

Fibreglass (GRP) Pipe Systems

Maskell manufacture fibreglass (GRP/FRP) pipe for a wide range of industrial and process plant applications. Pipe systems range in size from DN50-DN3500 and include a full range of pipe fittings and various jointing systems. Pipe systems are designed for specific projects with consideration of pressure, stiffness and external load requirements. A range of resin systems and manufacturing processes are used to optimise the pipe system for the application, from mild water and wastewater pipe work to aggressive chemical pipe handling caustic or sulphuric acid systems.



Fibreglass (GRP) Pipe Features

Maskell has been bringing products to local market and international market that are low cost, long-term piping solutions to their customers. Below is a list of features and benefits that provides optimum installed and life cycle cost system.

Features	Benefits
Advanced Technology pipe design	<ul style="list-style-type: none"> Complies with performance standards Consistent high product quality Lower wave celerity than other piping materials
Corrosion-resistant materials	<ul style="list-style-type: none"> Extended, effectual service life Low maintenance cost No necessity for linings, coating, cathodic protection, wraps or other forms of corrosion protection Constant Hydraulic characteristic over time
Light weight (1/4 weight of ductile iron 1/10 weight of concrete)	<ul style="list-style-type: none"> Reduced transport costs Eliminates need for handling equipment
Long Standard Lengths	<ul style="list-style-type: none"> Fewer joints hence reduced installation time Lower delivery cost – more pipe per transport
Extremely smooth bore	<ul style="list-style-type: none"> Lower operating cost and low friction loss Minimum slime build-up can help lower cleaning costs
Range of joint types	<ul style="list-style-type: none"> Quick installation for coupling joints Axial restraint for site welded pipe Site mitre of pipe
Flexible manufacturing process	<ul style="list-style-type: none"> Custom diameters can be manufactured.
High technology pipe design	<ul style="list-style-type: none"> Lower wave celerity than other piping materials can mean less cost when designing for surge and water hammer pressures.

Product Performance

Flow Velocity	Maximum recommended flow velocity is 3.0m/sec. Velocities of up to 4m/sec. can be used if the water is clean and contains no abrasive material.
UV Resistance	There is no evidence to suggest that ultraviolet degradation is a factor that affects the long-term service life of Maskell pipes. The outermost surface will be affected with discolouring of the surface observed. If so desired, the installing contractor may paint the exterior surface of Maskell pipe with two-part urethane paint compatible with GRP. However this will then become an item requiring future maintenance.
Poisson's Ratio	Poisson's ratio is influenced by the pipe construction. For Maskell pipe, the ration for hoop (circumferential) loads and axial response ranges from 0.22 to 0.29. For axial loading and circumferential response, Poisson's ratio will be slightly less.
Thermal Coefficient	The thermal coefficient of axial expansion and contraction for Maskell pipe is 24 to 30 x 10 ⁻⁶ cm/cm/°C.

Hydraulic Characteristics of Maskell Pipe

Maskell produces FRP pipes by reproducible process. All these pipes are provided with resin rich interior layers, providing very smooth inner surfaces. This smooth interior surfaces result in very low fluid resistance.

Apart from above, the interior pipe surfaces typically remains smooth over time, in most fluid services. Therefore, fluid resistance will not increase with age. This has been demonstrated when few FRP pipes under operation over the decade were inspected and evaluated. Certificate from respective authorities is available upon request confirming no deterioration.

Values for GRP pipe are:

Roughness Parameters (Mean Values)			
Flow Rate (m ³ /hr)	Cole Brook – White E or K (mm)	Manning M (m ^{1/3} /s)	Hazen- Williams C (10 ^{-1.38} m ^{0.37} /s)
1410-2860	0.029	104	146



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Design Specification

Fibreglass pipe and tanks have been in use in buried service globally for over 40 years for storage and transport of potable water, wastewater and chemical process streams.

Case histories and details of fibreglass pipe applications around the world are available upon request however we anticipate you will be familiar with the widespread use of GRP in countries including Australia, New Zealand, Europe and the United States.

