

BONDSTRAND

RTR - Pipe Systems



AMIA**NTIT PIPE SYSTEMS**

Introduction



Amiantit Group of Companies

The Amiantit Group is a leading global industrial organisation which manufactures high quality pipesystems, which researches, develops owns and licenses advanced pipe technologies, and provides water management services. The Group supports global infrastructure development projects, and delivers to municipal, industrial, agricultural and energy markets worldwide.

Amiantit has a presence in more than seventy countries, including almost thirty wholly-owned or joint-ventured manufacturing facilities in the Middle East, Europe, North America and Latin America, North Africa, The Far East, Central Asia, and the subcontinents of India and Africa. Amiantit's manufacturing capabilities are supported by technology companies and sales offices across the globe. Other members of the Group are predominantly limited liability companies, owned by the Amiantit Group in varying percentages, which operate under individual commercial registrations.

Bondstrand Limited

Bondstrand Limited is a joint venture company between the Saudi Arabian Amiantit Company and Ameron BV Fibreglass Pipe Europe, a wholly-owned subsidiary of Ameron International Corporation, US. The joint venture provides high-technology fibreglass pipe products, trading as Bondstrand® pipes, and offers professional services to the rapidly-growing Saudi Arabian and Gulf Region industrial market for high-performance fiberglass RTR pipe systems.

Bondstrand® Fibreglass-Reinforced Thermosetting Resin (RTR) pipe systems have served dependably in virtually every application in which resistance to internal and external corrosion is required at a reasonable cost

The pipe systems are carefully engineered and manufactured to perform the functions for which they are recommended. Designed for a minimum service life of twenty years, Bondstrand® products offer additional benefits and advantages that other piping materials do not. The system is suitable for aboveground, underground and submerged applications. A pigment is added to the epoxy resin system to ensure excellent ultraviolet (UV) resistance in aboveground services.

Production Process

Bondstrand® Fibreglass-Reinforced Thermosetting Resin (RTR) Pipes are manufactured in a discontinuously winding process. Materials used in manufacturing Bondstrand products are C-Veil, continuous glass filament (roving), boat tape, and an aromatic-amine cured epoxy-resin or Vinyl Ester resin system.

The numerically controlled (NC) process produces pipes that have a C-Veil reinforced corrosion resistant liner of 0.5 to 1.3 mm and a filament wound structural wall applied at a helix angle of $54^{\circ} \pm 2^{\circ}$. An aromaticamine cured epoxy system is used for both the liner and structural wall. The ends of the pipes are ground using numerically controlled grinding machines to give the required end shape configuration.



Applications

Bondstrand® corrosion-resistant piping systems are used in a wide range of applications. The major markets and application that are covered by Bondstrand piping systems are industrial plants, marine and offshore, military installations, oil field productions, service stations and utilities.

Industrial Plants

- Chemical processing
- Fertilizer plants
- Food processing
- Geothermal systems
- Paper and textile industry
- Petrochemical processing
- Power plants
- Steel/mining

Marine and Offshore

- Vessels/tankers
- Non-vital shipboard systems
- Offshore installations
- Port authorities

Military Installations

- Airport
- Air Bases
- Naval Facilities
- Jet fuel lines
- Petroleum piping

Oil Field Production

- Carbon dioxide injection and gathering
- Low pressure gas gathering
- Natural gas lift tubing
- Tank battery piping
- Submerged pump-well tubing
- Crude Oil transition lines

Service Stations

- Bulk plant terminals
- Central fuel oil systems
- Marinas and airports
- Secondary containment
- Service station product piping

Utilities

- Desalination/water treatment plants
- Public service facilities
- Water and sewerage authorities
- Agriculture
- Chilled Water supply and return carrier lines



