Golden Boy Statue - Canada

Project Description:

In 1918 the Golden Boy statue was cast at the Barbidienne Foundry in France and was hoisted to its perch on the top of the cone of the new Legislative Building of Manitoba on November 21, 1919. The original design called for a monolithic casting to help ensure stability of the statue. But material shortages caused by the war meant that France did not have enough steel, so a steel shaft was purchased in Chicago and then inserted in the left leg of the Golden Boy and plugged at the heel. In 1966 electrical wiring to accommodate a light fixture in the Golden Boy's torch was added to the statue. This had a detrimental effect on the statue's health leading to eventual corrosion of the steel supporting shaft.

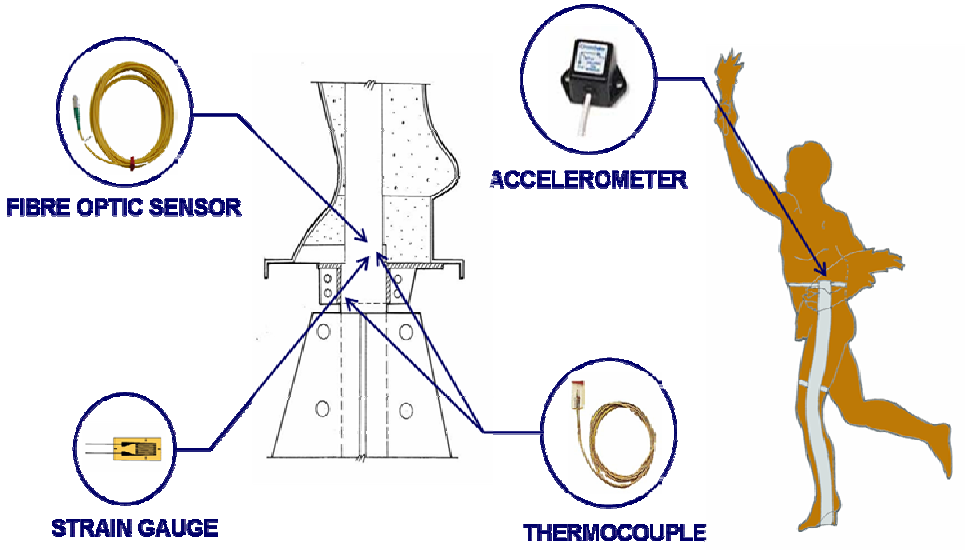
Golden Boy – Winnipeg, Manitoba, Canada

Quick Facts:

- **Name and Location:** Golden Boy - Winnipeg, MB, Canada
- **Owner:** Government of Manitoba
- **Structure category:** Statue
- **Spans and dimensions:** Statue stands 4.0 meters tall (13.2 feet) from his toes to the tip of his torch. Caste in bronze weiging about 1600 kg.
- **Structural system:** 1.74 m long steel shaft, fixed from one end
- **Start of SHM:** October, 2001
- **Number of sensors installed:** 8 sensors
- **Instrumentation design by:** ISIS Canada – University of Manitoba.

Description of Structure:

The Golden Boy is a hollow sculpture made of bronze, and he stands 4.0 meters tall (13.2 feet) from his toes to the tip of his torch. He weighs between 1550 and 1600 kilograms (just over 3,600 pounds), and the top of his torch is 77.0 meters (255 feet) above ground, the equivalent of a 24-storey building. (www.gov.mb.ca/goldenboy)



Cross-section of the Golden Boy support shaft

Purpose of Instrumentation:

As a part of an overall restoration project, the Golden Boy was going to be re-gilded with 24 karat gold leaf. A close inspection of the statue revealed severe corrosion at the base of the steel shaft that attaches the statue to the dome. The holes drilled to accommodate the wiring for the Golden Boy's electric torch permitted the intrusion of precipitation and moisture into the statue, eventually contributing to this severe corrosion. Originally 127mm (5 inches), the diameter of the shaft was reduced to about 114.3mm (4 ½ inches). The corrosion created a serious safety risk, adding structural repair to the aesthetic restoration of the statue, leading to the decision to replace the supported steel shaft.

