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Knostrop Footbridge – Innovative Design Solutions

(Experiences of the future: experimentations)

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Knostrop Footbridge, constructed as part of the Leeds Flood Alleviation scheme, had the objective of providing new walking and cycling routes along the River Aire, as well as creating a landmark gateway to the city.

Given the intended purpose and site constraints, a list of key aspirations was developed:

- Creation of a slender, flowing structure which “floats” over the water and encourages local use and interest.
- Simplified construction through off-site fabrication, streamlined installation, and facilitating tight construction tolerances.
- Mirroring the alignment of the newly constructed Knostrop Weir, whilst utilising the structure for support and accommodating the construction lag between the bridge and weir.
- A durable, low maintenance structure.

Achieving the above in combination proved challenging and required an innovative approach. Attention to detail was given to various potential solutions, with proposals being developed, experimented with, and analysed, prior to final implementation.

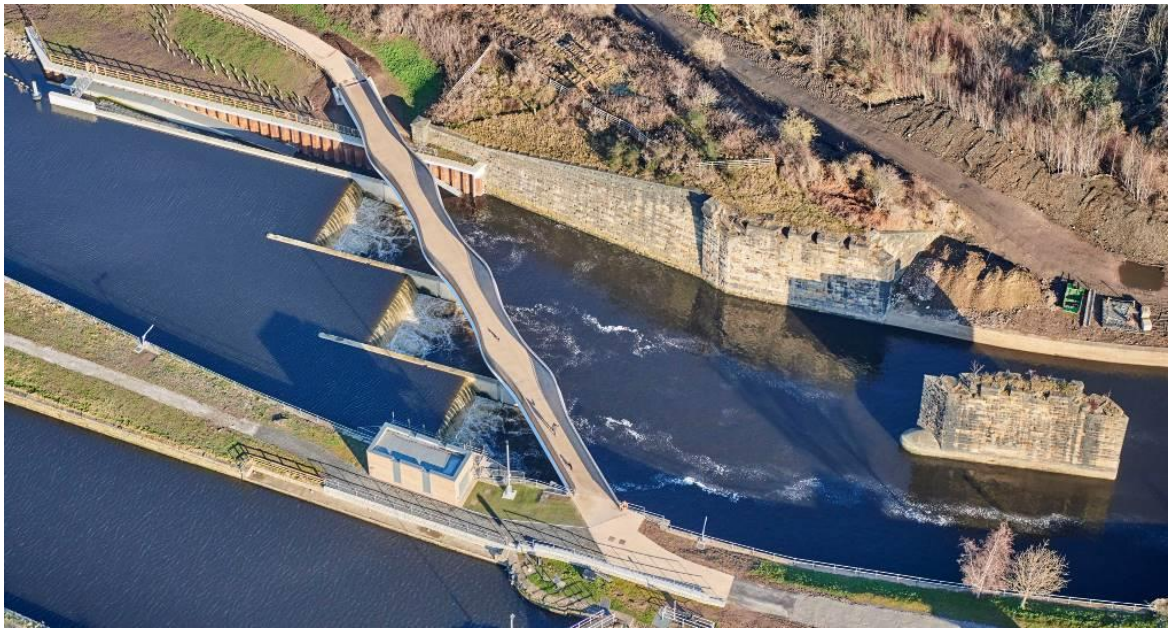

Fig 1. Aerial view of completed bridge

https://doi.org/10.24904/footbridge2022.242

This iterative process allowed the bridge to develop into a unique, innovative, and recognisable design, and one which exceeded expectations to efficiently fulfil its purpose with minimal anticipated lifetime maintenance.

The final design incorporated:

- Objectifying minimal lifetime maintenance resulted in a four-span continuous, externally painted slender weathering steel box, supported on 50mm thick integral steel piers and an integral abutment.
- An undulating plan curvature and curved soffit creating a flowing variable depth elevation, achieved without necessitating complex curvature.
- Accommodation of construction lag, allowing piers to be post installed in the radially tapered weir walls with reduced temporary works.
- Creation of a comprehensive three-dimensional BIM model which allowed detailed consideration of buildability and ECI throughout, highly precise fabrication and construction tolerances, the avoidance of conventional 2D drawings, and the creation of realistic bridge visualisations.

