



US-24 BRIDGE REHABILITATION • Dearborn, Michigan

CHALLENGES

- Find a way to reuse existing bridge abutments and foundations
- Reduce lateral earth load on existing abutments

SOLUTIONS

- Innovative use of geogrid and compressible foam wall layer
- Lower cost and much shorter timeframe than full bridge replacement

SERVICES

- Geotechnical investigation
- Geotechnical engineering
- Foundation design
- Construction engineering services

G2 engineers award-winning repair of 1930s-era bridge

Geotechnical engineering and construction-phase engineering assistance by G2 Consulting Group played an important role in a bridge rehabilitation project that won a 2008 national Engineering Excellence Grand Award from the American Council of Engineering Companies (ACEC).

The project repaired a 1930s-era bridge on U.S. Route 24 over the Lower Rouge River in Dearborn, Mich., with extensive substructure cracking and movement.

The bridge abutments and pile foundations had moved laterally due to excess earth load and an inadequate lateral load design. The bridge superstructure – its horizontal beam supports – and deck did a good job resisting the lateral movement at the top, but the vertical timber pile foundation could not resist the lateral earth load at the base of the abutments. As a result, the abutments were failing and had developed full length horizontal cracks. G2 cored the cracks to determine their depth and orientation and the location and size of the reinforcement steel (rebar). The cracks extended all the way through the abutments.

Wade-Trim, the project's lead design engineer, then asked if G2 could find a way to reduce the lateral earth load on existing abutments to within their actual allowable capacity.

G2 developed a reinforced backfill design that reduced soil pressure against the abutment walls by 75 percent, imposing less than the allowable lateral load and allowing rehabilitation and reuse of the bridge abutments and foundations. The design used multiple horizontal layers of geogrid, a web of synthetic polymer-coated fibers, and a compressible foam wall backing layer to reinforce the engineered backfill and reduce the soil load. This was a significantly less expensive option than the typical use of lightweight EPS foam block backfill. With G2's construction engineering assistance, the abutments were repaired, the reinforced backfill was installed and the superstructure and deck were replaced at significantly lower cost than full bridge replacement, and in a much shorter timeframe.

A 33-member judging panel of industry experts and professionals from across the nation analyzed 158 entries and selected the US-24 bridge rehab as one of eight Grand Award winners. The entry, which was submitted by Wade-Trim, first had to win at the state level to qualify. The bridge rehabilitation also won a "Breaking the Mold Award" from the Michigan Construction Quality Partnership.