

Esplanade Riel Pedestrian Bridge – Canada

Project Description:

Completed in 2003, the Esplanade Riel Pedestrian Bridge majestically rises over the Red River. Spanning 200 meters, it is supported by a 57-meter-high transversely inclined single pylon. It was especially designed for pedestrians and bicyclists. This aesthetically appealing bridge connects St. Boniface with The Forks. Next to it is a four lane vehicular bridge spanning 270 meters.



Figure 1: Esplanade Riel Pedestrian Bridge – Winnipeg, Manitoba, Canada

Quick Facts:

- **Name and Location:** Esplanade Riel Pedestrian Bridge – Winnipeg, MB, Canada
 - **Owner:** The City of Winnipeg
 - **Structure Category:** Cable Stayed Bridge
 - **Spans:** main span of 110 meters and back span of 90 meters
 - **Start of SHM:** Fall 2003
 - **Number of Sensors Installed:** 113
- Instrumentation design by:** ISIS Canada – University of Manitoba

Description of Structure:

The Esplanade Riel Bridge is comprised of 2 spans; the main span being 110 meters long and the back span being 90 meters long. The bridge is made of reinforced concrete which is post-tensioned. The spans are 5 meters wide. The slanted pier in the centre is 57 meters high, surrounded by a 370 square meter cantilevered plaza.

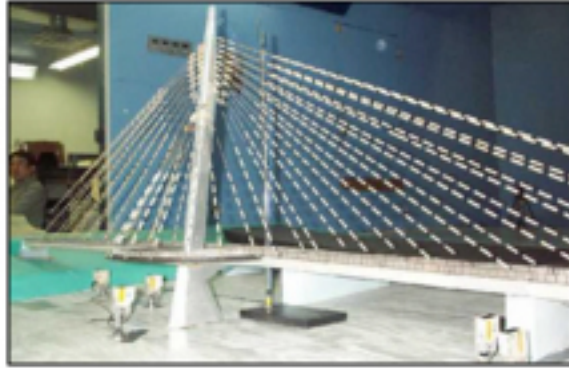


Figure 2: 1:60 scale model tested in wind tunnel

Purpose of Instrumentation:

The intent of the SHM system is to provide feedback on the behavior of the bridge as a whole, and on the performance of the cable stays, the pylon, the deck, the bearings, and the abutments. Based on the detailed analysis of the bridge structure, the performance criteria the SHM would be used to monitor was determined. From the City of Winnipeg Engineers' perspective, the SHM would be used to observe departures from the predicted behavior of the bridge, and to monitor its basic behavior such as the expansion and contraction of the bridge deck. From a research perspective, the SHM will be used to verify the dynamic behavior of the bridge subject to service load conditions including wind forces and to calibrate the clauses of the Canadian highway bridge design code (CHBDC S6-00) used for the bridge design.

Sensor Details*:

Type	Number	Location
Electric Strain Gauges	30	Pylon
Fibre Optic Sensors	18	Pylon
Accelerometers	30	Pylon /Ring Beam/Decks
Thermocouples	30	Pylon/Midspan
Inclinometers	5	Pylon

*A.Mufti et al

Benefits of using SHM technologies in the project:

The continuous monitoring of the bridge will assist the City of Winnipeg engineers to optimize the bridge maintenance budget over the estimated service life of the structure. With this state-of-the-art technology, the City may be able to identify problem areas more quickly than by traditional methods, so they may be resolved in a cost-effective and timely manner. The goal in this technology will result in savings to the maintenance budget over the long term. As well, the project provided a great opportunity for engineering students at the University of Manitoba to participate, through the ISIS Canada and NSERC programs, in a state-of-the-art project incorporating the application of leading-edge technology.

References:

Shehata, E., Haldane-Wilson, R., Stewart, D., Mufti, A.A. , Tadros, G., Bakht, B., Ebenspanger, B. *Structural Health Monitoring of the Esplanade Riel Pedestrian Bridge*. Proceedings ISIS SHM 2004 Workshop, Winnipeg, Manitoba, Canada, September 22 - 23, 2004

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Real time monitoring website: <http://130.179.57.204/index.htm>