الخليج لصناعة الانابيب [ش.ذ.م.م.]

**GULF PIPE** INDUSTRIES (L.L.C)

*Where Technology & Quality are integrated*

www.gulfpipe.com

# PRODUCT INFORMATION & INSTALLATION MANUAL

ISO 9001:2015
ISO 14001:2015
ISO 45001:2018
CERTIFIED

WRAS
WATER REGULATIONS ADVISORY SCHEME

# Table of Contents

# 1 Introduction

## 1.1 General

GPI pipes for aboveground applications are Glass Reinforced Plastics (GRP/GRE) consisting of a thermosetting chemical-resistant resin and fiberglass reinforcements. The glass fiber reinforced polyester is a material belonging to the group of the composites. The composites are made up of a continuous phase (matrix of thermosetting resins) and a fibrous phase (glass fiber), responsible for the mechanical characteristics.

GRP pipes are flexible, corrosion resistant, and can be used for a wide range of applications, such as cooling water, industrial waste water and effluents, fire water lines, seawater lines, acid cleaning, and chlorination lines.



## 1.2 Product Range-Pipes & Fittings

GPI pipes are manufactured using the filament winding process, according to the International Standards listed below, with nominal internal diameters ranging from 25 mm up to 2000 mm.

Available standard pressure classes are 3, 6, 10, 12 and 16 bar. Higher pressure classes are available upon request. Additionally, GPI pipes can be designed for use under vacuum conditions as well as for underground applications.



## 1.3 Applicable International Codes and Standards

| | |
|---|---|
| ASTM D2996 | Standard Specification for Filament–Wound "Fiberglass" (Glass– Fiber–Reinforced Thermosetting–Resin) Pipe. |
| ASTM D3262 | Standard Specification for "Fiberglass" (Glass–Fiber–Reinforced Thermosetting–Resin) Sewer Pipe. |
| ASTM D3517 | Standard Specification for "Fiberglass" (Glass–Fiber–Reinforced Thermosetting–Resin) Pressure Pipe. |
| ASTM D3754 | Standard Specification for "Fiberglass"(Glass–Fiber–Reinforced Thermosetting–Resin) Sewer and Industrial Pressure Pipe. |
| AWWA C950 | Fiberglass Pressure Pipe. |
| AWWA M45 | Fiberglass Pipe Design Manual. |
| ASME B31.1 | Power Piping. |
| ASME B31.3 | Process Piping. |
| ISO 14692 | Petroleum and Natural Gas Industries – Glass–reinforced plastics –piping |
| BS EN 1796 | Plastics Piping Systems for Water Supply With or Without Pressure – Glass–Reinforced Thermosetting Plastics (GRP Based on Unsaturated Polyester Resin (UP). |
| BS EN 14364 | Plastics Piping Systems for Drainage and Sewerage With or Without Pressure – Glass–Reinforced Thermosetting Plastics (GRP) Based on Unsaturated Polyester Resin (UP) – Specifications for Pipes, Fittings and Joints. |

## 2 Product Applications

GPI pipe can be used in the below pressure and gravity systems -

- Sanitary sewers
- Storm water
- Potable water
- Raw water
- Irrigation
- Industrial wastes and effluents
- Seawater transmission
- Fire protection
- Cooling water
- Chilled water lines etc.

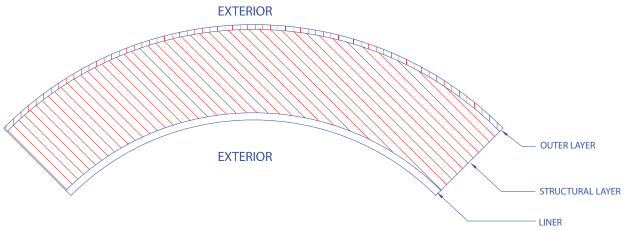
## 3 Product Features and Benefits

| Product Feature | Benefits |
|---|---|
| Light weight compared to traditional material. 1/4th the weight of ductile iron and 1/10th of pre stressed concrete pipe. | • Installation is easier compared to steel or DI pipes<br>• No need for expensive handling equipment.<br>• Lower transportation cost |
| Highly corrosion resistant composite material is used for manufacture of the pipes | • Expenses for corrosion protection are completely eliminated. Eg. cathodic protection, pipe coating, wrapping etc.<br>• Low maintenance costs.<br>• Flow characteristics remain unchanged during the design life and. more. |
| Long life | • Design life is 20-30 years as standard. |
| Manufactured in long sections | • Fewer joints means lower assembly time and associated costs |
| Smooth inside surface | • Operating costs are reduced since less pumping energy is required due to low friction of the pipe surface.<br>• Lower cleaning costs due to less slime build up |
| Pipe specifications comply with international standards | • Assures high quality product specifications. |
| Double Bell Coupling joints with elastomeric REKA gaskets | • Ease of joining, reducing installation time<br>• Accommodates small changes in the line direction without fittings or differential settlement |

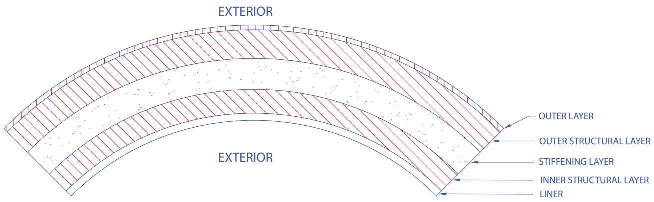
## 4 Pipe Construction

### 4.1 General

The pipe is a composite laminate consisting of a corrosion resistant liner, a structural layer and an exterior resin rich layer.




TYPICAL ABOVE GROUND PIPE SECTION




TYPICAL BELOW GROUND PIPE SECTION

### 4.2 Raw materials - Resins & Glass fibers

The type of resins used in the manufacturing of GPI pipes are given below. Generally, pressure and temperature requirements govern the resin system selection; therefore, maximum service temperatures can change depending on the service requirements. For more information please consult GPI Engineers.

**Orthophthalic:** It is normally used in the fabrication of the structural layer of the laminates, since due to its properties and excellent wettability it confers the laminate good mechanical properties.

**Isophthalic:** It is normally used in the fabrication of the liner (inner barrier) of the laminates, since they cover the light corrosions and moderate temperatures and they are applicable for conducting drinking water, seawater, waste water, industrial or sanitary water and for many other slightly critical services.

**Vinylester:** For industrial uses, with involvement of severe service conditions: Humid-hot chlorine, oxidant acids, sodium hypochlorite, concentrated organic acids, hydrochloric acid contaminated with aromatic hydrocarbons, etc., the maximum service temperature being 100°C depending on the chemical conditions. There exists a wide range valid for higher temperatures.

**Epoxy:** Epoxy resin is used to manufacture GlassReinforced Epoxy (GRE) pipes. GRE pipes are known to have excellent mechanical properties and resistance to chemical attacks including acids, neutral salts, and operate under a temperature reaching 110 °C.

**Glass Fiber:** The mechanical resistance of the composite will depend on the quantity, type, position and orientation of the glass fiber reinforcement, the latter being a chemically inert material and with high tensile strength (almost 18,000 kg/ cm2, higher than that of the best steels).

In the fabrication of piping and fittings of GPI GRP, three basic glass types are used:

Glass “C” It has a good inertia with respect to chemical corrosion.

Glass “E” of excellent mechanical and electrical properties.

Glass “ECR” with excellent corrosion resistance.

The typical glass reinforcements used are:

**Surface veil “C”:** Consisting of glass fibers dispersed at random in the form of a sheet, used as reinforcement of the first corrosion-proof layer of the laminate since it allows for a high content of resin.

**Synthetic veil:** The same as the previous one but based on synthetic glass fibers, indicated for specific uses.

**Mats of cut filaments “E”:** Fabricated with filaments cut in the form of a fabric with the corresponding binding agent compatible with the resin. They are used as specific reinforcement and in the Hand Lay up Process for the fabrication of fittings.

**Roving fabric “E”:** Fabricated with roving filaments directly in the form of a fabric. They are used as specific reinforcements and in the Hand Lay up Process for the fabrication of fittings.

**Direct Roving “E”:** In the form of continuous filaments with the same stress in all the filaments used in the Process of Filament winding, as pipe reinforcement.

# 5 GRP/GRE Pipes & Fittings Design

GPI is capable of designing FRP Solid piping and fittings for Underground (U/G), Aboveground (A/G) piping systems based on various standards such as ASTM, AWWA, BS, ASME & ISO. The design can be done using flexible coupling joint, tensile resistant joint systems or combination of both. Above ground pipe thicknesses are based on pressure and stiffness requirements. Buried pipes are designed based on of AWWA M45, Section 5.7.5. The pipe calculation generally covers live and dead load effects on the pipe in addition to the effect of internal pressure and vacuum level on the adequacy of the pipe for buckling, combined strain levels, allowable stresses ...etc.





