

Maskell Productions supply fibre reinforced plastic (fibreglass) products for corrosion resistant applications in industry. Maskell have proven international competitiveness in the fibreglass industry through engineering expertise and automated manufacturing plant and equipment. In house engineering is supported by a range of international associations, to provide clients with the world's latest technology. Services to clients extends from manufacturing to complete design, manufacture and install packages.



Hot gas diffuser structure inside cooling tower.



DN2200 GRP Offshore Cooling Water Pipework.



DN1800 Rising Main from Hot Well Pumps to Cooling Tower, at the Ohaaki Geothermal Power Station.

Maskell have experience in the manufacture of the following products, for the energy and geothermal power sector:

- Circulating water pipe (DN50 – DN3000).
- Onshore and Offshore Seawater Cooling Intakes/Outfalls.
- Cooling tower internal pipework.
- Buried pipework systems around plants for cooling/firewater.
- Gas diffuser structures inside cooling towers.
- Fibreglass fans, fan blades and cowls for corrosive gas streams.
- Wellhead silencer barrels.
- Hot gas and foul air duct systems.
- Condenser and intercooler pipework.
- Fibreglass tank covers up to 50m diameter.
- Fibreglass process tanks and vessels.
- Odour control and air pollution scrubbing systems.



Inlet Pipe at Watercare Mangere, installed in 1978, still in service in 1999.



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FRP Pipe...Exceptional Strength to Weight Ratio

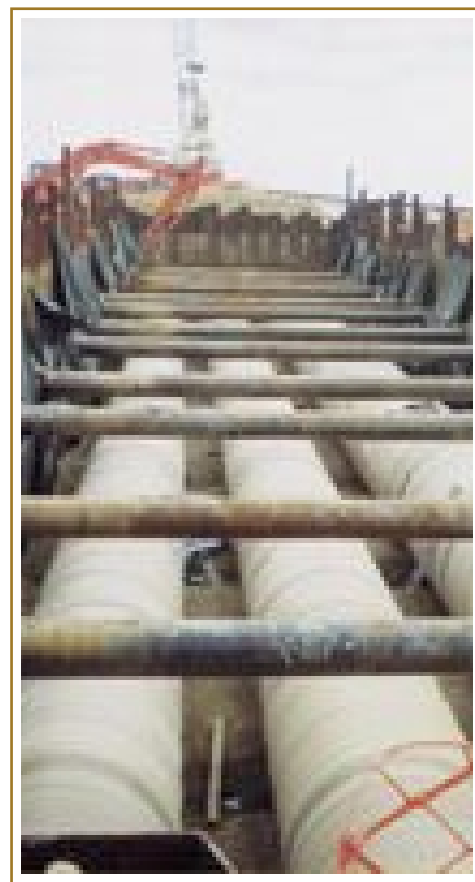
There are three basic layers to any FRP pipe:

- 1) The internal, or corrosion barrier has a high resin to glass ratio (75-80) and here the chemical barrier is set up and also the glass smooth internal surface is achieved.
- 2) The structural layer: Cover upon cover of this continuous filament is laid on top of each other until the required strength pipe is achieved, standard strengths include gravity pipe, 50 psi, 100 psi and 150 psi pipe, all have corresponding increasing wall thicknesses. Increased pipe strengths can be easily achieved on request.
- 3) The outer resin rich surface to protect the pipe from any external corrosion problems.

The following are some standard properties of filament wound pipe:

| Property at 23 deg C | Test | Value |
|---|------------|--------------------------|
| UTS | | BS 5480 Part 2 |
| Hoop | Appendix M | 275 MPa |
| Axial | Appendix P | 140 MPa |
| Modulus of Elasticity | | |
| Hoop | BS5480 and | 24,138 MPa |
| Axial | BS2782 | 12414 MPa |
| Co-efficient of linear thermal expansion. | | 2x10 ⁻² mm/MK |

The other method of pipe manufacture is hand laid pipe.



After the corrosion barrier is laid on the pipe mandrel, successive layers of either woven roving and chopped strand mat or just chopped strand mat are laid on by hand until the required strength thickness is achieved.

This is not quite so cost effective as the bi-axial woven cloth provides the same strength in the axial and radial directions, when the axial stress is only half that of the radial stress (P_r/t as opposed to $P_r/2t$), so therefore needs to be as an average, 1/3 thicker than filament wound pipe for the same strength properties. It can however become advantageous when being used in very harsh environments when thickness is advantageous due to the physical environment the pipes are in. One example of this is the fertiliser companies, who used physical force to clean the sludge from the inner walls, and here wall thickness and impact resistance became the determining criteria when selecting manufacturing methods.

Hand laid pipe also becomes effective on small diameter pipework, or when the internal stresses become very low, for example when corrosive element is a gas.

The following are some standard properties of hand laid pipe.

| Properties @ 23 deg | Test | ASTM Laminate thickness (mm) | | | |
|-------------------------------|---------|------------------------------|------|------|------|
| | | 3-5 | 6 | 8 | 10+ |
| UTS - MPA | D - 638 | 60 | 80 | 90 | 100 |
| Flexural strength - MPa | D - 790 | 110 | 130 | 140 | 150 |
| Flex. mod of elasticity - MPa | D - 790 | 5000 | 5500 | 6000 | 7000 |

Using our licensee's experience and our own in house engineering knowledge each pipe we produce has our full engineering backup, so whether the pipe be buried, or hung above ground we are fully capable of designing systems detailed specifically to meet the customers requirements.