Assessment of Infrared Thermography as NDE Method for Investigation of FRP Bridge Decks

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(ABSTRACT)

Statistics released in the fall 1989 showed that 238,357 (41%) of the nation's 577,710 bridges are either structurally deficient or functionally obsolete. New materials, such as fiber reinforced polymeric composites (FRP), are being suggested for use in bridge systems to solve some of the current problems. These materials are thought to be less affected by corrosive environmental conditions than conventional civil engineering materials. Therefore they may require less maintenance and provide longer life spans. More specifically, glass fiber reinforced vinyl ester matrix composites are considered possible replacements for deteriorating conventional bridge decks due to their durability, decreased weight, and relative affordability.

In order to facilitate rapid acceptance of FRP structural components into the world of civil structural engineering, effective and efficient NDE techniques must be explored and documented in these situations.

This thesis will discuss the use of Infrared Thermography (IRT) as a means of detecting debonds and voids caused by conditions encountered both in fabrication and in the field. As forced convective hot air is applied within the bridge deck, debonds between bridge deck components near the riding surface appear cold while imperfections near the bottom of the deck give rise to concentrations of heat. These variations in thermal propagation patterns are observed by the infrared camera and indicate possible structural deficiencies.

Results of experimentation and thermal analyses from laboratory studies of a model bridge deck and some from *in situ* full-scale investigations are presented.