

Clients:

Michigan Department of
Transportation

Lawrence Technological
University

Locations:

Jackson, MI

Southfield, MI

Services Provided:

Design and installation of
sensors to monitor long-
term behavior of bridge
using new, innovative
materials

Value Provided:

- Sensors validate performance and design assumptions
- Embedded sensor technology measures the effects of movement in bridge utilizing innovative materials
- Long-term data can be used to compare performance with steel reinforced structures

Background & Project Challenges

Through research and development efforts the Michigan Department of Transportation and Lawrence Technological University have been developing uses of carbon fiber reinforced polymer materials for major bridge components. Current uses include Carbon Fiber Reinforced Polymer (CFRP) post-tensioning cables and barrier walls, Carbon Fiber Composite Cable (CFCC) for transverse tensioning and New Fiber Composite Material for Reinforcing Concrete (NEFMAC) grid reinforcement in the deck. These new materials help to combat the effects of steel reinforcement corrosion, require less maintenance and help provide long-term durability of bridge structures.

The M-50 Bridge Project in Jackson, MI, involved fabrication and installation of twenty load cells for monitoring transverse Carbon Fiber Reinforced Polymer (CFRP) tendons and a data collection method to measure long term post-tensioning forces.



The Pembroke Ave over M-39 Bridge in Southfield, MI, involved monitoring deck strains in the NEFMAC deck grid reinforcement, CFCC transverse post-tensioning forces and mid-span deflections at selected locations. It also required collection of data and posting to a password protected website for near real-time data review.



Geocomp Role & Accomplishments

For the M-50 Bridge, Geocomp designed and fabricated 20 custom built 300-kip electrical resistance load cells, and calibrated and installed the load cells on the 40-mm diameter transverse Carbon Fiber Composite Cable (CFCC) with a switch panel for collection of manual load cell readings by MIDOT personnel.

For the M-39 Bridge, Geocomp designed and installed sensors, data logger and data management system inside an environmentally controlled enclosure to collect long-term real-time data which is posted to Geocomp's *iSiteCentral*[™] internet database system for review and reporting. The bridge deck contains 40 vibrating wire strain gages, 12 transversely mounted post-tensioning load cells and 12 distance laser units underneath the roadway to measure mid-span deflections.