

Public Abstract

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Title:Experimental Assessment of Advanced Thermal Imaging for Detecting Voids in Ducts

The state of the infrastructure in the United States is growing worse every day. Of the over 610,000 recorded bridges, around 23.4% of them need substantial repairs or have become obsolete altogether. In recent years, an increasing number of the bridges needing repairs are called Post Tensioned (PT) Bridges. This type of bridge utilizes better quality steel tendons embedded inside of a grout filled duct, that is placed inside of the bridge. If the grout isn't placed into the duct correctly, air can be trapped inside. Water and chlorides can then make their way into those air pockets. The water and chlorides can cause the steel tendons to corrode, and over time, can reduce the strength of these tendons. If the steel corrodes without detection, it could cause the steel to break. Currently, there are no reliable forms of detecting these air pockets inside of the ducts.

A time based infrared system, called the Infrared Ultra Time Domain (IR-UTD) system, was evaluated to detect these voids using only environmental heating and cooling. This system captures images throughout the day, and then processes them by taking into account the slope of heating and cooling that day.

The results found that the IR-UTD system is somewhat capable of detecting these air voids inside of the ducts, but future work is needed. This research is the first step in finding a safe, cheap and reliable way to detect air pockets in PT ducts by using infrared technology.