

## **STRENGTH ASSESSMENT OF THE IRON BRIDGE**

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### **ABSTRACT**

The Iron Bridge is the World's first iron bridge, dating from 1779. It is a Grade I listed structure and lies in a UNESCO World Heritage site in the Severn Valley. In many ways the construction of The Iron Bridge marked the beginning of modern engineering.

The bridge's guardian, English Heritage, was concerned about the long-term stability of the structure given, amongst other factors, extensive cracking in the cast iron and an increase in the depth of seasonal flood waters engulfing the bridge abutments.

Ramboll was commissioned to develop a plan of activities that would lead to a greater understanding of the bridge's structural vulnerabilities. This included precise measurement using 3D laser scanning, geometry modelling, risk assessment and archive research, structural analysis and the assessment of residual strength. This work has now been completed and the presentation will summarise the investigations that have been undertaken. It will also describe a new modelling process for the direct assessment of bridge strength which, apart from saving time, avoids the separate stress calculations traditionally used by Bridge Engineers.

Although the Iron Bridge has been the subject of numerous previous surveys and investigations, almost without exception these have been targeted at the archaeological and historic aspects of the structure and surroundings. The presentation will describe work which, for the first time, has considered the engineering behaviour in detail and determines the bridge's ability to carry load and survive extreme events.

Ramboll undertook both archive research on the nature and development of structural defects and a detailed Finite Element (FE) analysis of the structure to assess strength. The latter was based on geometry created from a 3D laser survey and unusually a 3D solid formulation so that stresses in the cast iron members and joints could be calculated directly, saving time and increasing accuracy.

The geometry modelling, structural analysis and strength assessment will be described as well as historic bridge movement and cracking which has been the primary cause of damage and deterioration. The assessment led to

recommendations on the permitted loading on the structure, the risk of failure from flood events and the possible need to strengthen an approach span.

## **SUGGESTED THEMES**

Laser Aided Modelling (LAM), Bridge Assessment