







# Bridging the Gap

## Application



The Kingston Bridge is one of Europe's busiest river crossings, carrying 150,000 vehicles a day high over the Clyde in the centre of Glasgow. The bridge is a key link in the West of Scotland's motorway system and it also plays a vital role in Scotland's economic life.

The Kingston Bridge was hailed as a remarkable piece of engineering when it was built almost 30 years ago. That year, daily vehicle crossings totalled 31,000. Major defects were discovered in the bridge in 1990. The 163-year-old north pier wall near the bridge's support piers was found to be bulging.

These problems required intensive remedial action. This ultimately involved moving the bridge onto a new set of supports.

Over two weekends 23rd-25th October and 30th October-1st November, the bridge deck was jacked up from its supports and moved southwards by up to 50mm (two inches). The task involved 128 hydraulic jacks raising 50,000 tonnes by 15mm (just over half an inch) – the biggest ever bridge lift.

Over the period of 10 years and up to the current day, the Kingston Bridge has become the most closely monitored bridge in the world. The engineers have ensured that the Kingston Bridge meets the toughest safety criteria. Bridge movements and meteorological data are being continuously recorded and ground surveys are taken regularly to give an overall picture of how the bridge is behaving.

Monitoring instruments include 36

reflecting prisms to check the global movements of the bridge and its approaches. A further 36 sensors on pillars and on the ground feed information on the bridge's local movements every 15 seconds.

Over the years of monitoring and during the critical movement of the bridge, the equipment used for monitoring and recording the bridge movement, was the Measurement Systems range of Datascan Distributed I/O and the Orchestrator data acquisition monitoring and logging software.

Due to its distributed design and its accurate stable measurement capability the Datascan was ideal for this particular application. Over the years of monitoring the Orchestrator software was used to record bridge movement which were kept in log files. Long term analysis of these files showed bridge movement over the duration.

The system designed for lifting the bridge, incorporated two separate servers connected to the same Datascan Network. One located at the North of the Bridge and the other at the South. This configuration together with a fibre optic network between the computers provided a fault tolerant configuration.



The Fibre optic network also provided full client server access to both or either of the Servers. In addition for remote monitoring an ISDN line was installed together with some dial up modem facilities using remote access.

Further to the lifting of the bridge the main support pier will be taken out and replaced whilst the bridge is supported on its temporary piers. Over this period

the system will continuously monitor and record the characteristics of the bridge, ensuring a safe environment for remedial work and providing vital information to the engineers to ensure a satisfactory conclusion to this complex civil engineering problem.

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