

# Queen Elizabeth Class Aircraft Carrier Project



Fiber Glass Systems | 

# QEC Project Case Study

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## Project Background

In 2010 we were awarded the prestigious contract to supply Bondstrand Glass Reinforced Epoxy (GRE) pipes and fittings by the Aircraft Carrier Alliance (ACA). Our reputation as one of the world's leading suppliers of composite solutions helped us to secure the work for two naval ships, the Queen Elizabeth Class Aircraft Carriers, HMS Queen Elizabeth and HSM Prince of Wales.

The ACA is a partnership between Babcock, Thales UK, BAE Systems and the MOD who were responsible for delivering the Royal Navy's new aircraft carriers— a defence programme worth an estimated £6 billion.

The Queen Elizabeth Aircraft Carriers, the largest warships ever built in the UK provides a total of four acres of sovereign territory whilst forming the most visible and potent demonstration of maritime power. The vessels displace 65,000 tonnes, are 280m long by 70m wide and 9 decks deep with a flight deck capable of carrying 36 F-35B Joint Strike Fighters plus EH 101 Merlin helicopters. The vessels have a speed of 25+ knot, a range of 8,000 – 10,000 miles and carry a crew of 1,450 including the air crew. The design and build of the ships created and sustained thousand of jobs across the UK.

The project was completed in September 2019 in Rosyth, Scotland, both HMS Queen Elizabeth (QEC) and HMS Prince of Wales (PWLS) were commissioned into the Royal Navy and are based at Portsmouth Naval Base. All future works for both carriers comes through the QEC through life support team, who are based at BAE Systems Surface Ships in Portsmouth.

## Our solution

Due to the magnitude of both aircraft carriers, weight was inevitably a huge driver for this project. With our Bondstrand GRE pipe systems and Fiber Reinforced Polymer (FRP) structures weight saving capabilities, we were able provide the perfection solution to our client.

## Benefits of Bondstrand GRE piping

- Fully compliant with stringent MOD technical specifications for use on naval ships
- Low operating and significant through life cost savings with minimal maintenance
- Fast track, cost effective and safe installation
- Lightweight, GRE pipe is on average 1/6th the weight of comparable steel pipe
- Superior resistant, internal and external corrosion resistance to saltwater, chemicals and organic matter
- Increased safety by eliminating hot work during the installation process

## Benefits of Bondstrand FRP structures

- Our FRP grating is tough, robust, high strength and tailored for the harsh marine environment
- Low weight, typically 2/3 weight saving over steel
- High temperature resistance, low smoke and low toxic fume emissions
- Excellent corrosion resistance
- Fast installation



## QEC Project Case Study

With our global engineering support, field service, expertise and large UK stock, we were able to provide flexible design, fabrication and installation solutions. We fabricated and supplied over 2000 Bondstrand GRE pipe spools per ship for:

- The chilled water distribution system supply and return
- Waste heat hot water
- Ballast system
- Sea water cooling system

Spools were delivered to BAE Systems Surface Ship at Govan and Portsmouth and also Babcock International at Rosyth. In addition, we also provided site installation of GRE spools working alongside BAE system and Babcock pipe engineers throughout the project.

We also supplied our innovative Bulkhead Penetration trims, 2 No. 700mm $\varnothing$ , 1 No. 500mm $\varnothing$ , 1 No. 600mm $\varnothing$  providing a solution to ensure that watertight integrity and fire resistance is maintained when a GRE pipe penetrates a watertight bulkhead, by encasing the GRE pipe in a steel sleeve.

### Weight savings

Each aircraft carrier has been supplied with;

- 4.1km of Bondstrand GRE pipe work
- 4,900 fittings
- 1,914 spools
- 1,314m<sup>2</sup> FRP grating
- 1 FRP access platform

### That's a combined weight saving of over 390 TONNES!

(Approximate figures when compared with traditional metallic alternatives)

### Typical weight comparisons

#### 6 in. pipe per metre

Bondstrand GRE = 4.6 kg

Steel = 28.3 kg

Copper Nickel (Cuni) = 15.2 kg

#### 6 in. flange

Bondstrand GRE = 4.9 kg

Steel = 7.5 kg

Copper Nickel (Cuni) = 9.5 kg



Bondstrand GRE pipe, ready for shipment from our Plymouth Facility



Bondstrand GRE pipe installed on QEC



FRP structures installed



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