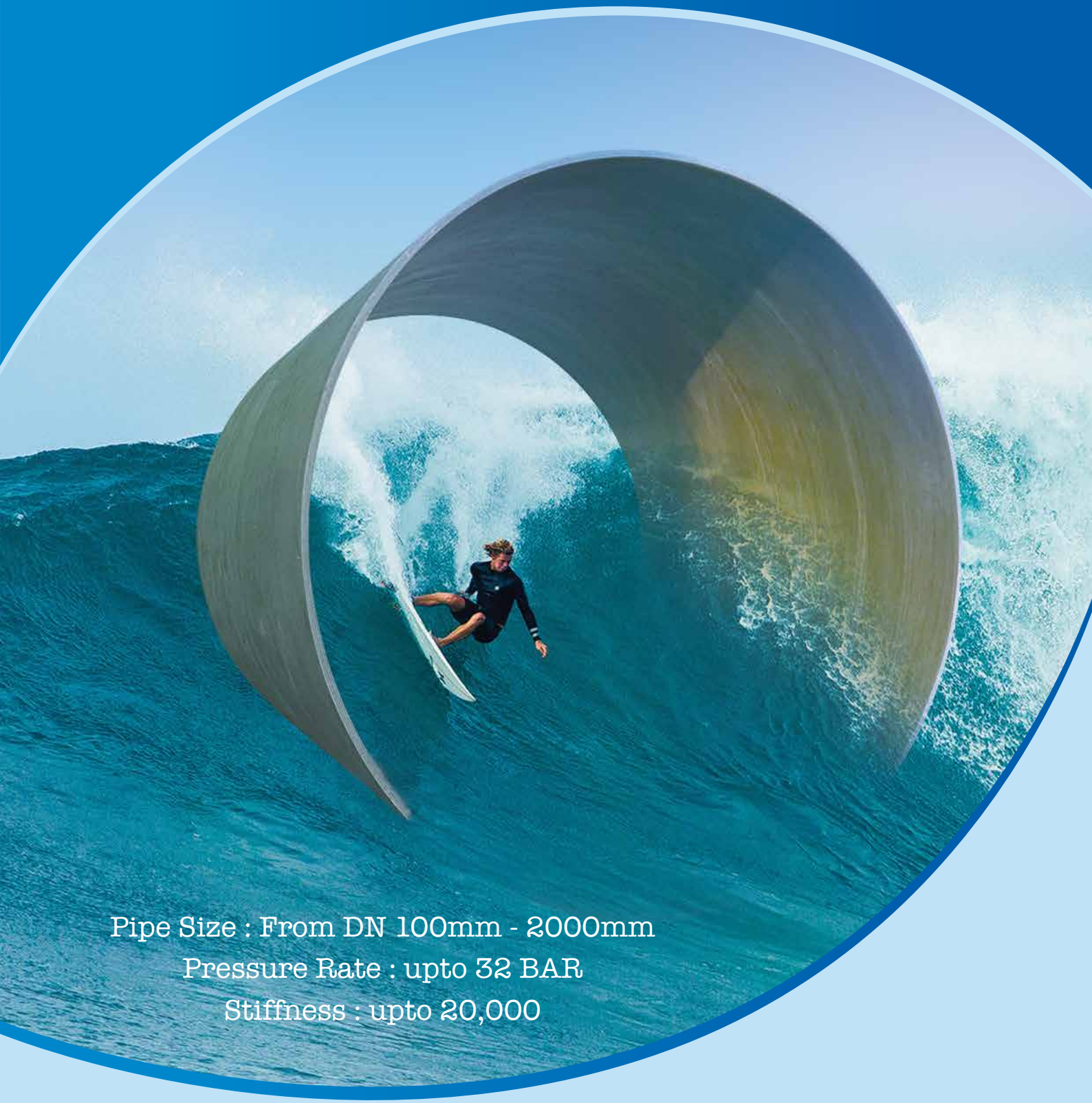
مصنع جودوين قطر للانابيب
GOODWIN QATAR PIPES FACTORY



