Monitoring Structures

6th Street Bridge Construction, Los Angeles

Capitol Complex Expansion, Austin

Airport Expansion, Tampa

GEO-Instruments monitors changes in parameters that affect the performance of a structure: tilt, settlement, load and strain, vibration, cracks and joints, and alignment of incoming utilities.

Monitoring systems can provide early detection of developing performance issues and can also verify the efficacy of repair and rehabilitation work.

AMTS Systems monitor prisms on interior and exterior walls to detect unexpected movement.

Crackmeters and Jointmeters monitor existing cracks, changes in alignment of structural elements.

Hydrostatic Levels, installed on floors and exterior or interior walls, monitor differential settlement.

Tiltmeters monitor deformation of walls and floors and lateral displacement of columns.

Laser Extensometers monitor wall-to-wall or floor-to-ceiling convergence.

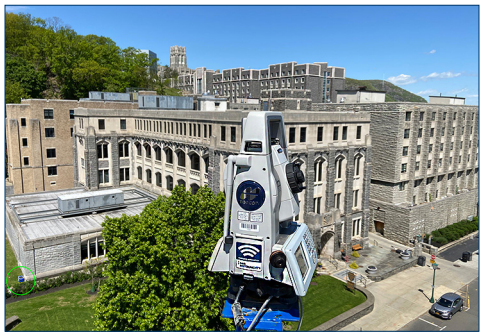
Strain Gauges monitor changes in loads on steel structural elements.

Vibration Monitors warn when vibration limits are exceeded.

GeoCloud Automation provides wireless data acquisition, web-based data management, and secure website access to data.

Mokulumne Aqueduct Retrofit, California

Kennedy Center Expansion, DC



West Point Expansion, New York

MSE Wall Repair, Texas

Bellevue Tunnel Construction, WA

Old South Church Repair, Boston

One Post Office Square

This 42-story skyscraper in Boston underwent extensive renovations to improve both its appearance and its energy efficiency. The structure's original cladding was replaced by a glass curtain. The photo above shows a small portion of the glass curtain. The project also replaced the original 6-story parking garage with an 18-story parking and office structure.

Monitoring Requirements

A crane on the roof of the building was used to remove the old pre-cast cladding and replace it with the new glass curtain. Crane operations would place new stresses on the structure, so monitoring was required for selected elements.

Demolition of the old parking structure could affect the main building. The basement level of the building had to be monitored for settlement and tilt. Measurements were to be taken at 15 minute intervals.

Implementation

GEO installed six pairs of arc-weldable strain gauges on selected structural elements. Self-powered, wireless nodes transmitted measurements to an internet gateway.

Eight hydrostatic level cells were installed in the basement along with 8 wireless tiltmeters to monitor vertical columns during demolition of the adjacent parking garage.

Measurements were automatically transmitted to a GeoCloud project website.

Wellesley College Science Center

The Wellesley College Science Center upgrade project involved replacing the interior of the structure while preserving the original brick facade.

Monitoring Requirements

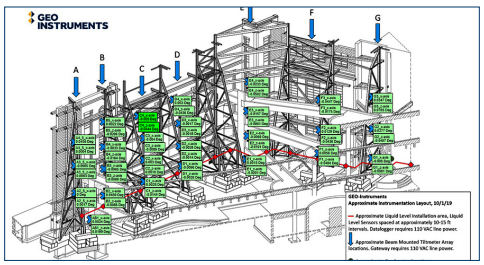
Construction of the new interior would place new stresses on the brick facade. Of particular concern was differential settlement and changes in verticality.

Implementation

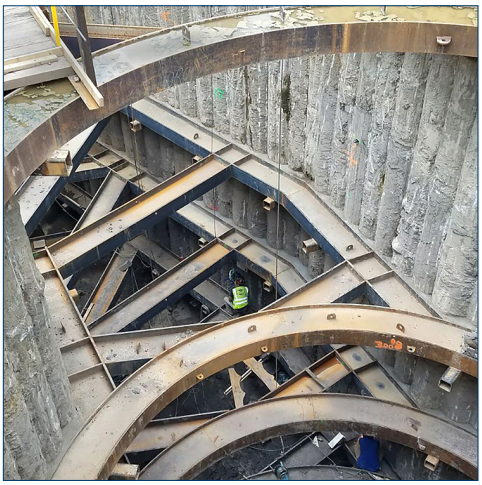
GEO installed wireless tiltbeam sensors in window openings to monitor for deformation and changes in tilt. In the photo above, eight of the tiltbeam sensors are circled in green.

GEO installed hydrostatic level cells along the base of the wall to monitor potential settlement. These were interconnected with electrical cable and liquid-filled tubing. Four of the cells are circled in blue in the photo above.

Wireless crackmeters monitored movement of the wall relative to an elevator shaft, and two automated vibration monitored vibration levels in a utility tunnel at basement level.



GeoCloud websites display site status, alarms, graphs, and reports.



Kennedy Center Expansion

The Kennedy Center Expansion project and the DC Water and Sewer CSO project took place simultaneously on the same site. This created challenges for construction coordination; movement of equipment, schedules, laydown areas for materials, and safety of personnel.

Monitoring Requirements

The work involved demolition, excavation, and heavy construction activities near the main structure, the Roosevelt Bridge, and sensitive DC water utilities.

Implementation

GEO installed tiltmeters and vibration monitors in the Kennedy center itself before work began.

AMTS and inclinometers were then installed to monitor the SEO and bridge approaches. All measurements were forwarded to a GeoCloud website.

The CSO project began a few months later. GEO deployed AMTS to monitor the CSO diversion structure and a secant pile cutoff wall (pictured above). Multi-point borehole extensometers were also installed to monitor settlements.

Some of the instruments already in place for the Expansion project were able to perform double duties, monitoring both the expansion work and the CSO work. Measurements for the two projects were kept separate and were forwarded to different GeoCloud websites.