# 6 Physical and Mechanical Properties

### 6.1 Tolerances on Dimensions

| Dimension | Specification | Tolerance |
|---|---|---|
| Pipe inside Diameter (ID) | Equal to DN | 4 mm or 1.0%. |
| Length | 3, 10 or 11.8 meters | ± 25 mm |
| Roundness Deviation | Pipes shall be round | +1.0% |
| End Squareness and End Plainness | Ends shall be both square to axis of the pipe and plane | Not more than 2 mm + 0.005 x DN |

### 6.2 Hydraulic Characteristics

Pipe wall friction factors:

- Darcy, Fanning, Weisbach  f  = 0.010 to 0.018
- Hazen Williams  C  = 140 to 150
- Manning  n  = 0.0095 to 0.012

### 6.3 U.V. Resistance

GPI pipes contain a U.V. inhibitor in their structure. This layer offers sufficient protection against U.V. radiation. If needed epoxy based paints can be used.

### 6.4 Coefficient of Thermal Expansion

The approximate co-efficient of thermal expansion of GRP pipe is 24 to 30 x $10^{-6}$ mm/mm/Deg. C

### 6.5 Heat Conductivity

Heat conductivity value is 0.30 to 0.35 W/m K

# 7 Joining Methods for Pipes & Fittings

There are two types of joining systems:

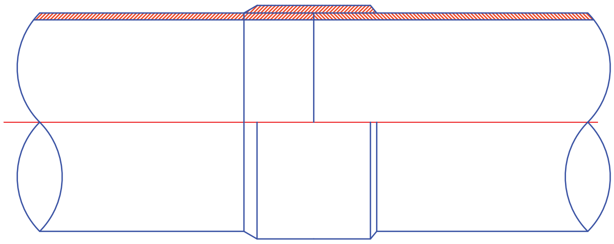
1. Joints which can take axial loads due to internal pressure and bending loads.
2. Non-tensile resistant joints where axial forces should be absorbed by anchors/thrust restraints.

### 7.1 Tensile Load Resistant Joints

#### (a) Bell/Spigot Joints-Cylindrical

This rigid joint consists of a slightly conical bell end and a cylindrical spigot end. It has an adhesive bonding joint, two components cemented, relatively low working pressure and is used for small diameter pipes.

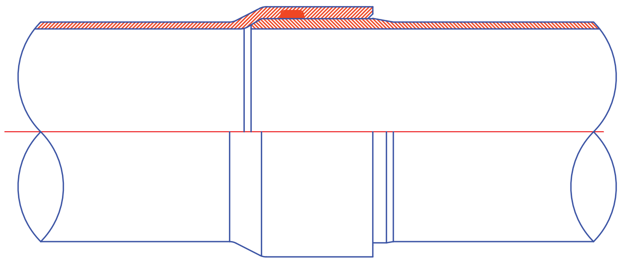
Pressure range: 8 - 32 bars
Diameter range: 80 - 400 mm



#### (b) Bell / Spigot -Tapered

This rigid joint is similar to the Bell/Spigot-Cylindrical joint with one exception that it has tapered bell and spigot and its working pressure is high. Failure is most often encountered at the straight (90°) end of the socket when dealing with cylindrical joint system. This is due to the "sudden" transition from a high stiffness section (joint area) to a low stiffness section (pipe section). The use of tapered bell and spigot ensures that the joint will perform better (no failure) and less material is being used.

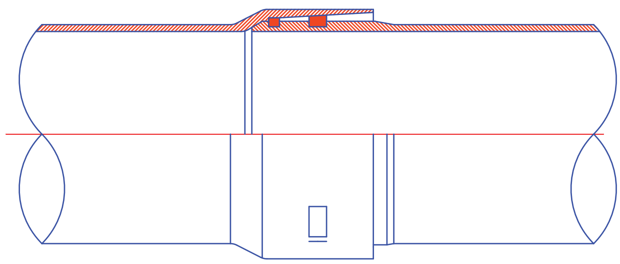
Pressure range: 8 - 50 bars
Diameter range: 80 - 600 mm



#### (c) Rubber Seal Lock Joint

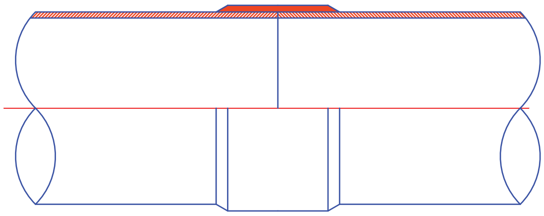
This type of joint consists of an integral socket end and a machined spigot end. The rubber ring (called O-ring for its round shape) is positioned on the spigot end and serves as a seal. Care should be well taken on the spigot outer surface where the O-ring is to be installed. This area must be free of defects. The locking strip is inserted through a rectangular opening on the socket end. This joint is flexible and allows for some axial movement as well as some angular deflection.

Pressure range: 8 - 32 bars
Diameter range: 80 - 1400 mm



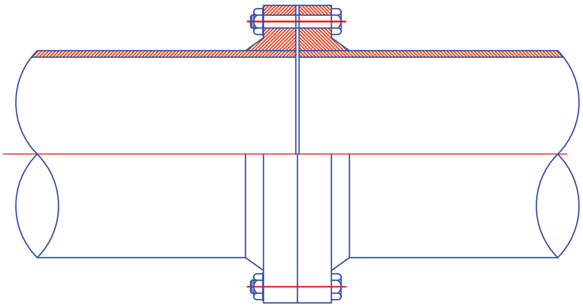
### (d) Laminated Joint (LJ)

This is made by use of hand lay-up laminations (Butt & Wrap) of two plain end pipes. This joint is rigid and does not allow for any axial movement or angular deflection. A very good grinding of the spigot outer surface to reach the structure of the pipe for excellent bonding between glass structures. The lamination thickness and bond length are standard and should be respected. This joining system is available for all ranges of diameters.



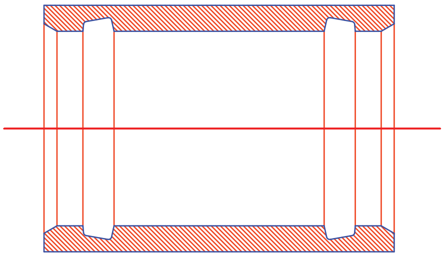
### (e) Flanged Joint (FJ)

This rigid joint is usually used to enable connections with steel pipes and to allow for easy assembly and dismantling of process lines. Flanged joints are mainly used inside valve chambers and pumping stations. A gasket is placed between the two flat faces of the flange to ensure proper sealing. This joint system is almost available for all ranges of diameters and can take pressure up to 50 bars.



### (f) Double Bell Coupling

Short pipes are joined using double bell coupling. The sealing of the joint is achieved by the compression of two elastomeric gaskets when the joint is assembled.



## 7.2 Non-tensile Resistant Joints

### (a) Rubber Seal Joint (RSJ)

This joint has the same configuration as the RSLJ without the need for a locking strip. Moreover, RSJ allows for a greater amount of axial movement and angular deflection than does the RSLJ.

Pressure range: 8 - 32 bars
Diameter range: 80 - 1400 mm

### (b) Mechanical Coupler

The mechanical coupler is used with plain end pipes. The sealing is maintained through the installation of two rubber rings between the coupler and the pipes. It is almost available at all pipe diameters and can take pressure up to 50 bars.

# 8 Flanged Joints

## 8.1 General

Before assembling the Flanged Joints, all safety precautions need to be taken. Ensure that all necessary tools and materials are available.

The necessary tools for the assembly of flanges are:

- Ring spanner with the required bolt head size.
- Torque wrench with the required socket size.

GRP flanges are flat faced. These flanges must always be accurately aligned and not subject to any stress. On the GRP side of the flanged joint, the bolts and nuts must have washers to avoid exceeding the permitted surface pressure. As an alternative, a steel backing ring can be installed.

## 8.2 Flange Drilling Standards

Standard flanges are drilled to ASME B16.5 / B16.47 pattern. Other drilling standards are also available. (BSEN, API, MSS SP.)

## 8.3 Notes on Flanges with '0-ring Seal

- Two flanges with an 0-ring cannot be jointed to each other. In this case one of the flanges must have a flat face (non-grooved).
- The 0-ring used for sealing may be made of EPDM or natural rubber with a shore hardness of 70 ± 5.

## 8.4 Tightening of Flanges

ASTM D4024 standard shall be followed for the bolt torqueing sequence.

Fiberglass flanges must always be installed tension free. Therefore, flanges must be accurately aligned. Pipelines must never be pulled by means of the flange bolts. If a Fiberglass pipeline is connected to a metal line, this metal line must be anchored to prevent any movements or loads being transmitted to the Fiberglass line.

Tightening of the bolts of a flanged joint shall be executed first diagonally, and then clockwise:

- Diagonally as per the bolt torque sequence described in ASTM D4024 and shown on Figure. Bolts shall be tightened, following the bolt torque sequence, first up to 60% of the recommended value and second up to 100% of the recommended value.
- Clockwise using the recommended bolt torque. This step has to be repeated until all bolts have been assembled at the prescribed bolt torque.
- In case bolts are not properly lubricated, or when the flange joint is not sealing, it is allowed to increase the bolt torque value up to a maximum of 150% of the recommended bolt torque.
- Bolts and nuts must have washers to avoid exceeding the permitted surface stress.
- Flanges must be properly aligned and shall not be subjected to any overload to meet each other.

