

# Marine Exhaust Tubing

Pipe, fittings, Silencers, Accessories

Mar 11



**ARMATEC**

## PRODUCT DESCRIPTION

A complete range of marine exhaust tubing, bends, tees, flanges, reducers, silencers and other accessories fabricated in 100% corrosion resistant fibreglass. It has been tested to and passes "Test method for fire endurance testing of water filled plastic piping (Level 3), IMO Resolution A.753(18), Appendix 2".

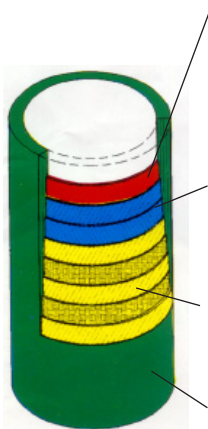
## STANDARD PRICE LISTS

To assist you in ordering tube and fittings, please ask for our standard price list. Simply fill out with your requirements and fax back to us for prompt service.

## BENEFITS

- **Corrosion Resistant:** Fibreglass tubing is corrosion resistant inside and outside and is ideal for handling the corrosive engine gases and seawater.
- **Fire Resistant:** Maintains structural integrity for at least 30 minutes in event of fire.
- **Less Maintenance:** As the fibreglass tubing does not corrode or rust it requires very little ongoing maintenance.
- **UV Resistant:** An external UV resistant coating can be applied to stop deterioration by UV radiation.
- **Easy Installation:** The light weight of fibreglass makes installation easy. Standard installation procedures are followed for hangers and expansion joints.
- **Leak Free Joints:** Tube lengths and fittings are typically joined by the standard butt and strap method giving a leak free system.

## Cross Section of Fibreglass Pipe



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

**Next Interior Layer.** Tube in all diameters is built with an additional chemical resistant liner at least 2.5mm in thickness in the form of chopped strand mat which critically limits chemical permeation.

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

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

## USES

- Engine exhaust tubing.
- Engine exhaust silencers and mufflers.
- Engine exhaust surge chambers.
- Engine exhaust intake tubing.
- Air ducting for air conditioning.
- Fittings such as bends, tees, flanges etc.

## AVAILABILITY

ARMATEC marine exhaust tubing, fittings and accessories are manufactured in New Zealand to international standards, using materials and technology sourced internationally. Some diameters of tubing and a number of fittings are stocked for immediate delivery. For non stocked items, typical lead times for manufacture are 1 to 3 weeks.

## SIZES

Typical tubing sizes include 50, 75, 100, 125, 150, 200, 250, 300 diameter and larger sizes. Reducers and spigots are available to fit standard flexible rubber hoses to couple to marine engines.



"Paradiso" constructed by Alloy Yachts International Ltd uses ARMATEC fibreglass engine exhaust tubing.

**ARMATEC Environmental Ltd**

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## Typical Physical Properties of ARMATEC FRP Tubing

### General

Specific Gravity	1.5
Linear Coefficient of Thermal Expansion (ASTM D696)	$27 \times 10^{-6}$ (m/m -degC)
Thermal Conductivity	1.5 W/mK
Glass Content	30 -35 %
Barcol Hardness	35 to 45

### Typical physical properties of 10mm thick laminate

	MPa	psi
Ultimate tensile strength (ASTM D638)	103	15,000
Flexural Strength (ASTM D790)	152	22,000
Flexural modulus of elasticity (ASTM D790)	6,895	1,000,000
Compressive strength (ASTM D695)	152	22,000

Specific physical properties are dependant on wall thickness, laminate construction and resin selection. Contact ARMATEC for detailed information and advice. Numbers given are typical properties, not to be construed as a specification.

### TEMPERATURE RATING

Marine exhaust tubing and fittings can be subject to temperatures in excess of 100°C under upset conditions, although typical operating temperatures rarely exceed 80°C. ARMATEC marine tube and fittings are only made from fibreglass materials with high heat ratings.

#### Table: Resin Heat Distortion Temperatures

Trade Name	Generic Type	HDT
Armatec C64	Chlorinated polyester	140°C
Armatec V68	Vinyl ester	118°C

### FLAME SPREAD RATING

The flame spread rating of fibreglass laminates used for marine exhaust fittings are given below. The ratings are done according to ASTM E84 Tunnel Test and are as reported by materials suppliers and the reference text Corrosion-Resistant Plastic Composites in Chemical Plant Design by John H. Mallinson, 1988.

#### Table: Flame Spread Classification ASTM E84

Flame spread	Classification
0 - 25	Noncombustible
25 - 50	Fire retardant
50 - 75	Slow burning
75 - 200	Combustible
> 200	Highly combustible

#### Table: Flame Spread Rating Table for FRP Materials

Trade Name	Generic Type	Rating
Armatec C64 with 5% Sb <sub>2</sub> O <sub>3</sub>	Chlorinated polyester	30
Armatec C64 unfilled	Chlorinated polyester	150
Armatec V68 unfilled	Vinyl ester	350+

Note Sb<sub>2</sub>O<sub>3</sub> is antimony trioxide which is a standard additive used to lower the flame spread rate of resins.

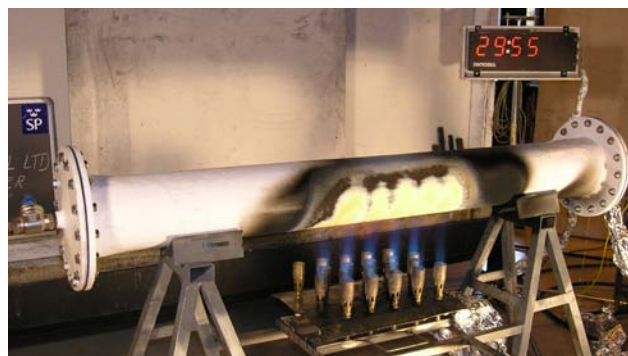
### INTERNATIONAL STANDARDS

Marine exhaust tube and fittings supplied by ARMATEC are manufactured to international standards:

- (1) Australian Standard AS 2634-1983 "Chemical Plant Equipment Made From Glass-Fibre Reinforced Plastics (GRP) Based on Thermosetting Resins".
- (2) USA Standard ANSI/UL1129-1988 "Wet Exhaust Components for Marine Engines".



"Spirit of Fitzroy" has an FRP exhaust system by ARMATEC.



IMO Fire Endurance Testing by SP Fire Technology of Sweden. Pipe maintains its structural integrity for more than 30 minutes.

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