

# HS2 designers cut carbon with pioneering new viaduct design

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HS2 has revealed that its designers are on track to more than halve the amount of embedded carbon in one of the high speed rail project's viaducts.

The innovative 'double composite' approach - which involves two steel girders sandwiched between two layers of reinforced concrete to create a super strong but light weight span - will be used on the Wendover Dean Viaduct in Buckinghamshire.

The 450m viaduct was recently given approval by Buckinghamshire Council under Schedule 17 of the HS2 Act and it will be the first major railway viaduct in the UK to use the 'double composite' approach.

Designed by HS2 Ltd's main works contractor, EKFB - a team made up of Eiffage, Kier, Ferrovial and BAM Nuttall - working with their design partner, ASC (a joint venture between Arcadis Setec and COWI) and specialist architects Moxon, the viaduct is one of 50 being built on the first phase of HS2 between London and the West Midlands.

Applying lessons from the use of double composite structures on the latest French TGV lines, the British

team has cut the amount of embedded carbon in the viaduct by 7,433 tonnes – the equivalent of 20,500 return flights from London to Edinburgh.

As well as cutting the amount of concrete and steel – one of the major sources of CO<sub>2</sub> – the slender design also reduces the silhouette of the structure viewed from across the valley. Nine evenly spaced piers will support the deck of the viaduct and will be placed to carefully reflect the near symmetry of the ground beneath.

In a further improvement to the original design, the piers – some of which will be up to 14 metres high – will be cast in pieces offsite before being assembled like giant lego blocks. This approach will reduce the amount of work on site and cut disruption for local residents.

HS2 Ltd's Project Client Director Ambrose McGuire said: "By providing a cleaner, greener way to travel, HS2 will help cut the number of cars and lorries on our roads, cut demand for domestic flights, and help the fight against climate change.

"But we're also serious about reducing the amount of carbon we use during construction, and Wendover Dean is a great example of how we're using the latest engineering techniques to do just that. Concrete is one of the construction industries' biggest sources of embedded carbon – and this design will help us cut our carbon footprint while delivering a lighter, stronger and more elegant structure."

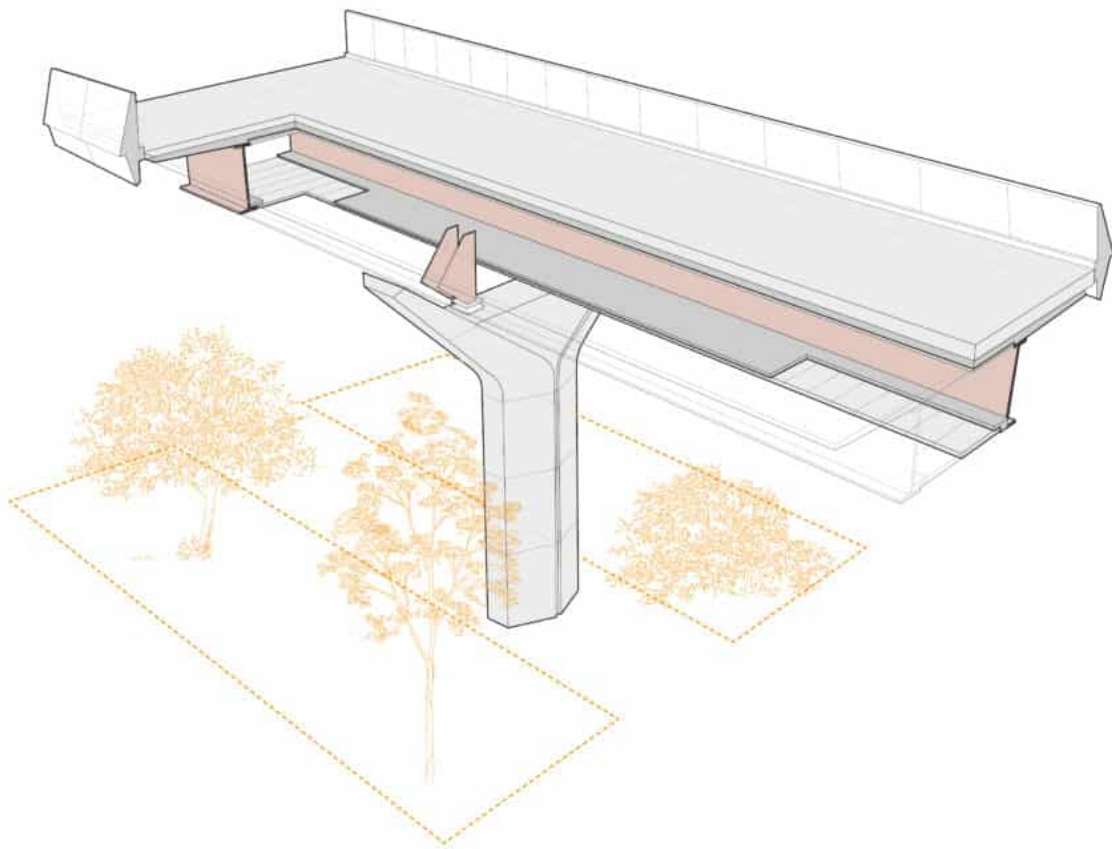
EKFB's Technical Director Janice McKenna said: "This viaduct was inspired by the latest innovative designs in France, but has been enhanced and developed in the context of the Chilterns. Our design solutions are always created with people and legacy in mind and I am really proud of the carbon savings that the Wendover Dean Viaduct represents."

The beams themselves will be made from weathering steel, which will age to a characteristically dark russet finish and echo the natural tones of the surrounding landscape. Total steel weight is around 1400 tonnes and will be topped with a concrete deck which will carry the track and built-in noise barriers.

When viewed from a distance, against the weathered steel, the pale concrete parapet will appear as a thin horizontal band hovering over the slender piers as it glides over the valley and make the whole structure look thinner.

This effect will be further emphasised by the viaduct piers, which have been extended to almost connect with the parapet, helping to give the appearance of a light and narrow structure.

The historic field boundaries and hedgerows will be recreated after the viaduct is built to provide uninterrupted access for farmers and local residents. A mix of trees and shrubs commonly found across the Chiltern chalk hills will be used for new woodland planting around the viaduct, including Oak, Beech, Hazel and Wild Cherry.



*Photo credit: HS2 Ltd*