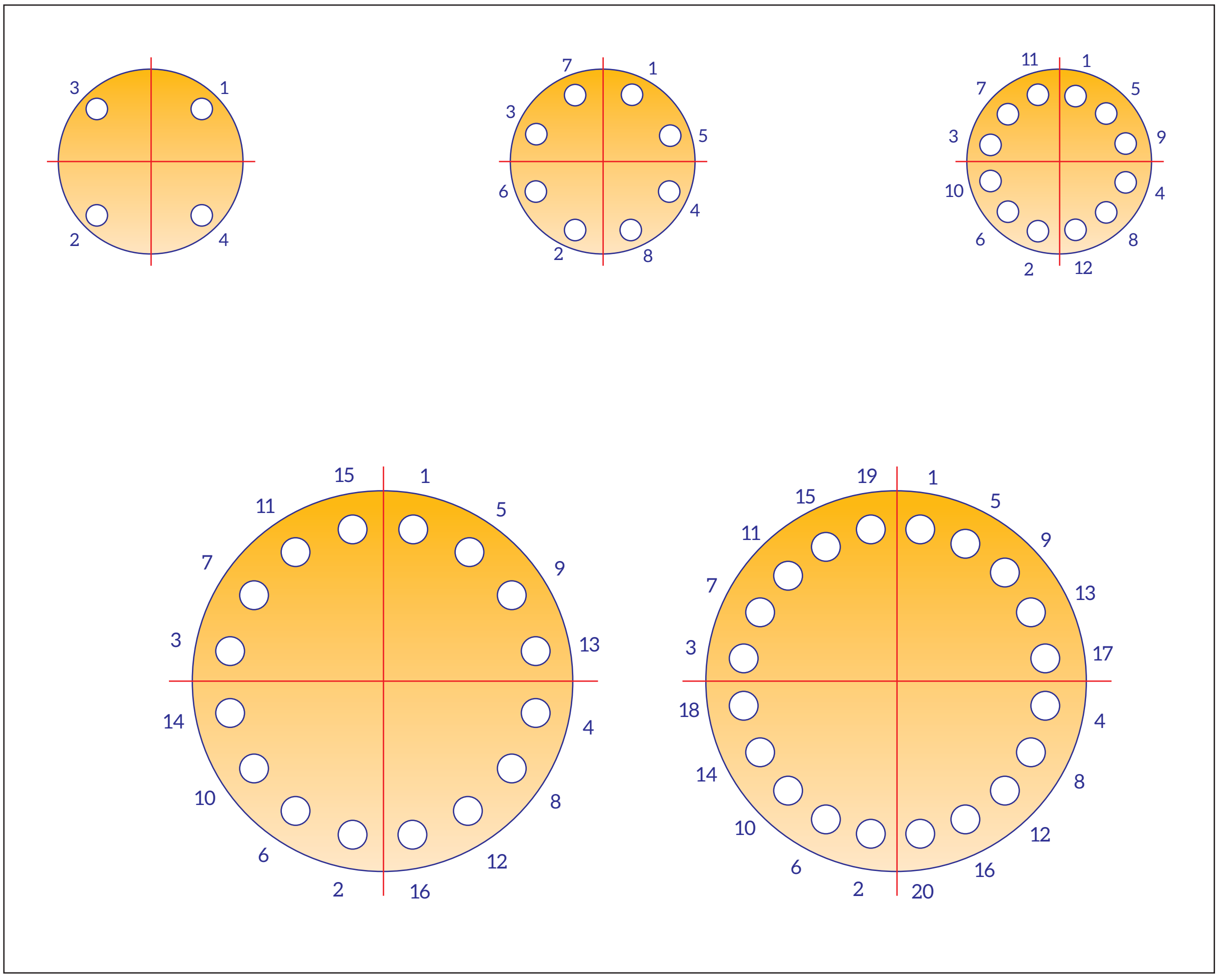


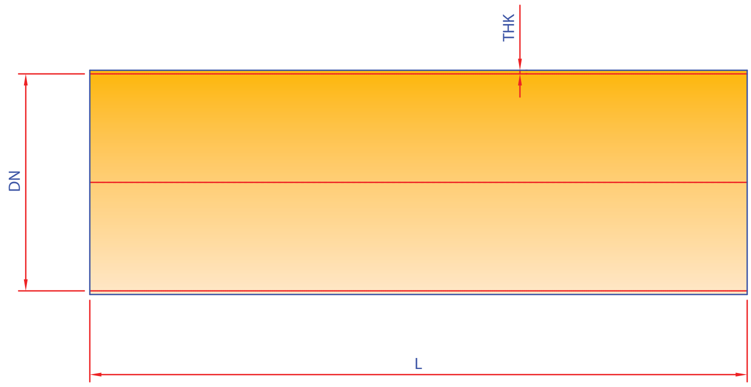
Figure: Bolt Torque Sequence as per ASTM D4024

**Valve Support**

If a GPI flange is connected to a steel flange, the support should preferably be situated at the side of the steel flange. This is also applicable for underground applications. Pipe sections should not become overloaded by the weight of the accessories, for example by soil settlement. One suggestion would be concrete supports provided with steel connections, able to carry the full load of the valve. Also bending and torque forces caused by opening and closing of valves should be absorbed. Hand operated butterfly valves can be supported or mounted in a manhole.

## 9 Product Dimensions - Pipes & Fittings

### ABOVE GROUND PIPE SPECIFICATIONS

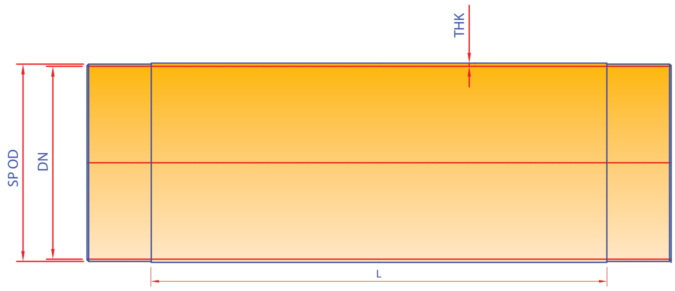



ABOVE GROUND PIPE

| DN | LENGTH | 6 BAR | | 10 BAR | | 12 BAR | | 16 BAR | |
|---|---|---|---|---|---|---|---|---|---|
| (mm) | L (mm) | Thk (mm) | Wt (kg/m) | Thk (mm) | Wt (kg/m) | Thk (mm) | Wt (kg/m) | Thk (mm) | Wt (kg/m) |
| 25 | 3000 | 4.0 | 0.6 | 4.0 | 0.6 | 4.0 | 0.6 | 4.0 | 0.6 |
| 40 | 6000 | 4.0 | 1.0 | 4.0 | 1.0 | 4.0 | 1.0 | 4.0 | 1.0 |
| 50 | 6000 | 4.0 | 1.2 | 4.0 | 1.2 | 4.0 | 1.2 | 4.0 | 1.2 |
| 65 | 6000 | 4.0 | 1.5 | 4.0 | 1.5 | 4.0 | 1.5 | 4.0 | 1.5 |
| 80 | 6000 | 4.5 | 2.1 | 4.5 | 2.1 | 4.5 | 2.1 | 4.5 | 2.1 |
| 100 | 6000 | 4.5 | 2.6 | 4.5 | 2.6 | 4.5 | 2.6 | 4.5 | 2.6 |
| 125 | 6000 | 4.5 | 3.3 | 4.5 | 3.3 | 4.5 | 3.3 | 4.5 | 3.3 |
| 150 | 6000 | 4.5 | 3.9 | 4.5 | 3.9 | 4.5 | 3.9 | 4.5 | 3.9 |
| 200 | 6000 | 4.5 | 5.1 | 4.5 | 5.1 | 4.5 | 5.1 | 4.8 | 5.5 |
| 250 | 6000 | 4.5 | 6.4 | 4.8 | 6.8 | 5.3 | 7.6 | 5.7 | 8.2 |
| 300 | 6000 | 4.6 | 7.8 | 5.5 | 9.4 | 6.1 | 10.4 | 6.6 | 11.3 |
| 350 | 6000 | 5.2 | 10.3 | 6.2 | 12.3 | 6.9 | 13.8 | 7.5 | 15.0 |
| 400 | 6000 | 5.7 | 12.9 | 6.9 | 15.7 | 7.8 | 17.8 | 8.4 | 19.2 |
| 450 | 6000 | 6.3 | 16.1 | 7.6 | 19.4 | 8.6 | 22.1 | 9.3 | 23.9 |
| 500 | 6000 | 6.9 | 19.6 | 8.4 | 23.9 | 9.4 | 26.8 | 10.2 | 29.1 |
| 600 | 6000 | 8.0 | 27.2 | 9.8 | 33.4 | 11.0 | 37.6 | 12.0 | 41.1 |
| 700 | 6000 | 9.2 | 36.5 | 11.2 | 44.5 | 12.7 | 50.6 | 13.8 | 55.1 |
| 800 | 6000 | 10.3 | 46.7 | 12.7 | 57.7 | 14.3 | 65.1 | 15.6 | 71.1 |
| 900 | 6000 | 11.4 | 58.1 | 14.1 | 72.1 | 15.9 | 81.4 | 17.4 | 89.3 |
| 1000 | 6000 | 12.6 | 71.3 | 15.5 | 88.0 | 17.6 | 100.2 | 19.2 | 109.4 |
| 1200 | 6000 | 14.8 | 100.5 | 18.4 | 125.4 | 20.9 | 142.7 | 22.8 | 155.9 |
| 1400 | 6000 | 17.1 | 135.5 | 21.2 | 168.5 | 24.1 | 191.9 | 26.4 | 210.6 |
| 1600 | 6000 | 19.4 | 175.7 | 24.1 | 218.9 | 27.4 | 249.4 | 30.1 | 274.4 |
| 1800 | 6000 | 21.6 | 220.0 | 27.0 | 275.8 | 30.7 | 314.3 | 33.7 | 345.6 |
| 2000 | 6000 | 23.9 | 270.5 | 29.9 | 339.4 | 34.0 | 386.7 | 37.3 | 424.9 |