Pipe Size : From DN 100mm - 2000mm

Pressure Rate : upto 32 BAR

Stiffness : upto 20,000

WRAS APPROVED MATERIAL

Exova ASTM E84 CLASS 1 FIRE RETARDANCE

qatar 2022

INTERNATIONAL ACCREDITATION FORUM ISO 9001:2015

ISOQAR REGISTERED UKAS MANAGEMENT SYSTEMS 0026

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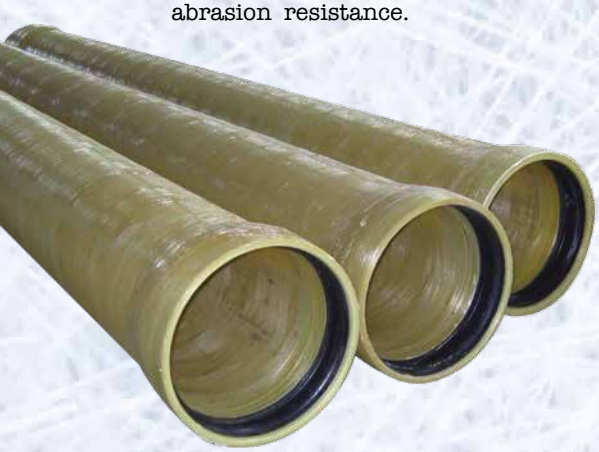
INTRODUCTION

The Goodwin pipe factory manufactures GRP pipes of various types and varying pressure, stiffness and diameter through the **Dual Helical Filament Winding and Hoop Filament Winding Process.** The Reinforced Thermosetting Resin Pipe is a composite material consisting of a thermosetting polymer, often a type of polyester, reinforced with glass or other fibres. Glass fibres provide strength and stiffness to the composite material. The different types of resins used for the manufacturing of GRP, GRV and GRE Pipes are Isophthalic resin, Vinyl ester resin and Epoxy resin respectively, which are selected according to the required properties like chemical resistance, temperature resistance and mechanical properties. The properties of GRP Pipes can be varied by changing the ratio of the raw materials and also by changing the winding angle.

ADVANTAGES OF GRP PIPING SYSTEMS

GRP Pipes have many advantages over other conventional pipes as far as installation is concerned.,

- The smooth interior of GRP Pipes results in low fluid resistance, which could lower horsepower requirements for pumped systems. This characteristic could contribute to a substantial cost savings over the life of typical piping systems. The interior surface of the pipe remains smooth over time in most fluid services. Therefore, fluid resistance does not increase with age. The smooth interior allows the pipe diameter to be reduced while maintaining the desired flow.
- GRP Pipe, being highly corrosion resistant, requires no separate lining or Cathodic protection, hence virtually no maintenance cost. Also no outside protection is needed against ground water, aggressive industrial gases and fumes or chemicals leaking from the neighbouring pipes and valves. Expected life span of GRP pipe is 60 years
- The relatively high compliance (low modulus of elasticity) of GRP Pipe contributes to a self-dampening effect as the pressure wave travels through the piping system. The magnitude of the pressure wave and hence surge pressure in a metallic piping system is much higher due to the higher modulus of elasticity of these materials.
- GRP Pipes are supplied in 12 m lengths, and therefore number of joints required is less. This means there are less chance of leakage and less time is required for installation resulting in substantial cost saving. GRP Pipes can have rigid joints, due to which thrust blocks can be eliminated also resulting in reduction of cost during the installation.
- The low thermal conductivity of GRP Pipes not only causes low temperature losses, but also in many cases eliminates condensation or the need for additional thermal insulation.
- The thermal end loads developed in GRP Pipes are small, restraining equipment like guides and anchors need not be as strong or heavy as for metallic piping. Short lengths, adjustment pipes or special fittings can be readily made available at a short notice. Unforeseen modifications can be made at site easily without delay and much cost.
- GRP Pipes are manufactured with an external liner, which acts as a barrier against ultra violet rays and have good abrasion resistance.



APPLICATIONS INDUSTRIES

SEWERAGE
POTABLE WATER SUPPLY
IRRIGATION
CHEMICAL TRANSPORTATION
THERMAL LINES
JACKING PIPE SYSTEMS & MICRO TUNNELING
SEAWATER INTAKE
DUCTS

PIPE COMPOSITION

GRP Pipe wall consists of three layers, perfectly adherent to each other and having different characteristics and properties in relation to their function.

INNER LINER

	MATERIAL	GRP / GRV	GRE
Inner Liner	Veil (Glass)	10%	10%
	Resin	90%	90%
	CSM (Glass)	30%	-
	Resin	70%	-

Liner is the innermost layer which is in direct contact with the conveyed fluid. This characteristic of smoothness reduces the fluid head losses to minimum and opposes the growth of mineral deposits and algae. The liner is made of two monolithic sub layers. The inner one, in direct contact with the fluid, is reinforced with glass veil, with a resin content of 90% and the outer one is reinforced with CSM glass, with a resin content of 70% by weight. The standard liner thickness is about 0.5 to 1.5mm, higher thickness can be produced on request.