Product Advantages

Benefits	Advantages
Superior Corrosion Resistance	Handles hundreds of corrosive chemicals
	Long effective service life
	No need for linings, coatings, cathodic protection or other forms of protections.
Lightweight	One-sixth the weight of steel pipe
	Easy and economical on unloading and installing pipes and no need for heavy and expensive handling equipment
Easy Installation, Low-Cost	Reduced manpower and equipment requirement
Excellent hydraulic characteristics	Very smooth bore offers very low resistance to flow.
	Low friction loss resulting in less pumping energy and lower operation cost.
	Compared to metal and concrete pipes, the same flow rate can be conveyed using smaller diameter pipes.
Reduced Maintenance Costs	Resistance to corrosion, erosion, and UV radiation
Non-Toxic	Approved by NSF for potable water. Suitable for use in the food industry and other industries where products purity is critical.
Non-Conductive	Does not conduct stray ground currents which may corrode expensive pumps, valves and other equipments.
Low Thermal Conductivity	Reduced heat and energy losses and offers good chill resistance

Product Range

Pipes

The numerically controlled filament winding equipment gives the RTR pipes highly accurate, consistent and high quality products. Pipes are available from 25mm (1") to 1000mm (40") in two standard lengths: 6.2 m (20 ft) and 12.2 m (40 ft)

Fittings and Flanges

Bondstrand offers a complete line of filament-wound fittings and flanges.

- The standard fittings are 90° and 45° Elbows, Tees Reducers, Couplings, 45 laterals (Wyes), Nipples, Flanges and Blind Flanges, and Saddles with SS Bushing RTR Outlet.
- Bondstrand can offer custom made products from various types and designs of fittings upon request.

Prefabricated Spools and Vessels

Prefabricated spools are specially assembled or fabricated combinations of pipes and fittings intended to provide customers with products custom-built for their specific needs. The main advantage of shop-prefabricated spools is fewer field joints resulting in lower installation costs.

Joints

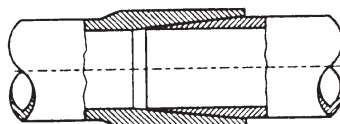
Bondstrand offers a comprehensive selection of adhesive bonded and mechanical jointing systems for fiberglass reinforced thermosetting resin piping.

• Quick-lock

An adhesive-bonded joint with straight spigot and tapered bell. The integral pipe stop in the Quick-Lock bell ensures accurate laying lengths in close tolerance piping. Available in sizes 25-400 mm (1 -1 6 in).

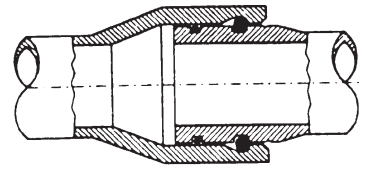
• Taper/Taper

An adhesive-bonded joint with matching taper male and female ends offers a superior joint strength by controlled adhesive thickness. Available in sizes 50-1 000 mm (2-40 in).



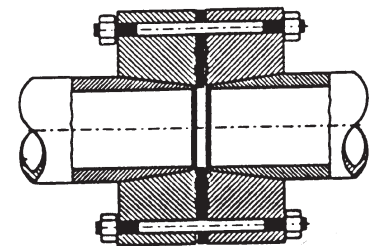
• Key-Lock

A self-restrained, easy to install, mechanical joint utilizing 1 or 2 locking keys depending on pressure requirements, and employs one O-ring to provide sealing. Available in size 50-1000 mm (2-40 in)



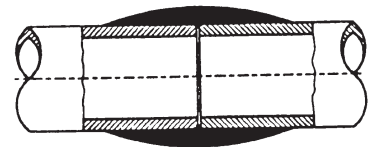
• Flanges

Filament-wound fibreglass flanges are used for joining Bondstrand RTR pipes to existing steel pipes, valves and pumps. These are provided with drilling patterns to bond with metal flanges conforming to worldwide standards. Available in sizes 25-1 000 mm (1-40 in).



• Butt-and-wrap

Butt-and-wrap (or lamination) joint for plain ends is used generally for field adjustments when adhesive bonded joint cannot be accommodated. Available for all sizes up to a maximum pressure of 16 bar.



• Mechanical joint for plain ends

A mechanical joint offers a quick assembly between plain ends. This jointing method, done by means of mechanical couplings like Viking Johnson, Dresser, etc., provides some flexibility to the piping system Available for all sizes.