Note: Dimensions are in mm, Weight in Kg/M.
Short-Pipes can be supplied as per requirement.
Pipe length Tolerance is +50/-50mm.

# UNDER GROUND PIPE SPECIFICATIONS




## STIFFNESS CLASS SN.2500

| Nominal Diameter | SPIGOT OD SP OD | | PRESSURE CLASS | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | PN - 6 | | PN - 10 | | PN - 16 | |
| (mm) | (mm) | (max) | Thk (mm) | Wt (kg/m) | Thk (mm) | Wt (kg/m) | Thk (mm) | Wt (kg/m) |
| 350 | 378 | 379 | 4.7 | 13.36 | 4.6 | 12.32 | 4.6 | 12.80 |
| 400 | 412 | 413 | 5.2 | 16.08 | 5.0 | 13.88 | 4.8 | 14.87 |
| 450 | 463 | 464 | 5.8 | 10.27 | 5.5 | 18.90 | 6.4 | 18.27 |
| 500 | 514 | 515 | 6.3 | 23.17 | 6.0 | 21.33 | 6.8 | 21.31 |
| 600 | 616 | 617 | 7.5 | 32.68 | 6.9 | 29.15 | 6.7 | 28.47 |
| 700 | 718 | 719 | 8.0 | 41.34 | 7.9 | 39.25 | 7.8 | 38.42 |
| 800 | 820 | 821 | 9.4 | 53.01 | 8.7 | 49.12 | 8.8 | 47.31 |
| 900 | 922 | 923 | 10.7 | 65.45 | 10.0 | 61.47 | 9.7 | 47.54 |
| 1000 | 1024 | 1025 | 11.8 | 81.32 | 11.1 | 74.72 | 10.7 | 74.00 |

## STIFFNESS CLASS SN.5000

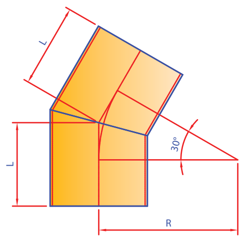
| Nominal Diameter | SPIGOT OD SP OD | | PRESSURE CLASS | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | PN - 6 | | PN - 10 | | PN - 16 | |
| (mm) | (mm) | (max) | Thk (mm) | Wt (kg/m) | Thk (mm) | Wt (kg/m) | Thk (mm) | Wt (kg/m) |
| 350 | 378 | 379 | 5.8 | 15.50 | 5.6 | 14.74 | 5.3 | 15.58 |
| 400 | 412 | 413 | 6.2 | 16.82 | 6.1 | 17.66 | 5.9 | 17.80 |
| 450 | 463 | 464 | 7.3 | 21.93 | 6.8 | 22.86 | 6.7 | 21.98 |
| 500 | 514 | 515 | 8.0 | 27.35 | 7.4 | 25.63 | 7.1 | 25.34 |
| 600 | 616 | 617 | 9.5 | 40.22 | 8.9 | 36.68 | 8.4 | 34.94 |
| 700 | 718 | 719 | 10.6 | 53.00 | 10.2 | 48.58 | 9.8 | 47.07 |
| 800 | 820 | 821 | 12.0 | 68.58 | 11.5 | 62.33 | 10.9 | 58.74 |
| 900 | 922 | 923 | 13.5 | 86.21 | 12.8 | 77.43 | 12.2 | 73.53 |
| 1000 | 1024 | 1025 | 15.0 | 103.56 | 14.1 | 93.35 | 13.5 | 92.32 |

## STIFFNESS CLASS SN.10000

| Nominal Diameter | SPIGOT OD SP OD | | PRESSURE CLASS | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | PN - 6 | | PN - 10 | | PN - 16 | |
| (mm) | (mm) | (max) | Thk (mm) | Wt (kg/m) | Thk (mm) | Wt (kg/m) | Thk (mm) | Wt (kg/m) |
| 350 | 378 | 379 | 7.3 | 18.49 | 7.1 | 17.76 | 6.6 | 16.86 |
| 400 | 412 | 413 | 8.0 | 23.44 | 7.9 | 21.49 | 7.4 | 20.90 |
| 450 | 463 | 464 | 8.9 | 28.02 | 8.6 | 28.84 | 8.2 | 26.31 |
| 500 | 514 | 515 | 9.6 | 34.12 | 9.3 | 32.08 | 9.1 | 30.61 |
| 600 | 616 | 617 | 11.7 | 47.76 | 11.1 | 45.79 | 10.6 | 42.63 |
| 700 | 718 | 719 | 13.6 | 64.06 | 12.8 | 62.05 | 12.1 | 57.33 |
| 800 | 820 | 821 | 15.5 | 82.90 | 14.6 | 78.04 | 13.9 | 74.78 |
| 900 | 922 | 923 | 17.2 | 103.44 | 16.4 | 98.36 | 15.5 | 93.48 |
| 1000 | 1024 | 1025 | 18.8 | 125.39 | 18.2 | 120.62 | 17.4 | 114.9 |

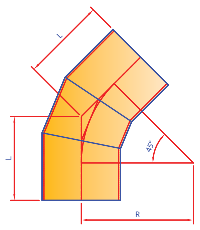
## FITTINGS - ELBOWS

Elbows are mitered pipe sections joined by glass laminate to take full axial Thrust. Small diameters elbow (400mm and below) can be made by hand laminate (Sweep). The standard dimensions of mitered elbows are as per the table below(R=1.5xD). Short Radius Elbows (R=1.0D) can also be fabricated as per the requirements.



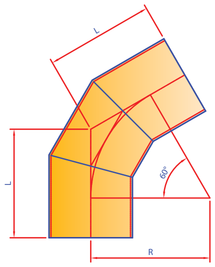

30° MITERED ELBOW

| Nominal Diameter | R | L |
|---|---|---|
| 400 | 600 | 400 |
| 450 | 675 | 400 |
| 500 | 750 | 450 |
| 600 | 900 | 500 |
| 700 | 1050 | 550 |
| 750 | 1125 | 550 |
| 800 | 1200 | 600 |
| 900 | 1350 | 650 |
| 1000 | 1500 | 650 |



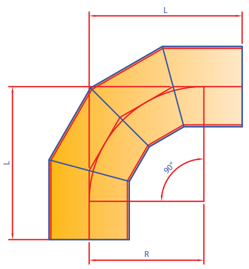

45° MITERED ELBOW

| Nominal Diameter | R | L |
|---|---|---|
| 400 | 600 | 450 |
| 450 | 675 | 500 |
| 500 | 750 | 525 |
| 600 | 900 | 625 |
| 700 | 1050 | 700 |
| 750 | 1125 | 750 |
| 800 | 1200 | 800 |
| 900 | 1350 | 850 |
| 1000 | 1500 | 900 |




60° MITERED ELBOW

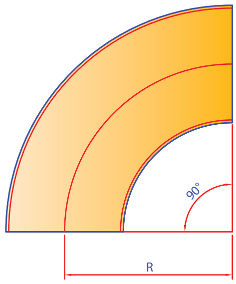
| Nominal Diameter | R | L |
|---|---|---|
| 400 | 600 | 500 |
| 450 | 675 | 550 |
| 500 | 750 | 600 |
| 600 | 900 | 750 |
| 700 | 1050 | 850 |
| 750 | 1125 | 925 |
| 800 | 1200 | 1000 |
| 900 | 1350 | 1100 |
| 1000 | 1500 | 1200 |



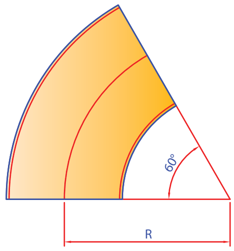

90° MITERED ELBOW

| Nominal Diameter | R | L |
|---|---|---|
| 400 | 600 | 700 |
| 450 | 675 | 800 |
| 500 | 750 | 900 |
| 600 | 900 | 1100 |
| 700 | 1050 | 1300 |
| 750 | 1125 | 1400 |
| 800 | 1200 | 1500 |
| 900 | 1350 | 1650 |
| 1000 | 1500 | 1800 |

