

Structural Integrity Testing and Monitoring



North Bridge, Hull is a bascule lifting bridge which dates from the 1930s. During a routine refurbishment programme, cracking was discovered on the track girders, along which the rolling quadrant moves. MPI and metallurgical studies were used to determine the extent of cracking.

Strainstall were appointed by Hull City Council to devise and implement a programme of testing to identify the cause of the cracking, so that the risk of failure could be assessed.

Using LVDT displacement transducers across cracks and strain gauges in zones where cracks were most likely to form, dynamic measurements were recorded during a number of bridge opening/closure cycles.

The testing established that:

- Cracks open/ close during operation of the bridge, but return to original condition after each cycle
- Existing cracks are the result of fatigue, based upon high strain levels in uncracked sections
- The structure is stable, although potential for crack propagation exists.

In order to monitor the ongoing performance of the structure, a long term monitoring system was designed, based upon the information gathered during the testing phase.

The monitoring system comprises LVDTs and strain gauges at critical locations and an inclinometer to measure bridge lift angle. The datalogger takes readings at regular intervals, but if movement is detected by the inclinometer (ie whilst the bridge opens/closes), a series of rapid readings are triggered. The datalogger is linked to the client's office via a modem connection.

Strainstall's team of experienced engineers operate from offices in Cowes, Bath and Aberdeen (UK) and Tønsberg (Norway).



Instrumentation used:

- LVDT displacement transducers
- Straingauges
- Inclinometer
- SES "Data Analysis in Real Time" (DART) fast multi-channel data acquisition system (for Phase 1 testing)
- Datalogger with modem connection (for Phase 2 – long term monitoring)

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