FFU® Synthetic Sleepers and Longitudinal Baulks
41/37/745 cm Longitudinal Baulks | A global first for installation
Military Canal Bridge & Block House Bridge on the Ashford to Hastings line

September 2014
Network Rail has been working with Sekisui in developing a sustainable alternative to wooden longitudinal baulks.

A programme of site trials has now begun with Network Rail having installed synthetic cross sleepers and longitudinal baulks using FFU (Fibre-reinforced Foamed Urethane) over two bridges, Block House and Military Canal (Ashford to Hastings Line) in Kent. This is a trial installation, the first of its kind on Network Rail infrastructure. This trial is part of a Network Rail long term technical strategy to offer a sustainable alternative to the hard or softwood currently being used.

The material has similar density to hardwood but offers a projected service life in excess of 50 years.

FFU offers improved whole life cost, reduced maintenance costs, improved track availability and system reliability due to:

- anticipated reduction in scope of detailed inspection
- workability - FFU can be drilled and planed on site
- elimination of decay
- non-flammable properties
- associated reduction in disruptive possession costs due to increased time between renewals
- reduced maintenance intervention
FFU synthetic wood was installed for the first time in the United Kingdom over the weekend 20-21 September 2014. Network Rail fitted out two railway bridges on the Ashford to Hastings line with longitudinal baulks and cross member sleepers manufactured from FFU (Fibre-reinforced Foamed Urethane).

The longitudinal baulks measure 41/37/745 cm (w/h/l) - a global first for installed FFU units of that size.
The longitudinal baulks were manufactured at the SEKISUI works in Japan. The required construction height of up to 37 cm was achieved by laminating single plies for a precise installation.

The undersides of the cross sleepers (in contact with the top surface of the longitudinal baulks) were milled at the works in order to achieve predefined track geometry. The dimensions of these sleepers were 25/13.5/240 cm (w/h/l).
The track on the Ashford to Hastings line was converted at the Military Canal Bridge 1800/A. The track with a superelevation of 1:264 lies on a curve with a radius of 2,320 m, the permitted linespeed is 60mph. The bridge is of an open steel-framed construction and has a length of 29.5 metres.

In the Ashford direction of travel, the Military Canal Bridge 1800/A is followed in close proximity by Block House Bridge 1800/B which has the same technical parameters but is only 13.0 metres long. This was the second bridge to be fitted out with FFU over the same weekend.
Prior to the conversion work at these two bridges, in July 2014, Network Rail staff conducted a demonstration in working with the FFU material at their depot in Ashford, for training and familiarisation; this included test drilling and cutting, chiselling, and repairs to holes. The experience gained from this exercise enabled Network Rail staff to more accurately adapt the longitudinal baulks to the specific geometric requirements on site.
The conversion work at both bridges was carried out as follows:

First of all, the rails and their fastenings were dismantled. Next, the existing softwood bridge sleepers and longitudinal baulks were removed revealing the steel substructure with its riveted plate girders.
The baulks (each weighing up to 840 kg) were lifted into position and installed one by one. This called for much skill and expertise from Network Rail’s workforce because the existing geometry of the steel channel in which the longitudinal baulks were to be installed allowed a gap of only a few millimetres at each side. The longitudinal baulks could then be bolted down onto the steel bridge with holding down straps.

The transition from the bridge structure to the ballasted track was redesigned for the new installation. The longitudinal baulks and cross member sleepers were marked as to their position in-situ before being transported to the installation site by a road-rail excavator, plus freight car.
The bridge sleepers were spaced out manually and correctly positioned on top of the longitudinal baulks. Each cross sleeper was secured onto the underlying baulk with two bolts. The holes were drilled at the work site, assisted with the use of an industrial vacuum. The cross sleepers were then bolted down tight.

During the works, the placement of the bridge sleepers was checked constantly using measuring equipment.

FFU uses standard fittings, fastenings and installation methods as used with conventional timber beams.
Once all of the bridge sleepers were correctly positioned and bolted down, the base plates could then be placed on top. The first rail was lifted onto the base plates and its position was precisely referenced to the adjacent track.

The holes for final fastening of the first rail could then be drilled for each point of support and the base plates screwed down tight. The second rail was installed in the same way, using the first rail as a measurement reference (datum).

Once the work was completed, and the new track panels with rails mounted were in the required geometric position, the line could then be opened for rail services.