Bondstrand RTR Pipe Systems Series

Series	Joint Type	Resin	Max. Operation Temp.		Operation Pressure Range		Nominal Pipe Size	
			C°	F°	(bar)	(psi)	(mm)	(inch)
2000	Adhesive	Epoxy	120	250	10-Oct	150 - 200	25 - 400	16-Jan
2000M	Adhesive	Epoxy	120	250	10-Oct	150 - 230	25 - 1000	Jan-40
2400	Adhesive/ Mechanical	Epoxy	120	250	10-Oct	150 - 1000	50 - 1000	Feb-40
4000	Adhesive	Epoxy	120	250	10-Oct	150 - 230	25 - 400	10-Jan
5000	Adhesive	Vinyl Ester	80	180	10-Oct	150 - 230	25 - 400	10-Jan
6000	Adhesive	Epoxy	120	250	10-Oct	150 - 230	25 - 400	10-Jan

Product Properties

Mechanical Properties

Pipes Properties	Imperial		Metric	
	Value	Unit	Value	Unit
Circumferential				
Tensile Stress at weeping (ASTM D1599)	24	103 psi	165	MPa
Tensile Modulus	3.65	106 psi	25.2	GPa
Poisson's Ratio	0.56		0.56	
Longitudinal				
Tensile Stress (ASTM D2105)	8.5	103 psi	58.6	MPa
Tensile modulus (ASTM D2105)	1.6	106 psi	11	GPa
Poisson's Ratio	0.37		0.37	
Beam Strength				
Apparent elastic modulus (ASTM D2925)	1.7	103 psi	11.7	GPa
HDB (Hydrostatic Design Basis) ASTM D2992, Procedure B, Static	18	103 psi	121	MPa
Hydrostatic	2.3	BTU-in/(hr-ft ² -°F)	0.33	W/m-K
Thermal Expansivity, Linear (ASTM D696)	10	10-6 in/in °F	18	10-6 mm/mm °C
Flow Coefficient	150	Hazen Williams	150	Hazen Williams
Absolute roughness	17.4	10-6 ft	5.3	10-6 m
Specific Gravity (ASTM D792)	1.8		1.8	
Density	0.065	Lb/in ³	1.8	g/cm ³

Approvals and Certificates

Bondstrand, Ltd. is ISO 9001:2000 certified since 1994. Bondstrand products hold approvals from various entities such as the National Sanitation Foundation (NSF) for potable water, Factory Mutual (FM) for firewater, and API 15LR for oil and gas applications.

The pipes and fittings are pressure-rated using ASTM D2992. All materials and manufacturing process conform to strict QA/QC procedures and standards.

Quality Control (QC) / Quality Assurance (QA)

The manufacturing process is monitored and controlled during all stages of production for:

- Inspection and testing of incoming raw materials
- In process inspection and monitoring during manufacturing
- Check and records of products dimensions
- Destructive and non-destructive testing of the products
- Visual and final inspection
- Customer or third party inspection
- Qualification of new products

Documentation and test reports are always prepared and kept available for future references.

Quality Assurance is achieved by following ISO 9001:2000 Quality Management system at all management and production levels.



Services

Engineering Services

Bondstrand, Ltd. offers guidance at every stage of the project, from planning to installation. With advanced computer systems, Bondstrand, Ltd. can provide assistance in pipe design, calculations and engineering. Some of the specific optional services are:

- Preparing isometric drawings of RTR Pipe lines
- Preparing Material Take-off (MTO) or Bill of Materials (BOM)
- Stress Analysis
- Surge analysis
- Pipe wall thickness calculations

Field supervision of RTR pipe jointing

In addition, Bondstrand® field service engineers and technicians are available to assist the listed contractors by providing supervision during job site installation and by training the client's field crew on Bondstrand installation procedures and techniques, as well as with any other technical assistance the client may need throughout the project.



Utmost care has been taken to ensure that all the contents of this brochure are accurate. However, Amiantit and its subsidiaries do not accept responsibility for any problems which may arise as a result of errors in this publication. Therefore customers should make inquiries into the potential product supplier and convince themselves of the suitability of any products supplied or manufactured by Amiantit and/or its subsidiaries before using them.



Distributed by:



BONDSTRAND LTD.

P.O. Box 589

Dammam 31421

Kingdom of Saudi Arabia

Phone: +966 3 847 15 00

Fax: +966 3 847 21 33

info@amiantit.com

www.amiantit.com