

## Infinity Bridge, UK



Flint & Neill Limited was appointed by English Partnerships to carry out the Category III Independent Design Check of this landmark bridge over the River Tees in Stockton. The bridge consists of a tied arch structure with a main span of 120m and a side span of 60m. The slender steel arch bifurcates in the region over the central pier and supports a precast pre-stressed concrete deck via inclined locked coil hangers at 7.5m centres. Four longitudinal cables up to 90mm in diameter are provided in each span located parallel to and outside of the deck section forming the arch tie and providing pre-stress in the deck.

As part of the design check extensive studies were undertaken to determine the buckling capacity of the slender arch. This included establishing allowable imperfections for the arch and looking at elasto-plastic behaviour of the arch under theoretical collapse loads. A number of aspects of the design fall outside the scope of current design standards in particular some aspects relating to the design of the curved steel arch. We were able to draw on our extensive knowledge of the UK steel design code to develop design rules applicable specifically for this project. Checks were also undertaken to investigate the effects of accidental removal or failure of any of the hangers or the longitudinal tie cables.

The bridge deck and arch were subject to extensive wind tunnel testing to verify the stability of the structure under a range of wind conditions. F&N provided expert advice throughout this testing which included both section model tests and aero-elastic model tests. The bridge also incorporates a series of tuned mass dampers within the deck to counteract pedestrian induced vertical and lateral vibrations.

Flint & Neill's scope also includes providing advice during construction, reviewing critical method statements and fabrication drawings. The project is currently being procured under a design and build arrangement.