Fibreglass (GRP) pipework is to be designed in accordance with AWWA C950 for Fibreglass Pressure Pipe with pipe and fittings specified as follows:

Pipework	<p>Pipe diameters range from DN50 – DN3000, to a full range of pressure ratings and pipe stiffness classes.</p> <table border="1"> <tr> <td>DN50</td> <td>DN75</td> <td>DN100</td> <td>DN150</td> <td>DN200</td> <td>DN250</td> </tr> <tr> <td>DN300</td> <td>DN350</td> <td>DN400</td> <td>DN500</td> <td>DN600</td> <td>DN750</td> </tr> <tr> <td>DN900</td> <td>DN1050</td> <td>DN1200</td> <td>DN1350</td> <td>DN1500</td> <td>DN1800</td> </tr> <tr> <td>DN2000</td> <td>DN2200</td> <td>DN2500</td> <td>DN2800</td> <td>DN3000</td> <td>DN3500</td> </tr> </table>	DN50	DN75	DN100	DN150	DN200	DN250	DN300	DN350	DN400	DN500	DN600	DN750	DN900	DN1050	DN1200	DN1350	DN1500	DN1800	DN2000	DN2200	DN2500	DN2800	DN3000	DN3500
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Fittings	<ul style="list-style-type: none"> • Bends - Swept (DN1500) or Mitre Bend (Radius 1.5xD) • Reducers - Standard length – $L=2.5xD(D2-D1)$ • Flanges - For attachment of valves, testing and measuring equipment. Standard flanges to British Standard BS10 or ANSI150 flanges are available • Blank Ends - Domed end caps are available for all pipe diameters and are ellipsoidal end caps for installation and testing blanks. Bolted, flat end blanks are also available to fit full face flanges. 																								
Internal/External Finish	<ul style="list-style-type: none"> • Internal - All pipework have a molded internal surface finish for maximum chemical resistance • External - Finished with resin coat for longevity using the structural resin 																								
Joint Types	<ul style="list-style-type: none"> • Butt and Strap Joint – A fibreglass bandage centred over the joint effectively bonds the two pipes together as one. Most secure. • Coupling – A flexible joint that slip over each end of the pipe and use a rubber ring to seal. GRP pipe couplings are available for jointing of the pipe. 																								
Resin system	<p>To suit the required chemical resistance and longevity for the project, Pipes are manufactured from resin systems. (Isophthalic polyester and vinyl ester resin systems are used).</p>																								



Performance Standards

Standards developed by AWWA, ISO, Australian Standards and British Standards are applied to a variety of Maskell fibre glass pipe application including water waster. This then implies that all required performance and testing of the pipes are specified.

ISO and EN Standards

The International Standards Organization (ISO) and the Committee for European Normalization (CEN) are actively drafting product standards and corresponding test methods.

AWWA

AWWA C950 is one of the most comprehensive product standards in existence for fibreglass pipe. This standard for pressure water applications has extensive requirements for pipe and joints, concentrating on quality control and prototype qualification testing. Like ASTM standards, this is a product performance standard. Maskell pipe is designed to meet the performance requirements of this standard. AWWA has recently issued a new standards manual, M-45, which includes several chapters on the design of GRP pipe for buried and aboveground installations.

The international codes used by Maskell for design and manufacture of GRP pipe include:

1. American Water Works Association AWWA C950: Fibreglass Pressure Pipe
2. AWWA Design Manual M45 for Fibreglass Pressure
3. Australian Standard AS2556.1 (1998): Buried Flexible Pipelines
4. Australian Standard AS2634 (1983): Chemical Plant Equipment Made From Glass-Fibre Reinforced Plastics (GRP) Based on Thermosetting Resins
5. British Standard BS5480 (1990): Specification for GRP Pipe for use for Water Supply or Sewerage
6. British Standard BS7159 (1989): Design and Construction of GRP Piping Systems for Individual Plants
7. British Standard BS6464 (1984): Specification for Reinforced Plastics Pipes, Fittings and Joints for Process Plants

Quality Assurance

The Maskell production facilities have been accredited to ISO9001.

A summary of Maskell quality assurance system is available upon request which details the QA procedures and principles used in the manufacture of GRP pipe and chemical plant equipment.

A quality assurance ITP would be provided for the project along with details of the level of quality assurance to be used.



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Control Testing & Qualification Testing

Raw Materials	Raw materials delivered to Maskell contain vendor certification which demonstrates their compliance with Maskell quality requirement. In addition to this, all raw materials are sample tested prior to their use, ensuring pipe materials compliance with the stated specifications.
Finished Pipe	All pipes undergo control checks in the following listed ways: <ul style="list-style-type: none"> • Visual inspection • Barcol hardness • Wall thickness • Section length • Diameter
Physical Properties	Routine checks are performed on manufactured pipe's hoop and axial load capacities are verified. Pipe construction and composition are confirmed as well. <p>The following control checks are performed on a sampling basis:</p> <ul style="list-style-type: none"> • Pipe stiffness • Deflection without damage or structural failure • Axial and circumferential tensile load capacity

