CTS Bridges
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FRP (Fibre Reinforced Polymer) Footbridges

Frequently Asked Questions

What are the main benefits of using FRP for bridge building?

The material is strong yet lightweight so is ideal for remote locations with difficult access and where long term maintenance would be costly. They can be easily man-handled into site or even air-lifted in by helicopter.

Are these bridges designed for 5kN/m^2?

Yes. 5kN/m^2 is the standard requirement for all footbridges that CTS design and manufacture.

Can the FRP Deck have a non-slip surface?

Yes – we apply our Hi-Grip Plus non-slip overlay onto the FRP deck to provide a non-slip surface.

Can these bridges be designed for vehicles?

Yes. FRP bridges can be manufactured for vehicular access. We are in the process of manufacturing our first FRP public highway bridge which will be capable of carrying regular 44t articulated lorries. For this project the client chose FRP instead of concrete as it offered a much faster site time.

Are they easy to assemble on site?

YES - The bridges are easy to assemble with all components simply bolted together. Thus requiring minimum tools on site.

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What spans are FRP bridges most suited to?

A truss style is structurally the most efficient style which works well for bridges up to about 15m span (depending on width).

We can modify our standard truss solution to make it work for longer spans.

For bridges up to 6m we would use FRP beams only (sitting below the deck). Beyond this, the deflections become too large and it is necessary to use the handrail as a truss to stiffen the whole structure.

The longest FRP footbridge in Europe is a 40m cable-stayed structure in Denmark. CTS have not fabricated anything this large in FRP yet, but we have the potential!

How vandal resistant are they?

As a guide, we would say that an FRP structure offers similar levels of vandal resistance to a timber structure – for example, it is possible to cut the material with a saw. If your project is in a situation where a timber bridge is unsuitable due to potential vandalism we would recommend we supply a steel structure.

How fire resistant are they?

The FRP material is classified as B2 to German DIN 4102-04. In practice, this means that the material offers a 'normal' level of flammability; a fire set close to the structure will cause it to catch light locally, but the fire will not readily spread through the FRP. Again, this is comparable with the behaviour of a timber structure.

A further precaution may be to provide passive fire resistance by means of cladding the bridge.

How do their prices compare to conventional steel and timber bridges?

We are unable to provide a straightforward price comparison between FRP bridges and those we manufacture in conventional construction materials. This is due to the large number of specification parameters that affect each design. We always recommend that you enquire with us for a budget cost for your particular scheme.

That said, depending on size, an FRP bridge may range from being marginally more expensive than a high specification steel bridge or up to twice the cost of the most basic softwood timber alternative.

If FRP bridges are often more expensive than steel and timber, why are they becoming so popular?

It is important to consider that in many small and medium sized footbridge projects the actual cost of the bridge superstructure fabrication is likely to form a relatively small part of the total project costs. Main contractor mobilisation, foundation construction, consultants fees etc will all reduce the proportion of the costs taken up by the bridge frame.

Any increase in 'up-front' superstructure costs may be offset by the potential for:

- Savings in the installation costs
- Savings in the maintenance costs (particularly if the bridge is difficult to access).

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What is the effective lifespan of an FRP structure? Does it degrade over time?

The longevity offered by FRP is very good. There are examples of FRP structural sections being used in service for over 30-years. As with our steel and timber bridges, we do not guarantee a lifespan for the materials. However, it is worth considering that wind turbine blades are made of FRP and these are designed for replacement after 20-years after prolonged exposure to dynamic loadings. Wind turbine blades typically use 45% fibre reinforcement. The FRP in our structures typically uses more than 60% fibre reinforcement – which will enhance the longevity further.

FRP is resistant to corrosion, weathering and freeze thaw effects as the surface is impermeable and the resin is chemically inert.

The material is supplied in a light grey colour. Over time and with exposure to UV light, this may slightly change colour to become yellow tinged. The profiles we use all have a polyester surface veil which serves to contain the polymer and push the fibre reinforcement away from the profile surface. This means that the mechanical properties of the section will remain the same even if there is some degradation of the outer polymer layer.

Can FRP be painted?

Yes. Very good levels of paint adhesion can be achieved on FRP.

As with a steel paint system, the life expectancy and maintenance intervals of the FRP paint system will dependent on the paint specification adopted. Paint manufacturers do not provide guarantees, but it is realistic to achieve 12-years to first major maintenance. We have different recommended paint specifications for low and high wear areas.

It is important to remember that FRP is only painted for aesthetic reasons. If a paint system is omitted – it won't require maintenance.

What are the mechanical properties of FRP? How does FRP behave in comparison with timber and steel?

The FRP sections we use in our bridges have continuous strands of glass fibre running through them (in a similar manner to steel reinforcement in a concrete beam). These contribute a very high tension means that the sections are very strong in tension.

The design of FRP structures is generally governed by the deflection requirements. Because of this sections are not stressed to anything close to their 'ultimate limit' failure state. Before a brittle failure could occur excessive elastic flexure would be observed.

Irrespective of this, FRP is designed with multiple safety factors.

What Codes and Standards do the designs use?

In the UK we have BD90/05 – "Design of FRP Bridges and Highway Structures". This sets out guidance and requirements for the technical approval of schemes using FRP.

There is currently no specific standard (e.g. a British Standard or Eurocode) for FRP design, however BD 90/05 advocates a limit state philosophy based on BS 5400:Part 1 and the requirements of BD 37/01.

Composite construction is a rapidly developing field and BD90/05 also makes provision for the use manufacturer's data and calculations by defining material test criteria. The FRP composites that CTS use are all compliant with the highest E23 quality standard as defined by the European standard for pultruded profiles - EN 13706.

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All FRP bridges are classified as Category II or III structures under BD90/05 and as such the designs produced by CTS' own Chartered engineers must be subject to an independent structural design check prior to manufacture.

How much does it cost to hire a helicopter?

This very much depends on the size and weight of your bridge and the location of the nearest helicopter hire company.

You can contact helicopter hire companies directly. In some instances The Royal Airforce/Army have been willing to install these bridges as per of an exercise.

If you would like a quotation for FRP Bridges or any other type of bridge, please contact Sales on 01484 606416 enquiries@ctsbridges.co.uk. www.ctsbridges.co.uk.

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