of assemblies in any desired length. In the case of nominal pipe diameters of DN 2500 to DN 3000 lengths come at intervals of 100 mm. After creation of the moulds and shafts, the partition walls are integrated along with flooring and inspection openings as well as all break-throughs and connections.

4.2 Transport and installation

Starting with the service chamber the assemblies are transported by truck to the building site. There may be one or several modules depending on size.

The modules are then positioned by crane and connected by a coupling system. All necessary measures are to be taken in accordance with the nominal diameters and the given circumstances.

The assemblies can be fitted together faster and more safely using suitable auxiliary aids and equipment such as traction chains or a digger. It must be ensured that the ends and couplings are not damaged by the installation equipment.
All current standards and guidelines of DIN EN and DVGW apply to installation in the same way as to the laying of pipes for potable water for the respective nominal diameter range. The same applies to the subsequent work on filling and compacting the ground. Separate installation instructions exist and are handed over on delivery.

The location of a potable water tank is influenced by a large number of factors and frequently entails a high degree of flexibility in design and execution. FLOWTITE GRP pipes and modules have a high circular stiffness that permits above ground or underground installation of the storage system. In the case of the above ground solutions it is recommended that the ground be dammed up at the sides. The entire system can be greened at a later date and is therefore part of an ecological construction approach.
5 Supplementary systems made of GRP

4.3 Landscaping

The GRP modular storage system offers a number of possibilities also in the design of the outdoor facilities. It is almost always necessary to install a door that may be locked.

For this purpose a steel door is inserted directly into the front end of the system or in the dome. In view of the high strength and resistance of GRP such systems need not be cladded. Cladding with wood or stone is possible, however, at any time for reasons of the visual appearance. A pipe solution cut in to the slope for front end entry is also popular.

5.1 Well heads for potable water generation

Well installations are frequently installed upstream of a complex potable water tank.

A GRP prefabricated system is also available for this purpose including the accompanying shaft systems. The cylindrical shafts are composed of an anti-lift floor slab, a GRP lining and a cover plate. All installations are integrated directly into the shaft depending on weight and supplied as a complete module. The material of the piping can be suited to customer requirements. Entrances such as ladders and covers made of anti-corrosive GRP can be installed. Cover plates made of concrete are also available on request complete with GRP coating.

5.2 Fittings and water meter shafts

Fittings and water meter shafts complement the potable water systems portfolio.

Systems in horizontal pipes are to be specially recommended here, permitting any length with sufficient standing height for personnel. Well accessible nominal diameters from DN 2500 to DN 3000 are recommended.
Design of a complex GRP potable water tank

Please send the filled-in form sheet to the fax number listed at the back page of this brochure.

The following information is required for planning purposes:

<table>
<thead>
<tr>
<th>DOCUMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ground plan</td>
</tr>
<tr>
<td>2. Longitudinal section of the ground (optional)</td>
</tr>
<tr>
<td>3. Construction drawings if available</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Storage system</td>
</tr>
<tr>
<td>2. Potable water storage chamber</td>
</tr>
<tr>
<td>2.1 Storage volume</td>
</tr>
<tr>
<td>2.2 Minimum number</td>
</tr>
<tr>
<td>2.3 Access (flange, flap, door, …)</td>
</tr>
<tr>
<td>2.4 Position of the circulation line (inside, outside)</td>
</tr>
<tr>
<td>2.5 Special features</td>
</tr>
<tr>
<td>3. Service chamber</td>
</tr>
<tr>
<td>3.1 Position in relationship to water chambers (front end, cross-wise)</td>
</tr>
<tr>
<td>3.2 Access (front end, dome)</td>
</tr>
<tr>
<td>3.3 Desired diameter</td>
</tr>
<tr>
<td>3.4 Position of the lines (lateral, concealed, …)</td>
</tr>
<tr>
<td>4. Equipment</td>
</tr>
<tr>
<td>4.1 Pressure increase system</td>
</tr>
<tr>
<td>4.2 Pipe material</td>
</tr>
<tr>
<td>4.3 Dimension – inflow</td>
</tr>
<tr>
<td>4.4 Dimension – outflow</td>
</tr>
<tr>
<td>4.5 Fire extinguishing reserve</td>
</tr>
<tr>
<td>5. Miscellaneous</td>
</tr>
</tbody>
</table>
This handbook is intended as a guide only. All values listed in the product specifications are nominal. Unsatisfactory product results may occur due to environmental fluctuations, variations in operating procedures, or interpolation of data. We highly recommend that any personnel using this data have specialised training and experience in the application of these products and their normal installation and operating conditions.

The engineering staff should always be consulted before any of these products are installed to ensure the suitability of the products for their intended purpose and applications. We hereby state that we do not accept any liability, and will not be held liable, for any losses or damage which may result from the installation or use of any products listed in this handbook as we have not determined the degree of care required for product installation or service. We reserve the right to revise this data, as necessary, without notice.

We welcome comments regarding this handbook.