

Structural Health Monitoring of Building Near Excavation Site

In modern urban environments, heavy construction often must be conducted immediately adjacent to neighboring properties and structures that must remain open to business or residency during excavation and construction.

DIMETIX
LASER DISTANCE SENSORS



Summary

Traditional surveying techniques allow for +/-5mm precision of displacement, but Dimetix laser distance sensor technology allows for measurements with sub-millimeter accuracy at distances up to 500m to detect any shift or displacement of structures. In today's world of high-density construction sites, these systems provide a more accurate and precise method of protecting adjacent buildings and infrastructure against construction-based damage.

Challenge

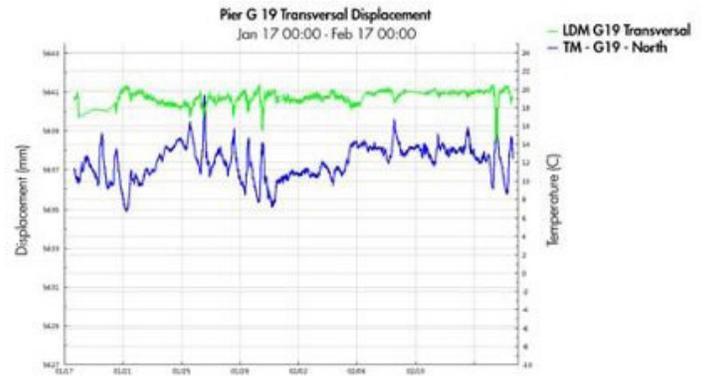
A unique request to measure sub-millimeter displacements in 3 axis of freedom required Civionic Engineering & Consulting Inc. which maintains offices in Washington state, to develop a new multi-axis, multi-sensor structural health monitoring system within a 3 month timeframe. New tower development in the heart of a busy sports complex required excavation only a few feet away from three existing bridge piers. The developer needed to ensure no shift of the existing bridge structure occurred during the excavation and construction periods of the new 320' high mixed commercial/residential development.

Shifting of the existing bridge structure could have had catastrophic consequences. The owner of the structure wanted to ensure a high precision measurement system was in place prior to excavation to detect any anomalies during the excavation and construction period.



Solutions

By combining 3 heated Dimetix FLS-CH10 laser displacement sensors from Laser-View Technologies and a specialized, high precision 2-dimensional laser position target detector, Civionic Engineering & Consulting was able to provide the client with readings of 0.3 mm precision for the Lasers and 0.1 mm precision for the detector. The IP65 rated laser sensors were equipped with optional heater units to withstand temperature variations and harsh external conditions, and measure transversal displacement from the bridge piers to the sports arena while the detectors measure transversal and vertical displacement. The systems were deployed in July 2014 and have been collecting readings 24 hours a day, 7 days a week ever since.



Key Application Notes

- ⌚ Civionic Engineering & Consulting's structural health monitoring system has enabled 24/7 data collection and observation with sub-millimeter accuracy, which could not have been achieved with traditional survey methods
- ⌚ Careful data collection and monitoring have allowed the sports complex to remain operational throughout excavation and construction
- ⌚ Adjacent buildings and infrastructure protected against damage in a high density construction area
- ⌚ Structure displacement monitored over long distances despite temperature variations and harsh external conditions
- ⌚ Maintenance free application- no moving parts to wear or string cables to break
- ⌚ Economical, rugged, and compact package

Results

Traditional surveying techniques allow for +/-5mm precision of displacement, but Dimetix laser distance sensor technology allows for measurements with sub-millimeter accuracy at distances up to 500m to detect any shift or displacement of the structures in the complex, which has remained operational throughout excavation and construction. In today's world of high-density construction sites, these systems provide a more accurate and precise method of protecting adjacent buildings and infrastructure against construction based damage.