The full paper will detail the innovative solutions used in developing and delivering the bridge design; hopefully providing inspiration for those faced with future engineering challenges.

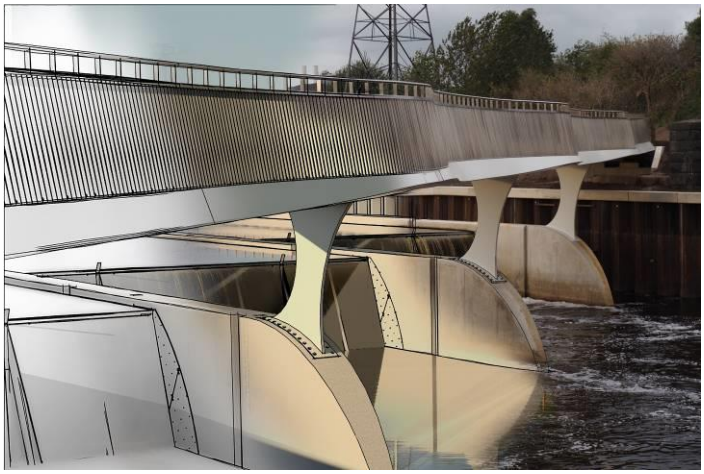

Fig 2. Composite image of BIM model and completed bridge

Fig 3. Pier installation

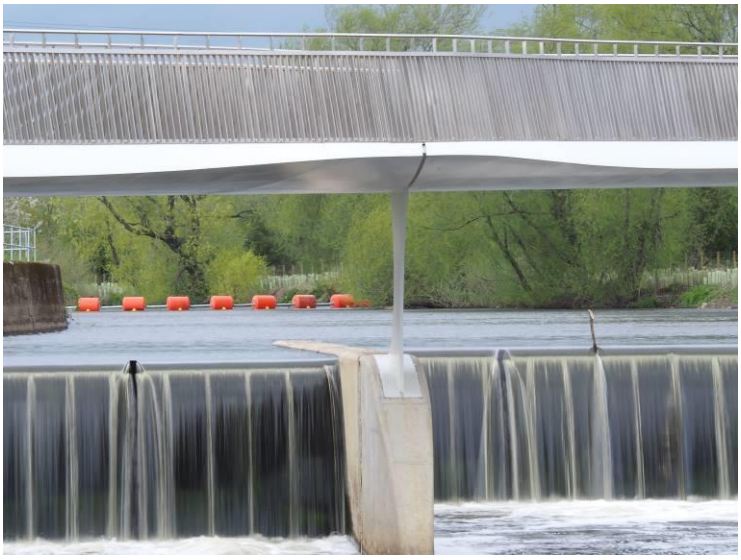

Fig 4. Completed pier connections

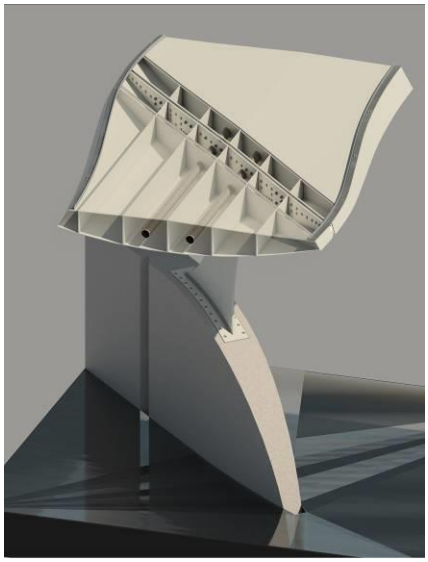

Fig 5. Model pier connections