

Monitoring & Investigation of Llanrhystud Bridge

Llanrhystud Bridge is a Post Tensioned Concrete bridge (i.e. after the concrete bridge deck is cast, high tensile steel wires are passed through ducting and tensioned). This is a durable form of construction however the integrity of the tensioning wires needs to be checked at about 30-year intervals.

The bridge was constructed circa 1962 and widened in 1994. Not all of the original construction drawings are available.

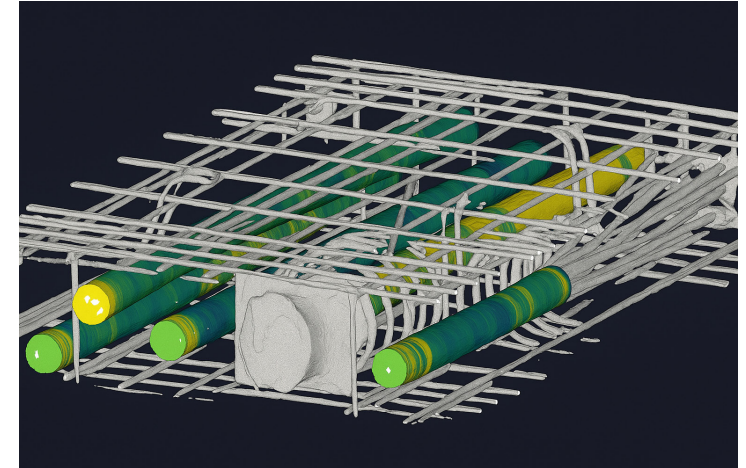
In 2024 investigation works were carried out in line with the requirement to check the condition of the bridge and also determine as far as possible the as-built construction information. This was largely successful; however, it proved impossible to determine the location and size of some of the steel reinforcement and post-tensioning wire buried deep inside the bridge deck.

The monitoring and testing being carried out this year utilises a new technology, which will gather this information. Llanrhystud Bridge will be the first in-service bridge in the UK to utilise this technology.

The new method is similar to an X-ray scan but uses naturally occurring background radiation (Muons) from cosmic rays. Sensors are placed either side of the concrete deck which detects the passage of muon particles as they enter and exit the deck. The muons will interact differently as they pass through steel or concrete, allowing the detector to generate a 3D image of the bridge's internal structure.

To recreate in detail the internal structure from naturally occurring muons, it takes time for the detailed image to be generated. For Llanrhystud Bridge it is anticipated to take 15 days. It may seem nothing is happening on the bridge but about every 5 minutes an additional set of information about the construction and condition of the bridge is being captured which will assist engineers plan targeted maintenance in order to keep the bridge in service.

The image on the right is an example of the type of information generated by this process. It shows the reinforcement bars (in grey) and ducts carrying post tensioned wires in yellow and green.



Example of data generated of internal structural components



Muons in great quantity are naturally in our environment



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