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Fiber Optic Sensor : Monitoring Precast Beams

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FIBER OPTIC SENSOR – MONITORING PRECAST BEAMS

THE NEED

A new bridge over the Rio Puerco river, west of Albuquerque will be the first of its kind in the nation with built-in fiber-optic sensors to monitor stress in the bridge's girders. Known as "smart bridge" technology, the self-monitoring system offers many advantages over methods that rely largely on visual inspections. Fiber-optic sensors can monitor shrinkage, creep and other processes that cause weakening in high-performance concrete structures.

THE TECHNOLOGY

For bridge safety monitoring, the use of fiber-optic sensors can provide information on the effects of stress long before signs of fatigue begin to show visibly, allowing engineers to address potential problems before they become serious and costly. Sensor enables precise strength measurement as the concrete cures, as pieces are trucked to the site and placed and during the first year of use. Data from such systems can be downloaded on-site, which will be the case for the Rio Puerco bridge, or transmitted to a remote location. The monitoring system installed on the I-10 bridge in Las Cruces transmitted data by cellular telephone to computer of Dr. Rola Idriss, principal investigator for this project, on the NMSU campus (see Figure1).



FIGURE 1 I-10 BRIDGE



THE BENEFITS

The data will be immediately useful, from the time the concrete is poured for the girders, as they are transported to the site, during the construction of the bridge, and while it is in service (see Figure2).



FIGURE 2 INSTALLATION

The built-in monitoring system will provide data for assessing the performance of the concrete, which is expected to withstand heavier loads and last longer than ordinary concrete.

STATUS

The Rio Puerco bridge, being built for an Interstate 40 frontage road about 15 miles west of Albuquerque, is the first U.S. bridge to have this type of monitoring system built into the girders. The Rio Puerco bridge monitoring project is being funded by the state Highway and Transportation Department, the Federal Highway Administration and the National Science Foundation. Collaborating on the project is the University of New Mexico, which is involved in testing the high-performance concrete. Installation of the fiber-optic instrumentation and the pouring of concrete for the girders took place in July. The bridge construction is expected to be completed by the end of the year.

BARRIERS

- The price of sensors is expensive
- Careful installation and protection method during construction should be considered.



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REVIEWERS

Peer reviewed as an emerging construction technology

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