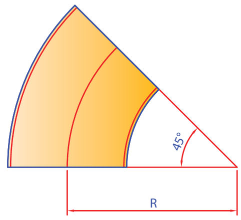
## SWEEP ELBOWS




90° SWEEP ELBOW




60° SWEEP ELBOW



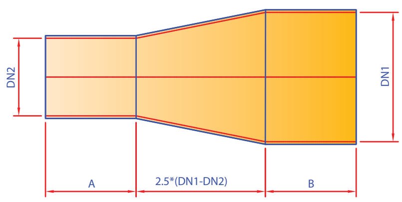

45° SWEEP ELBOW

Elbow with flanged end, spigot end can be supplied as per requirement.

| DN | R |
|---|---|
| 20 | 75 |
| 25 | 75 |
| 40 | 120 |
| 50 | 150 |
| 80 | 160 |
| 100 | 150 |
| 150 | 225 |
| 200 | 300 |
| 250 | 375 |
| 300 | 450 |
| 350 | 525 |
| 400 | 600 |
| 500 | 750 |
| 600 | 900 |
| 700 | 1050 |

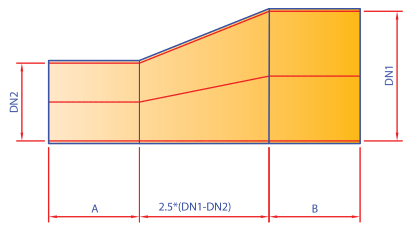
## REDUCER

Reducers are fittings that connect two different pipe diameters. The standard reducers are made eccentric and concentric to the pipe center. The joint between pipes and Reducers is glass laminate.




CONCENTRIC REDUCER

CONCENTRIC REDUCER




ECCENTRIC REDUCER

ECCENTRIC REDUCER

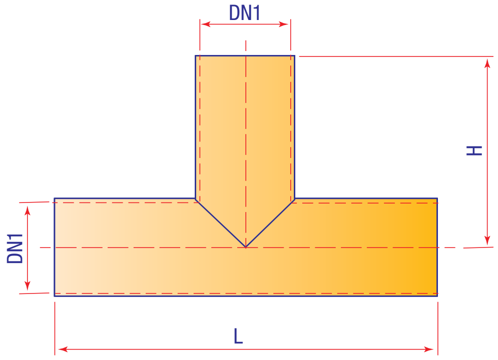
A = 150 or 0.5 * DN2 whichever is greater

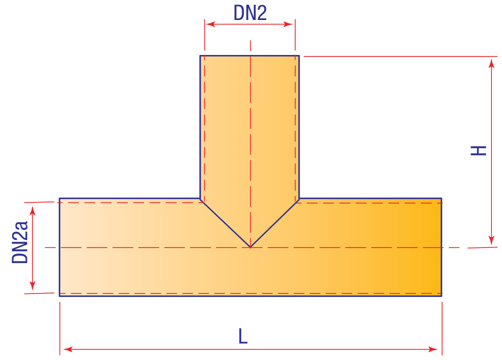
B = 150 or 0.5 * DN1 whichever is greater

# TEE

Tees and pipe sections jointed by glass laminate to take full axial thrust. The standard dimensions of Tees are as per the below table.

## STANDARD EQUAL & UNEQUAL TEE DIMENSIONS



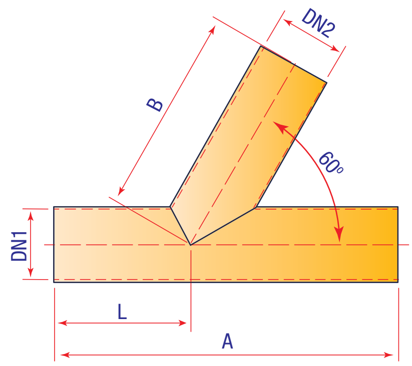

### EQUAL TEE

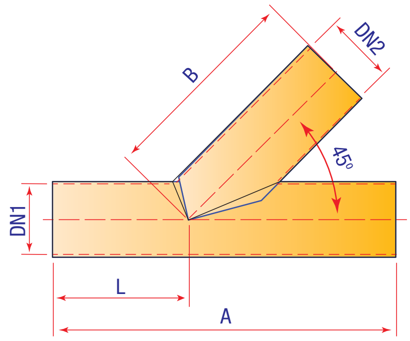
| DN1 | DN1 | L | H |
|---|---|---|---|
| 25 | 25 | 200 | 100 |
| 40 | 40 | 200 | 100 |
| 50 | 50 | 250 | 125 |
| 80 | 80 | 300 | 150 |
| 100 | 100 | 300 | 150 |
| 150 | 150 | 450 | 225 |
| 200 | 200 | 600 | 300 |
| 250 | 250 | 750 | 375 |
| 300 | 300 | 900 | 450 |
| 350 | 350 | 1050 | 525 |
| 400 | 400 | 1200 | 600 |
| 450 | 450 | 1350 | 675 |
| 500 | 500 | 1500 | 750 |
| 600 | 600 | 1800 | 900 |
| 700 | 700 | 2100 | 1050 |
| 800 | 800 | 2400 | 1200 |
| 900 | 900 | 2700 | 1350 |
| 1000 | 1000 | 3000 | 1500 |

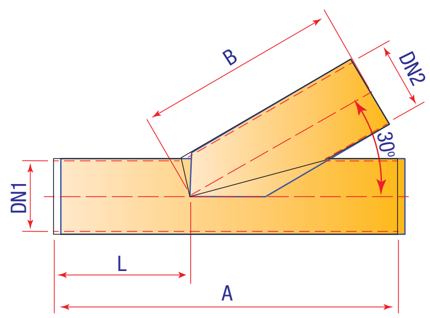
### UNEQUAL TEE

| DN1 | DN2 | L | H |
|---|---|---|---|
| 50 | 25 | 200 | 100 |
| 80 | 25< DN2 <50 | 300 | 100 |
| 100 | 25< DN2 <80 | 300 | 150 |
| 150 | 25< DN2 <100 | 400 | 200 |
| 200 | 25< DN2 <150 | 500 | 250 |
| 250 | 25< DN2 <100 | 600 | 300 |
| | 150< DN2 <200 | 750 | 375 |
| 300 | 25< DN2< 100 | 700 | 350 |
| | 150< DN2< 250 | 850 | 425 |
| 350 | 50 < DN2< 150 | 800 | 400 |
| | 150 < DN2< 300 | 1000 | 500 |
| 400 | 80 < DN2< 150 | 950 | 475 |
| | 200 < DN2< 350 | 1150 | 500 |
| 500 | 100 < DN2< 200 | 1200 | 600 |
| | 250 < DN2< 450 | 1400 | 700 |
| 600 | 150 < DN2< 300 | 1200 | 600 |
| | 350 < DN2< 500 | 1400 | 800 |
| 700 | 150 < DN2< 300 | 1350 | 650 |
| | 350 < DN2< 600 | 1650 | 800 |
| 800 | 150 < DN2< 400 | 1600 | 800 |
| | 450 < DN2< 750 | 2000 | 1000 |
| 900 | 200 < DN2< 450 | 1800 | 900 |
| | 500 < DN2< 800 | 2150 | 1100 |
| 1000 | 200 < DN2< 450 | 2000 | 1000 |
| | 500< DN2< 900 | 2400 | 1200 |

# WYE




45° & 60° WYE (DN2 > 0.5 x DN1)

| Size | A | B | L |
|---|---|---|---|
| 150 | 440 | 240 | 145 |
| 200 | 610 | 360 | 205 |
| 250 | 780 | 480 | 265 |
| 300 | 950 | 600 | 325 |
| 350 | 1120 | 720 | 385 |
| 400 | 1290 | 840 | 445 |
| 450 | 1460 | 960 | 505 |
| 500 | 1630 | 1080 | 565 |
| 600 | 1970 | 1320 | 685 |
| 700 | 2310 | 1560 | 805 |
| 800 | 2650 | 1800 | 925 |
| 900 | 2990 | 2040 | 1045 |
| 1000 | 3330 | 2280 | 1165 |

30° WYE (DN2 > 0.5 x DN1)

| Size | A | B | L |
|---|---|---|---|
| 150 | 500 | 530 | 120 |
| 200 | 700 | 673 | 177 |
| 250 | 900 | 817 | 234 |
| 300 | 1100 | 960 | 291 |
| 350 | 1300 | 1103 | 347 |
| 400 | 1500 | 1246 | 404 |
| 450 | 1700 | 1390 | 461 |
| 500 | 1900 | 1533 | 518 |
| 600 | 2300 | 1820 | 631 |
| 700 | 2700 | 2106 | 745 |
| 800 | 3100 | 2393 | 858 |
| 900 | 3500 | 2679 | 972 |
| 1000 | 3900 | 2966 | 1085 |

45° & 60 ° WYE (DN2 < 0.5 x DN1)

