FFU® waybeams on 135m long Shannon River Bridge in Limerick.
Iarnród Éireann chooses synthetic timber for cost savings

It undertook a project to replace the timber waybeams on the 135m long 5-span Shannon River Bridge UBE16 in Limerick.
When new, timber waybeams are treated with a preservative, however, over time they become susceptible to rot. A detailed inspection of waybeams is carried out annually to ensure the security of bolts, packings and other fixings as well as to assess the general condition of the timber. An important part of this annual inspection is to hammer tap the timber whilst listening for any change in pitch. If a dull sound is detected this is indicative of rot in the timber. At bridge UBE16 in Limerick rot was detected by the hammer tap inspection in 2015. There was little indication on the top surface of the timber of an internal problem and this is why the hammer tap inspection is so important.

Having identified the timber waybeams were approaching a condition where they would have to be removed, an engineering appraisal of options for replacement was prepared. An appraisal must consider an appropriate range of options to ensure that Iarnród Éireann meets its statutory responsibilities with due regard to Efficiency, Economy and Safety. Five different options were identified and appraised in terms of whole-life costs and the cost/disruption for installation. Bridge UBE16 is on the line between Limerick and Ennis. It is a single track line with bi-directional operation. Therefore there is no alternative track that could be used if the option chosen requires a period of line closure. In terms of costs, keeping a line open is obviously favourable as it will avoid the cost of replacement buses and avoid the loss of revenue if passengers choose not to travel as a consequence.

The appraisal of the five options for UBE16 identified a valuable opportunity to bring significant cost savings during the lifetime of the track system by choosing renewal of the timber waybeams in a synthetic material. A specification was prepared and following a tender process Sekisui were awarded a contract to supply a Fibre-reinforced Foamed Urethane (FFU) material for installation.
FFU is a material developed for the Japanese Railways and introduced in Japan in the 1980s. FFU is much more durable than natural timber and most importantly does not rot. It has a design life in excess of 50 years which is in stark contrast to hardwood timber’s 20 years. Choosing FFU eliminates 2 future renewals that timber waybeams would require by 2067.
Also, since FFU does not absorb water, corrosion of steel at the transverse supports and at the fixings will be much reduced. Less corrosion means less structural maintenance required to the bridge. Another advantage of the FFU material over timber is that boreholes can be repaired using a resin repair system should it be required.
To keep the Limerick to Galway line open and operating as usual, the FFU waybeams are being installed at night. At the end of each 8-hour shift the track is checked and returned in a serviceable condition for trains to run in the morning. By choosing to introduce a new material for the first time on the network, the FFU material and its use as a waybeam at UBE16 needed to pass Iarnród Éireann’s vigorous Safety Approval Process.
Safety approval by Iarnród Éireann of the FFU material for use as a waybeam was completed in stages between January and July 2017. Since the transverse supports under the waybeam are generally inaccessible unless the waybeam is removed, the project has provided an opportunity to undertake minor steel repairs to these areas and rivet replacement. The work plan at the start was to change a waybeam every 3 nights following steel repairs. As the work proceeded the crews became more familiar and it sped up to a rate of changing a waybeam every 1 or 2 nights following steel repairs. All works, including track protection, waybeam installation and steel repairs were carried out by in-house Iarnród Éireann work crews.