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TECHNOLOGY ADAPTABLE TO LOCATING WATER IN POST-TENSIONED BRIDGE TENDONS

BACKGROUND

Every year, millions of dollars are spent nationwide in the rebuilding, repairing, re-engineering, and maintaining of post-tensioned bridges that have had their structural integrity compromised, and in some cases ruined, by bleed-water in the conduits housing their structural strands. The Florida Department of Transportation (FDOT) recently finished an $11,000,000 project to repair the Mid-Bay Bridge in Okaloosa County, and are currently in the midst of a $15,000,000 contract to repair damage done to the state's flagship bridge, the Sunshine Skyway. Both post-tensioned bridges had been severely damaged by bleed-water in the conduits housing their structural strands.

Currently, FDOT spends time and energy checking the condition of individual strands and reacting to troubled strands by searching for bleed-water at its most likely location. The methods used to conduct this type of search, however, are destructive and not as reliable as desired.

OBJECTIVES

The purpose of the research was to determine if technologies exist that can be developed to reliably and non-destructively identify and locate bleed-water water in the conduits of post-tensioned bridge members. Specific objectives included the following:

1. Generate a short list of technologies that have the possibility to locate and identify the problem water.

2. Test the technologies on the list to determine their potential for development.

3. Analyze the data and identify the single technology that holds the most promise for meeting the challenge.

FINDINGS AND CONCLUSIONS

The research team tested four technologies for their potential to provide a non-destructive, accurate, and efficient method for identifying and locating bleed-water. They included ultrasonic sound wave technology, impact echo technology, ground-penetrating radar, and gamma-ray spectroscopy. Researchers performed the tests in three laboratories with the assistance of some of the world's top experts in the tested technologies. Testing and analysis showed that gamma-ray spectroscopy is, by far, the most promising of the candidate technologies.

BENEFITS

The results of this research could be developed into a system able to provide real-time identification and location of bleed-water in existing and newly constructed bridges. A system that is safe, non-destructive, and capable of early detection would enable the Department to remove the bleed-water before it can severely damage affected strands. The cost savings associated with damage prevention resulting from the reduction or elimination of costly repairs and bridge closures is substantial. In addition, the incidental damage resulting from current testing methods, which has the potential to develop into problem areas, would also be eliminated. An inherent and significant benefit of damage prevention is increased safety of structures.

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