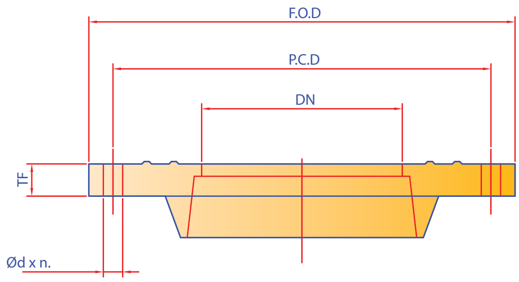
| Size | A | B | L |
|---|---|---|---|
| 150 | 335 | 218 | 93 |
| 200 | 470 | 290 | 135 |
| 250 | 605 | 363 | 178 |
| 300 | 740 | 435 | 220 |
| 350 | 875 | 508 | 263 |
| 400 | 1010 | 580 | 305 |
| 450 | 1145 | 653 | 348 |
| 500 | 1280 | 725 | 390 |
| 600 | 1550 | 870 | 475 |
| 700 | 1820 | 1015 | 560 |
| 800 | 2090 | 1160 | 645 |
| 900 | 2360 | 1305 | 730 |
| 1000 | 2630 | 1450 | 815 |

30° WYE (DN2 < 0.5 x DN1)

| Size | A | B | L |
|---|---|---|---|
| 150 | 350 | 390 | 45 |
| 200 | 500 | 487 | 77 |
| 250 | 650 | 583 | 109 |
| 300 | 800 | 680 | 141 |
| 350 | 950 | 777 | 172 |
| 400 | 1100 | 783 | 204 |
| 450 | 1250 | 970 | 236 |
| 500 | 1400 | 1067 | 268 |
| 600 | 1700 | 1260 | 331 |
| 700 | 2000 | 1453 | 395 |
| 800 | 2300 | 1646 | 458 |
| 900 | 2600 | 1840 | 522 |
| 1000 | 2900 | 2033 | 585 |

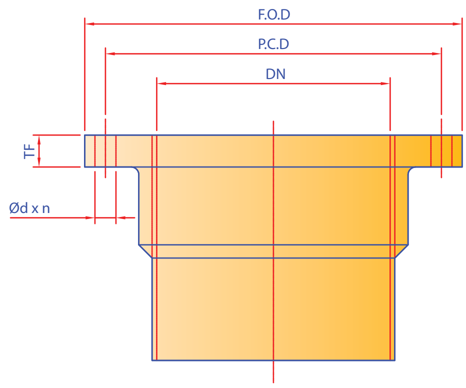
## FLANGE JOINTS

The flange is a heavy collar made up of glass laminate impregnated with resin, where the laminate is bonding to one end of the




CONICAL BELL FLANGE

DN ≤ 300mm




FLAT FACE FLANGE

DN ≥ 350mm

## STANDARD FLANGE DIMENSIONS

| Nominal Dia. DN | Flange Dia. FOD | Bolt Circle FCD | Hole Dia. Od | No. of Holes n | Flange Thick TF |
|---|---|---|---|---|---|
| 15 | 89 | 60.5 | 16 | 4 | 20 |
| 20 | 99 | 70.0 | 16 | 4 | 20 |
| 25 | 115 | 79.4 | 16 | 4 | 30 |
| 40 | 135 | 98.5 | 16 | 4 | 30 |
| 50 | 160 | 120.6 | 18 | 4 | 35 |
| 65 | 180 | 139.7 | 18 | 4 | 35 |
| 80 | 200 | 152.4 | 18 | 4 | 40 |
| 100 | 235 | 190.4 | 18 | 8 | 40 |
| 125 | 255 | 215.9 | 23 | 8 | 45 |
| 150 | 285 | 241.3 | 23 | 8 | 45 |
| 200 | 350 | 298.5 | 23 | 8 | 45 |
| 250 | 410 | 361.9 | 27 | 12 | 55 |
| 300 | 485 | 431.8 | 27 | 12 | 55 |
| 350 | 535 | 476.3 | 30 | 12 | 55 |
| 400 | 600 | 539.8 | 30 | 16 | 60 |
| 450 | 635 | 577.9 | 33 | 16 | 65 |
| 500 | 700 | 635.0 | 33 | 20 | 70 |
| 600 | 815 | 749.3 | 36 | 20 | 75 |
| 700 | 930 | 863.6 | 36 | 28 | 80 |
| 750 | 985 | 914.4 | 36 | 28 | 85 |
| 800 | 1065 | 977.9 | 42 | 28 | 90 |
| 900 | 1170 | 1085.9 | 42 | 32 | 95 |
| 1000 | 1290 | 1200.2 | 42 | 36 | 100 |

Note: Flange dimensions are as per ASME B16.5 / B16.47
Other Flange drilling specification are available upon request.
Dimensions are in millimeters.

## 10 Quality Control

Before, during and after manufacturing, GPI realizes rigorous quality controls conforming to relevant standards.

### 10.1 Controlling Raw Materials

Resins: Each barrel is submitted to a viscosity control. Similarly, a reactivity control is also realized, for checking the gel time and the exothermic peak in determined conditions of hardening, accelerating and working conditions. At the same time, the specific gravity is also controlled.

Glass: On all glass reinforcements used, there is a control of weight per surface unit.

### 10.2 QC during production

Each pipe & fitting is produced according to a specific production sheet. Each single piece is registered when manufactured with the date of manufacturing, on individual number, the fittings type, DN, PN, resin used and the name of manufacturer.




### 10.3 QC of finished products

Conforming to the international standards, systematic control realized on the following points:

**Visual Inspection**

Each fitting coming out of the production is visually controlled, based on an internal procedure from ASTM D-2563.


**Weight Control, Dimensional Inspection**

Each fittings weight is controlled and compared to the minimum weight resulting from calculation and depending upon this, its shape, its pressure class, the raw materials used, the type of connection... the minimum wall thickness is also controlled on each single piece, as well as dimension.

### Glass content

The glass content and construction are regularly controlled by loss of ignition test for each type of manufacturing process (winding or laminating in a mould).

### Geometrical Inspection

Geometrical controls are carried out on critical locations for the wall thickness. The outer diameter and length of a spigot, or the length and inner diameter of a socket, dimensional conformity of flanges and collars are also systematically controlled.

### Hydro Testing

The standard pipes and fittings are subjected to hydro testing as part of quality control. The test pressures vary from 1.5 to 2 times the design rating. For site testing, the spools / pipeline are tested at 1.5 times design pressure. Hydro testing is also conducted as per the Inspection Test Plan agreed with the client depending on the site / process conditions.

### Identification & Marking

All QC data is recorded. Each fitting gets an identification number when manufactured which allows tracing them and their data. Identification marking includes information like type of resin, nominal size, maximum working pressure and temperature. All these markings, together with GPI trade mark, are incorporated under the outer layer.

## 11 Certifications and Accreditations

Certificate Of Registration

GULF PIPE INDUSTRIES L.L.C.

Quality Registrar Systems certify that the management system of the above organization has been audited and found to be in compliance with the QRS requirements for registration of the management system standard detailed below:

ISO 14001:2015

Environmental Management Systems

Scope of work

PIPES, FIBRE GLASS PRODUCTS AND FITTINGS MANUFACTURING

Certificate Of Registration

GULF PIPE INDUSTRIES L.L.C.

Quality Registrar Systems certify that the management system of the above organization has been audited and found to be in compliance with the QRS requirements for registration of the management system standard detailed below:

ISO 45001:2018

Occupational Health and Safety Management Systems

Scope of work

PIPES, FIBRE GLASS PRODUCTS AND FITTINGS MANUFACTURING

Certificate Of Registration

GULF PIPE INDUSTRIES (L.L.C)

Quality Registrar Systems certify that the management system of the above organization has been audited and found to be in compliance with the QRS requirements for registration of the management system standard detailed below:

ISO 9001:2015

Quality Management Systems

Scope of work

PIPES, FIBRE GLASS PRODUCTS AND FITTINGS MANUFACTURING

# 12 Handling of GRP/GRE pipes

### 12.1 Receiving

Generally pipes will be handed over to the Contractor or his representative at the factory or at the Job site or as agreed upon in the Contractor's purchase order. In the case of an Ex-works delivery, the pipes and fittings shall be loaded on the Contractor's trucks, by the factory loading staff. If the loading staff considers the transport of items unsuitable they will advise the contractor or his representative accordingly. Inspection is thoroughly made by the factory loading staff of the goods being loaded; nevertheless, the Contractor or his representative should make their own inspection of the goods during dispatch.

The Contractor should make the following inspection at the time of the reception of the goods:

- Each item should be inspected with care upon its arrival.
- Total quantity of pipes, fittings, etc. should be carefully checked against our delivery notes.
- Any damaged or missing item must be pointed out to the dispatcher or driver and noted on the delivery note.

Materials that have been damaged during transportation should be isolated and stored separately on site, until the material is checked by our site representative and repaired or replaced. Damaged material must not be used before it is repaired.

