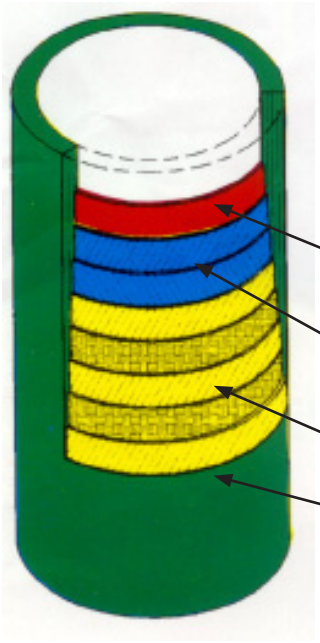
Fibreglass Pipe Systems

Contact Moulded Manufacture

ARMATEC

Pipe Cross Section



Industry Standard for Best Chemical Resistance

Fibreglass laminates made by contact moulding, also called hand lay-up, have the highest resin to glass ratios of 70:30 when compared to alternative manufacturing methods. As it is the resin that gives a fibreglass laminate its chemical resistance, this high ratio makes contact moulding the preferred fibreglass manufacturing process when the highest degree of chemical resistance is required. In contact moulding, the main laminate is reinforced mainly with non-continuous glass fibre, and this limits the spread of any chemicals within the laminate should it be exposed or damaged.

Inner Surface. The interior surface 0.25mm - 0.5mm, is a smooth resin rich laminate reinforced with surface veil. This provides optimum corrosion-resistance and a minimal friction factor when combined with the best resin for the specific chemical conditions.

Next Interior Layer. PIpes in all diameters are manufactured with an additional chemical resistant liner at least 2.5mm in thickness in the form of chopped strand mat, critically limiting chemical permeation.

Remaining Thickness. Subsequent reinforcing layers of woven roving and chopped strand mat are used to build the laminate to the desired thickness.

Exterior Surface. The final layer provides protection against weathering, fumes, spillage and ultraviolet attack. This gives the pipe a longer life and reduces maintenance expenses.

The Importance of Contact Moulded Manufacture

After 11 years in service at temperatures fluctuating from 20ºC to 95ºC within seconds, the interior surface of the fibreglass pipe made from contact moulding has crazed from thermal shock, but the pipe remains structurally sound. The high resin to glass ratio (70:30), the non-continuous reinforcing fibres, and the reinforced resin rich interior surface all contribute to the successful service.

After less than 5 years in similar service: By comparison, pipe made by the centifugally cast method uses sand filled resin to create thickness and stiffness, and has an unreinforced resin rich inner surface. Thermal shock resulted in the resin on the interior surface cracking and flaking, exposing the underlying structural sand filled laminate, consequently the pipe failed.

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Pipes & Sewer Capacities

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ARMATEC Pipe Sizes

Standard pipe diameters available from ARMATEC are 100, 125, 150, 200, 225, 250, 300, 350, 400, 450, 500, 610, 760, 818, 910, 1070, 1200, 1480, and 1300 mm. Elbows and fittings are made to match these diameters. Special fittings are made to order: puddle flanges to embed in concrete, collars and spigots to match other pipes, etc.

Pipe Options

Standard options for buried pipe are stiffness factors of SN1250, SN2500, SN5000 and SN10000. For most applications SN5000 pipe is recommended (see page 13 for buried pipe design). Pressures to 10 bar for rising mains.

Jointing Options

'Butt and strap' joints are standard for secure leak-free joints that are stronger than the pipe itself. Flanged joints are ideal for transitioning between different materials. Sleeved flexible joints are also commonly used. Rubber ring joints can be used, but the rubber ring will probably have a shorter life than the fibreglass.

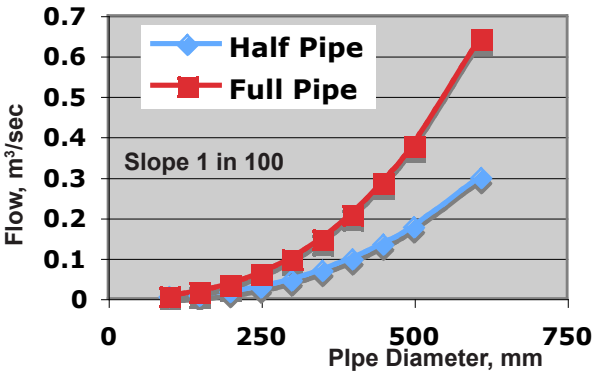
Suitable for Pipe Thrusting

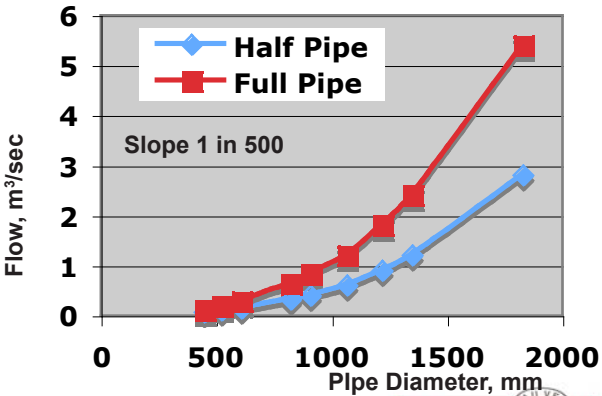
ARMATEC fibreglass pipe is contact moulded with high strength in the longitudinal direction, so can be installed by thrusting techniques after the hole is directionally drilled. A cone is provided at the leading end, and the pipe can be pulled, or thrust, or both. Quick cure jointing kits allow multiple thrusts per day; usually 4 to 6 metres is done at any one time. Contact ARMATEC to ensure the correct wall thickness of FRP pipe is used.