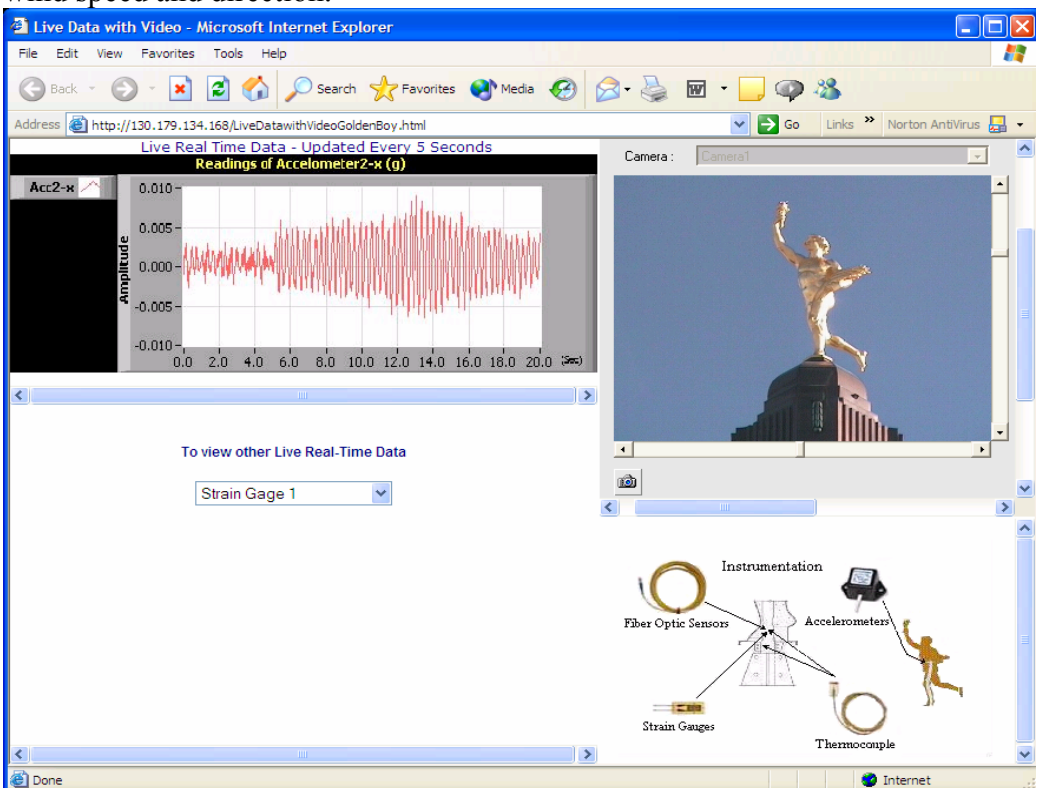
Sensor Details*:

Type	Number	Location
Fibre optic sensors	4	At the support shaft
Electric foil strain gauges	8	At the support shaft
Thermocouples	1	Close to the gauges
Accelerometer	2	Top of the shaft
Win meter	1	On the roof of the legislative building

Examples of outcomes:

Two accelerometers at the top of the shaft inside the statue record the movement of the statue in response to wind and various weather systems. A combination of electrical resistance strain gauges and Bragg grating fibre optic sensors are installed on the support shaft near the heel of the Golden Boy. These gauges monitor the strains in the shaft due to wind on the Golden Boy.

Located in close proximity to the gauges at the base of the support shaft, thermocouples, record temperatures. Measuring temperature is important because it affects the strains of the supporting shaft, which, in turn, can affect the integrity of the shaft. A wind meter located on the roof of the legislative building measures wind speed and direction.



Screen shot of Golden Boy live data showing natural frequencies

Benefits of using SHM technologies in the project:

There are three main benefits of incorporating SHM technologies into the Golden Boy restoration project.

- Analysis of the SHM data will contribute to the development of cost efficient maintenance procedures that will save taxpayer dollars over time.
- Early access to information about the physical and structural state of the statue will help identify potential risks.
- Knowledge gained from analyzing the SHM results can be used to create safer and better designs for similar structures.

References:

Department of Industry and Commerce, Travel and Publicity Branch, Manitoba. 1956. "The Golden Boy, The Story of Manitoba's Legislative Building", Queen's Printer, Winnipeg, MB.

Kopp, G.A., and Surry D., "A Study of Wind Effects on the Golden Boy, Winnipeg", BLWT-SS62-2001, The University of Western Ontario, Faculty of Engineering Science, Nov. 2001.

Mufti, A.A. and Tadros, G, "Manitoba Legislative Building, Golden Boy – Review and Comments", report submitted to Dillon Consulting, Winnipeg, MB, Nov. 2001.

Redston, J. (editor) February 2002. Golden Example of How Partnerships are Generated. Innovator, Newsletter of ISIS Canada, Winnipeg, MB. pp. 1.

Mufti, A.A. "Structural Health Monitoring of Manitoba's Golden Boy" Technical Report, ISIS Canada research network, University of Manitoba, April 2003.

http://www.gov.mb.ca/goldenboy. 2002. Official Manitoba Government web site.

http://www.isiscanada.com. 2002. Official web site for ISIS Canada, a federally funded network of centres of excellence.

Submitted by:

Dr. Aftab A. Mufti
President
ISIS Canada
University of Manitoba
A250 Agriculture and Civil Engineering Bldg.
96 Dafoe
Winnipeg, MB R3T 2N2
Phone: (204) 474-7476
Fax: (204) 474-7519
Email: muftia@cc.umanitoba.ca