Determing capacity of Iowa's precast concrete deck bridges

This article is third in a series exploring low-cost bridge replacement alternatives.

Several hundred precast concrete deck bridges, which were built in the mid 1950s, are still in service on Iowa's secondary roads, and many of these are experiencing significant deterioration. Typically that deterioration is in the form of longitudinal cracking at the level of the reinforcement, says Terry Wipf, Iowa State University professor of civil and construction engineering. When deterioration like that is discovered, a load limit needs to be posted on the bridge.

Because of the loss of bond strength due to this deterioration, engineers can't accurately estimate the capacity of a deteriorated precast concrete deck bridge. There aren't any methods for determining the effect of the reduced bond strength on the flexural strength of the bridge. However, Wipf, Wayne Klaiber, an ISU professor of civil engineering, and Ann Sardo, an assistant professor of civil engineering, are conducting research that may provide some answers for this particular type of bridge.

Wipf, Klaiber, and Sardo are currently evaluating the strength of deteriorated precast concrete deck bridges through field and laboratory testing. The ultimate purpose of their research is to determine the capacity of deteriorated bridges in order to a) provide data and/or criteria for rating such bridges and b) investigate methods for strengthening these bridges in order to extend their service lives.

The field testing portion of the project was completed last summer; four different bridges were tested. Diagnostic load testing was completed to determine the bridges' capacities.

After the field testing, several of the precast units from a bridge in Cedar County near Bennett, Iowa, were transported to ISU for laboratory testing. Some of the elements were tested to failure to determine their flexural strength. Four of the precast elements were reassembled and service load tested to learn more about the load distribution in this type of bridge. Currently a post-tensioning strengthening system is being tested on the laboratory bridge.

Once this research project (Iowa Highway Research Board project TR-440) is complete at the end of this year, Technology News will publish the results.