### 12.2 Pipe Offloading

Offloading at the jobsite must be carried out carefully under the control and responsibility of the Contractor. Care should be taken to avoid impact with any solid object (i.e. other pipes, ground stones, truck side etc...)

**Offloading by Hand**

Unloading by hand with two men should be done for small diameter pipes, not exceeding 60 kg.

**Mechanical Offloading**

Mechanical offloading is required for pipes heavier than 60 kg. Flexible slings or straps should be used combined with a mobile crane. It is recommended to use two slings or nylon lifting straps to hold and lift the pipes. Steel cables must not be used for lifting or handling GPI pipes. GPI Pipes can also be lifted with one sling or strap balanced in the middle with the aid of a guide rope.

**Caution:** Hooks must not be used at the pipe ends to lift the pipes, nor should the pipe be lifted by passing a rope or sling through it.

### 12.3 Storing GPI Pipes on Site

**Distribution along the trench**

Avoid placing the pipes where they can be damaged by traffic or blasting operation. Also avoid laying the pipes on sharp rocks or objects that may damage and affect their function. Store the pipes if possible on soft level ground (e.g. sand), timber bearers or sand bags.

**Caution:** Pipes must not be stored on rocks.

### Storing in stock piles

Care must be taken that the storage surface has the same level, firm as possible and clear of rocks or solid objects that might damage the pipes. Store the pipes in separate stock–piles according to their class and nominal diameter. Pipes are to be placed on wooden timber at a maximum spacing of 6 meters. Any extraneous materials are to be removed from the area. Wooden wedges, used in order to prevent the pipe stack from sliding, should be placed on both sides of the stack, on the timber bearer, as shown in Figure.

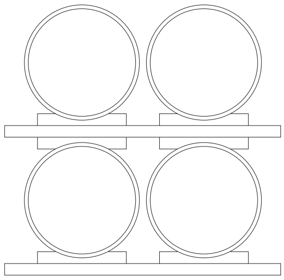


Figure : Pipe storage

### Handling of Nested pipes

Pipes delivered in nested system (small pipes kept inside bigger pipes) should be handle with special care.

When handling nested pipes, never use only one sling or strap. Nested pipes must always be lifted using at least two straps or slings. A spreader bar will help to insure that the load is lifted at one level. Mobile lifting equipment should move slowly when handling nested pipes and all such movements should be kept to a minimum to ensure the safety of site personnel. The Contractor should ensure that the crane operator realizes that the nested pipes which is kept inside may slip out and fall during movement. All necessary precautions should be taken.

De–nesting a load is easily accomplished by inserting a forklift fork into a padded boom. Figure shows how this is accomplished. Ensure that the forklift capacity is adequate for the job . Proper padding is essential; rubber, several wraps of corrugated cardboard sheets, a PVC pipe or PE pipe slipped over the boom are all suitable options to avoid damaging the inside of the pipes.

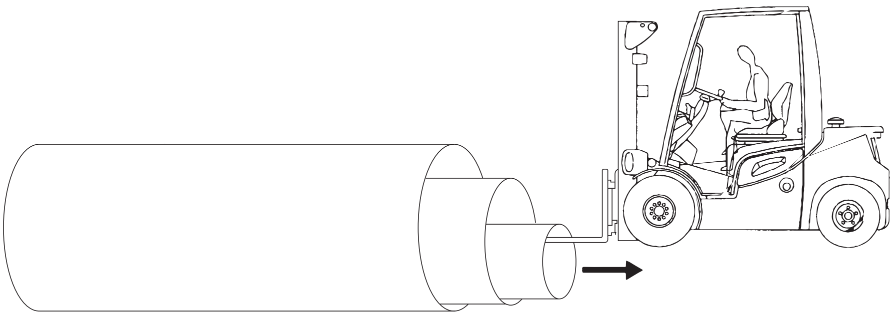


Figure: De nesting of pipes

The Forklift operator should lift the innermost pipe above the pipe around it sufficiently so the pipes do not touch each other when the inner pipe is being pulled out.

## 13 Manhole liners and Tank shells

Manhole liners and tank shells are constructed from a thermosetting chemical resistant polyester resin, glass fiber reinforcements, silica sand, and additives as required.

Manhole liners are mainly used in municipal projects and serve as an inside liner for a concrete surrounding. They can be provided as either loose liners or with "cover slabs" that have either a round or a square opening. Liners are available in diameters ranging from Ø 600 mm to Ø 4000 mm and have an ordinary wall thickness of 7.5 to 10 mm.


Tank shells serve as storage tanks for water, fuel and other chemicals. VE resin used for liner formation is known to have a very good chemical resistance that protects the inner surface of tanks from corrosive chemicals. Silica sand is added as a filler and ribbing is a must to achieve a good stiffness value. The outer surface of tank shells is rough so as to have a better bonding to the later applied reinforcing material. Tank shells are available in diameters ranging from 0 1200 mm to 0 4000 mm and have a maximum wall thickness of 14 mm.

## 14 Pressure Vessels & Tanks for Above Ground and Under Ground Applications

### 14.1 Pressure Vessels

FRP Pressure vessels are manufactured as per the client requirements of capacity and site / process conditions.

FRP Pressure vessels can be manufactured with Polyester, Vinyl Ester, and Epoxy resins depending on the process requirements. Tanks can be designed and manufactured in compliance with international standards like ASME Sec-X of BPV code or BS 4994. The manufactured vessels are subjected to quality control tests and hydro testing.

Salient Features of the FRP pressure vessels are:

- Corrosion Resistant
- Light in Weight
- High Impact Strength
- Superior Outlook
- Easy to handle & Install
- Maintenance Free.

### 14.2 Above Ground Fiberglass Tanks

Above ground fiber glass vessels and piping are widely used by municipalities and manufacturers because of their ability to handle corrosive chemicals. For instance, waste water treatment facilities use above ground fiber glass storage tanks and piping because they safely contain and transport harsh chemicals such as sodium hypochlorite (bleach), alum and ferric chloride. In addition, above ground fiberglass corrosion resistant stacks are used to ventilate waste water treatment facilities.

### Manufacturing standards for Above Ground Tanks

GPI above ground tanks can be designed and manufactured to meet the following standards, as well as other customer requirements and specifications:

- American Society of Mechanical Engineers — Std : ASME RTP-1
- British & European Standards — Std : BS 4994, BS EN 13121
- American Society for Testing and Materials — Std: ASTM D 3299, ASTM D 4097

Applications of aboveground fiberglass tanks, piping and equipment include the storage of such diverse items as bleach, food, chemicals and brine, as well as the collection of refinery spills

GPI aboveground tanks may be ordered in single-wall or double-wall models, for a full range of seismic conditions, insulated or not, in diameters up to 4m, and in capacities up to 50,000 gallons. When an aboveground tank is ordered with saddles, legs or a skirt, these support components are also manufactured of fiberglass.

GPI aboveground tanks can be designed and manufactured with the following options:

- vertical or horizontal models
- open, flat or dome tops
- flat-bottom, dish-bottom, cone-bottom or sloped-bottom
- leg-supported, skirt-supported or saddle-supported
- single-wall or double-wall models.

### Typical accessories for GPI above ground fiberglass tanks

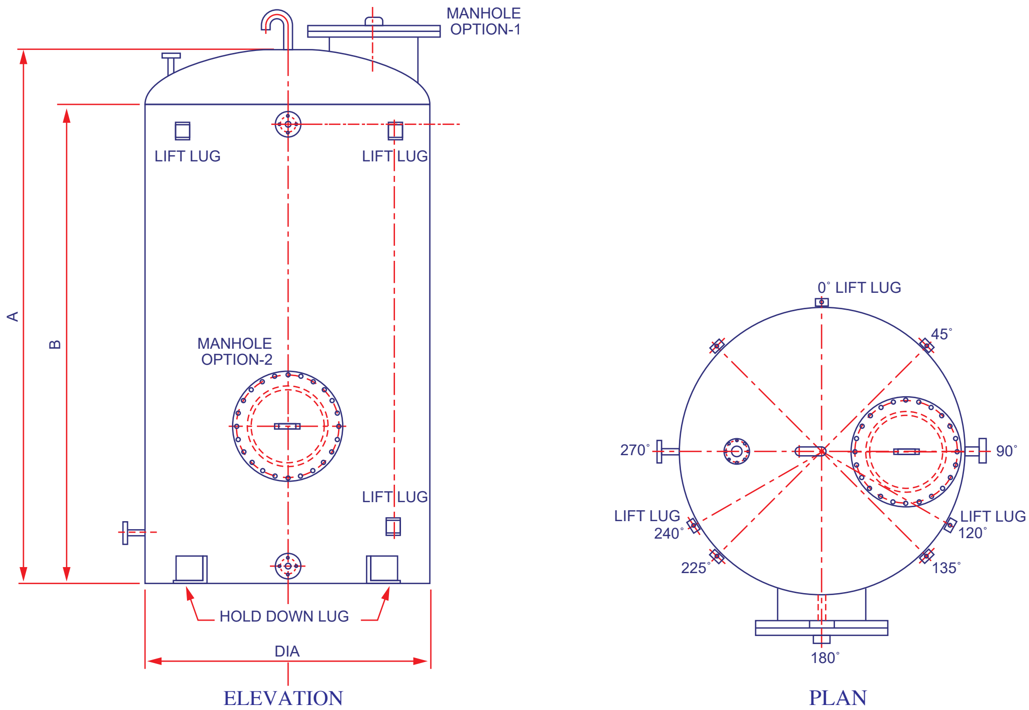
- Manways
- Hinged manways
- Mounting brackets
- Vents (gooseneck and mushroom)
- Flanged nozzles
- Ladders
- Lifting lugs
- Tie-down lugs
- Drains
- Work platforms and catwalks
- Handrails

### 14.3 Under Ground Fiber Glass Tanks

Fiberglass underground fuel storage tanks can be used to store gasoline, aviation fuel, gasohol (90% gasoline and 10% ethanol mixture), jet fuel, diesel fuel, potable water or waste water at ambient underground temperatures, or fuel oil at temperatures not to exceed 65°C. American National Standard ANSI/UL 1316 are the Standard for Fiber Reinforced Plastic Underground Storage Tanks for Petroleum Products, alcohols and alcohol-gasoline mixtures. GPI produces tanks conforming to this standard.