STRUCTURAL WALL

Structure	Roving (Glass)	70%	70%
	Resin	30%	30%

Glass reinforced layers guarantee the mechanical resistance of the whole pipe against stresses due to internal and external pressure, external loads and thermal loads. For GRP pipes, this layer is obtained by applying on the previous partly cured liner, continuous roving of glass wetted with resin, under controlled tension. For GRE Pipes, the structural wall is wound directly on a wet liner. This layer can contain aggregates like silica sand, if allowed by specifications. Thickness of the mechanical layer depends on the design condition.

EXTERNAL LINER

External Liner	Veil (Glass)	10%	10%
	Resin	90%	90%

Top coat or external liner is the outer layer of the pipe which consists of pure resin. If required, UV protectors shall be added to protect the pipe from exposure of sun. In case of severe exposure conditions like aggressive soil or very corrosive environment, the external liner can be reinforced with a surfacing veil or added with fillers or pigments.

RAW MATERIALS

Fibreglass composites consists of glass fibre reinforcements, thermosetting resins and additives, designed and processed to meet the specific functional performance criteria:-

FIBRE GLASS REINFORCEMENTS: The amount, type and orientation of the glass fibres in the pipe provides the required mechanical strength. C-Glass, E-Glass & ECR Glass are used commonly, depending on the application of the pipe. The various forms of glass reinforcements are surface veil, chopped strand mat (CSM), chopped roving, filament roving, and woven roving (WR).

RESINS: Isophthalic, Vinylester and Epoxy are common type of resins used. This will provide the thermal and chemical properties such as glass transition temperature, resistance to heat, chemical resistance etc. required for the finished product.

AUXILIARY RAW MATERIALS: Raw materials like catalyst, accelerators, exhibitors, aggregates and pigments are used together with resin and glass reinforcements to achieve the desired properties of the Fibre Glass product. Catalyst is the organic compound which when added to resin in presence of an accelerator determines the polymerization reaction at ambient temperatures. Accelerator is the chemical compound used together with a catalyst to shorten the polymerization time. Inhibitor is added to the resin to reduce its reactivity at ambient temperatures.

TESTING

Electro-mechanical Stiffness Testing Machine
Diameter Range DN250 - DN4000

Short Strip Test

Split Disk Test

Flexural Testing

Stiffness Testing
Conform to standard ISO 7685 & ASTM D2412

Pipe Axial Testing

Compresstion Testing
Conform to standard ASTM D695

TYPICAL PROPERTIES OF GRP PIPES

HYDROSTATIC PROPERTIES	TEST METHOD	VALUE			UNIT
		GRP	GRV	GRE	
Ultimate Hoop Stress-Rupture (Uni-axial)	ASTM1559	570	570	570	MPa
Hydrostatic Design Basis (Bi-axial)	ASTM D 2992 B	350	350	-	MPa
Hydrostatic Design Stress (Uni-axial)	ASTM D 2992 B	175	175	-	MPa
Hydrostatic Design Stress (Bi-axial)	ASTM D 2992 B	68	68	87	MPa
MECHANICAL PROPERTIES	**TEST METHOD**	**VALUE**			**UNIT**
		GRP	**GRV**	**GRE**	
Axial Tensile Stress	ASTM D 2105	35	50	75	MPa
Axial Tensile Modulus	ASTM D 2105	13000	13000	15000	MPa
Hoop Tensile Stress	ASTM D 2290	250	250	300	MPa
Hoop Tensile Modulus	ASTM D 2290	24000	24000	30000	MPa
Hoop Bending Modulus	ASTM D 2412	25000	25000	25000	MPa
Poisson's ratio (Hoop loading)	-	0.45	0.45	0.45	-
Poisson's ratio (Helical loading)	-	0.65	0.65	0.65	-
THERMAL & PHYSICAL PROPERTIES GRP		**VALUE**			**UNIT**
		GRV	**GRE**		
Coefficient of Linear Thermal Expansion		20×10^{-6}	20×10^{-6}	15×10^{-6}	Mm / mm / °C
Specific Gravity		1.8	1.8	1.8	-
Glass content (by weight)		65	65	70	%
Hazen William Coefficient		150	150	150	-
Maximum Temperature		60	90	110	°C
Thermal Conductivity		0.3	0.3	0.3	W / m-K
Roughness factor (Including head loss over joints)		0.04	0.04	0.04	mm
Effective Roughness (only pipe)		0.0015	0.0015	0.0015	mm

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