Capacities For Fibreglass Sewers

'Manning's equation' is used to calculate the flow through a gravity, by specialist drainage engineers once the line has been surveyed and the slope established. Charts at right can be used as a guide, and assume a small drop at the end of pipe, no applied hydraulic head and slopes as noted.

Fibreglass pressure pipe handling wastewater





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Buried Pipe Wall Thickness

Typical pipe wall thickness is determined from standards. Each installation is specific. Structural layers of fibreglass take into account the buried depth, ground water table height, soil types, backfill material, and imposed loads, such as vehicles. This determines the minimum stiffness of the pipe required, and from there, the fibreglass pipe is designed to achieve this. Layers of chopped strand mat and coremat are combined to achieve the thickness needed for the required stiffness. A 2.5mm corrosion barrier thickness is included on the inside surface of the pipe.

ARMATEC pipe wall thicknesses (mm)
for different stiffness ratings:
Gravity drain and up to 100 kPa pressure applications

Nom Diam	SN1250	SN2500	SN5000	SN10000
150	5	5	5	5
200	5	5	5	5
250	5	5	5	7
300	5	5	6	8
350	5	6	7	9
400	5	7	8	11
450	6	7	9	12
500	7	8	10	13
610	8	10	13	16
760	10	12	16	20
910	12	15	19	24
1070	14	17	23	29
1200	16	20	26	33

Wall thicknesses shaded grey above incorporate Coremat.
All other wall thicknesses are combinations of CSM and WR as required.
Pipe thickness will vary for pressures over 100 kPa.
Stiffness of SN 5000 is usually necessary for traffic loadings.

Pipe wall thicknesses can be checked post manufacture using an ultrasonic tester (as shown at left). Manufacturing methods make the ends of the pipe several millimetres thicker than the body of the pipe. Measuring the pipe wall thickness at the ends of pipe lengths can therefore be misleading. Pipes with coremat as part of the laminate are unable to be tested with ultrasonic testers.

Fibreglass Pipe Systems

Buried Pipe Design

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Specifying Pipe Stiffness

Fibreglass pipes are considered to be 'flexible' pipes. They are designed to deform or deflect diametrically within specified limits without structural damage. The degree of side support provided by the backfill used is a major determinant of the pipe stiffness required.

Parameters for Pipe Stiffness Specification:

- Type of backfill and compaction control used
- Native soil type
- Trench depth, width and wall angle
- Presence and height of ground water
- Pipeline operating pressures (+ve or -ve)
- Applied loads, e.g. traffic.

The site geotechnical engineer and consultant will generally be responsible for assessing these parameters, and will specify the pipe stiffness required. Note: the 'stiffness' of a pipe wall is proportional to the cube of the wall thickness, hence the wall thickness is the major parameter in achieving a high stiffness rating.

Low Stiffness Pipe Options

Installation must be carried out with great care when using low stiffness pipe such as SN 1250 or SN 2500. It is critical to carefully select backfill material, and ensure compaction is done to strict standards. The site geotechnical engineer and consultant must specify and approve pipe stiffness, excavations, backfill material, and supervise backfill installation. Even then, with low stiffness pipes, long term problems with pipe deflection and eventual cracking can occur. Generally, backfill requirements lessen as the pipe stiffness increases.

A Typical Project

In many drainage projects, there is ground water at ground level, traffic loads, buried depths of 1 to 3 metres, normal trench widths, and poor native soils. Projects are often done in difficult weather and to strict timetables. Compromises occur, so ARMATEC usually recommends:

- Pipe to be a minimum stiffness of SN 5000
- Normal trench widths to enable compaction along the sides of the pipe - wider at butt and strap joint locations
- Pipe bedding with 100mm minimum of compacted gravel/ scoria AP7/quarry fines
- Backfill with compacted gravel/scoria AP7/quarry fines, compacted in 300mm layers
- Ensure large or sharp objects are not in contact with FRP
- Backfill as above to at least 300mm above top of pipe
- Use native soil to backfill to ground level. Compact in 300mm layers

For deeper buried depths, or where the pipe has large applied loads, then custom design will be required.

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Floor Drains

ARMATEC

"E-Trap" Floor Trap

- All fibreglass sump - all joints fully sealed
- Sump same material as pipes
- Stainless steel grate and water seal
- Easily cleaned
- Mates to standard monolithic floors
- Fewest cavities for bacteria
- No rubber ring joints to fail

Installation

Floor traps and connecting underground fibreglass pipe are preferably installed to grade before the concrete floors are poured at new sites. All fibreglass pipe joints underneath the slab are done by butt and strap, and will require no further maintenance. Pipes are then connected to fibreglass manholes located outside the building perimeter.

Jointing Fibreglass Pipe

Butt & Strap Joints

A butt and strap joint is simple to do. The resulting joint is stronger than the pipe itself. Consult ARMATEC for full instructions and training. Use only ARMATEC approved materials.

Pipe ends are cut square, sanded to clean material, butted together and joined with ARMABOND vinyl ester putty. Once cured, the joint is ready to strap. The surfaces are primed just prior to strapping.

Pre-cut layers of glass reinforcing are saturated with resin and consolidated to remove trapped air. This strap is then placed around the joint. Three to four layers of glass can be done at once.

The strap is consolidated with a ribbed roller to remove entrapped air and ensure a leak free joint. This strapping and consolidation process is repeated until the required thickness is reached.

Surfacing tissue is applied as the final layer to achieve a smooth spike free finish. Once cured the joint is resin coated.

VIDEO .... on butt and strap jointing ... http://www.youtube.com/watch?v=wLmi-w6xFH0