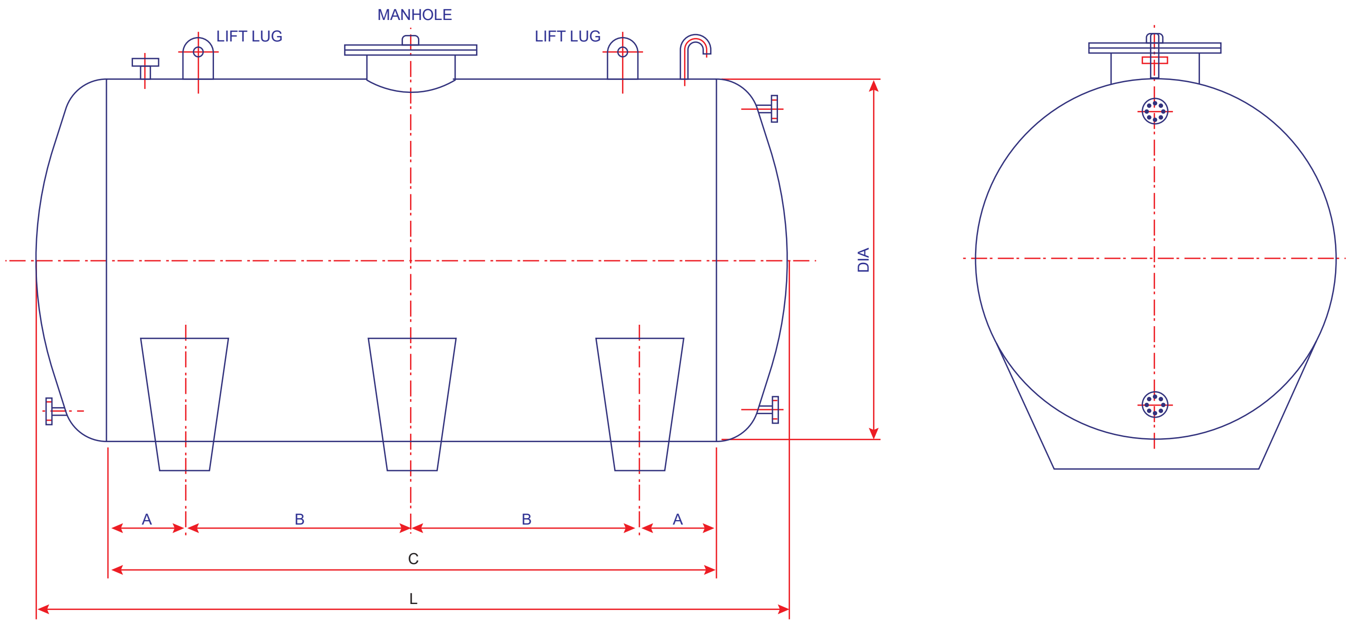
GRP Tanks are made up of stiffened tank shell with end caps and provision for fuel intake and outlet and fuel metering devices. Tanks should be provided with pipe connections and man-ways. Tank shells are provided with ribbing to achieve a high stiffness level. The outer surface of the tank shell is rough, which ensures a very good bonding.

# ABOVE GROUND VERTICAL TANK




| MODEL | Nominal Capacity (CuM) | DIA (mm) | Shell Height B (mm) | Total Heigl A (mm) |
|---|---|---|---|---|
| AGTV 12001 | 1 | 1200 | 1200 | 1440 |
| AGTV 12003 | 3 | 1200 | 2960 | 3200 |
| AGTV 16005 | 5 | 1600 | 2790 | 3110 |
| AGTV 16006 | 6 | 1600 | 3285 | 3605 |
| AGTV 18008 | 8 | 1800 | 3450 | 3810 |
| AGTV 200010 | 10 | 2000 | 3490 | 3890 |
| AGTV 200012 | 12 | 2000 | 4120 | 4520 |
| AGTV 240015 | 15 | 2400 | 3620 | 4100 |
| AGTV 240020 | 20 | 2400 | 4725 | 5205 |
| AGTV 300025 | 25 | 3000 | 3840 | 4440 |
| AGTV 300030 | 30 | 3000 | 4550 | 5150 |
| AGTV 300035 | 35 | 3000 | 5260 | 5860 |
| AGTV 360040 | 40 | 3600 | 4230 | 4950 |
| AGTV 360050 | 50 | 3600 | 5220 | 5940 |
| AGTV 360060 | 60 | 3600 | 6200 | 6920 |
| AGTV 400070 | 70 | 4000 | 5870 | 6670 |
| AGTV 400080 | 80 | 4000 | 6670 | 7470 |
| AGTV 400090 | 90 | 4000 | 7470 | 8270 |
| AGTV 4000100 | 100 | 4000 | 8260 | 9060 |
| AGTV 4000125 | 125 | 4000 | 10250 | 11050 |
| AGTV 4000150 | 150 | 4000 | 12240 | 13040 |

Note : Accessories are Ladder, Platform & Hand Rails.




ELEVATION

END VIEW

| MODEL | Nominal Capacity | | DIA (mm) | Shell Length C (mm) | Total Length L (mm) | A (mm) | B (mm) | Number of Cradles |
|---|---|---|---|---|---|---|---|---|
| | (USG) | (LT) | | | | | | |
| HT 500 | 500 | 1900 | 1200 | 1340 | 1940 | 375 | 595 | 2 |
| HT 750 | 750 | 2850 | 1200 | 2220 | 2820 | 375 | 1035 | 2 |
| HT 1000 | 1000 | 3800 | 1600 | 1420 | 2220 | 450 | 660 | 2 |
| HT 1500 | 1500 | 5700 | 1800 | 1720 | 2620 | 500 | 810 | 2 |
| HT 2000 | 2000 | 7550 | 1800 | 2500 | 3400 | 500 | 1200 | 2 |
| HT 3000 | 3000 | 11350 | 1800 | 4060 | 4960 | 500 | 1980 | 2 |
| HT 4000 | 4000 | 15150 | 1800 | 5620 | 6520 | 500 | 1840 | 3 |
| HT 5000 | 5000 | 18950 | 1800 | 7190 | 8090 | 500 | 2363 | 3 |
| HT 6000 | 6000 | 22750 | 2400 | 4440 | 5640 | 600 | 2220 | 2 |
| HT 8000 | 8000 | 30300 | 2400 | 6200 | 7400 | 600 | 2067 | 3 |
| HT 10000 | 10000 | 37900 | 2400 | 7950 | 9150 | 600 | 2650 | 3 |
| HT 12000 | 12000 | 45450 | 2400 | 9710 | 10910 | 600 | 2428 | 4 |
| HT 15000 | 15000 | 56800 | 3000 | 7390 | 8890 | 700 | 2497 | 3 |
| HT 20000 | 20000 | 75750 | 3000 | 10200 | 11700 | 700 | 2575 | 4 |
| HT 25000 | 25000 | 94650 | 3000 | 13020 | 14520 | 700 | 2624 | 5 |

Note : Accessories are Ladder, Platform & Hand Rails.

## 15 Custom fabrication

GPI is able to fabricate a wide range of engineered fiberglass structural products to meet specific customer requirements. Examples of this custom fabrication are

- Contact-molded tanks
- Ductwork
- Free-standing exhaust stacks
- Air stripping towers
- Scrubbers
- Wastewater holding tanks
- Food-processing tanks
- Brine makers
- Sea water intake tower screen
- GRP Channels
- Sludge Silo
- Gravity Sludge thickneners






## 16 Site services

- Pipe joint laminations
- GRP lining for concrete tanks
- GRP lining for Manholes

## 17 Trading Activities

- Supply of HDPE Jacket pipes for Insulated pipes
- Supply of Industrial/ Process plant Chemical
- Supply of HDPE, PE, U/CPVC pipes & filttings

## Project Photos

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