FACT SHEET

Investigating Thermal Imaging Technologies and Unmanned Aerial Vehicles to Improve Bridge Inspections

RESEARCH PROJECT TITLE

NETC 20-3: Investigating Thermal Imaging Technologies and Unmanned Aerial Vehicles to Improve Bridge Inspections

STUDY TIMELINE

March 2021 – June 2023

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MORE INFORMATION

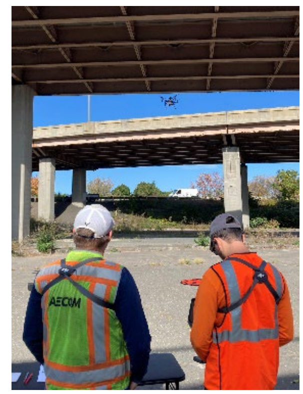
https://www.newenglandtransportationconsortium.org/projects/netc-20-3/

The New England Transportation Consortium, a cooperative effort of the transportation agencies of the six New England States, funded this research. Through the Consortium, the states pool professional, academic and financial resources for transportation research leading to the development of improved methods for dealing with common problems associated with the administration, planning, design, construction, rehabilitation, reconstruction, operation and maintenance of the region's transportation system.

Introduction

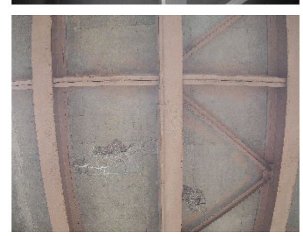
Bridge inspection is central to any transportation facilities maintenance program. One area of concern is concrete delamination along the underside of bridge decks, especially on overpass bridges and bridges that see vehicular, pedestrian, or boat traffic underneath. Thermal imaging and unmanned aerial vehicles (UAV) are two innovative technologies that can be utilized to help improve delamination detection and overall efficiency.

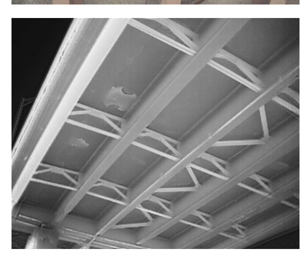
Methodology



The research focused on thermal imaging for concrete delamination detection with the use of drones as a method for data collection. The research included field testing of handheld and drone mounted thermal cameras to determine effectiveness for delamination detection at five bridges in Massachusetts and Rhode Island. Varying approaches for data collection and analysis were utilized at each bridge. The delaminations identified using thermal imagery were compared to those identified through traditional manual soundings. The field testing and results (including accuracy of detection and weather conditions) were the basis of developing guidelines and protocols for the implementation of these technologies.

Conclusion





The research team verified that thermal imaging could detect varying degrees of concrete delamination under the right conditions. Guidelines and protocols for both thermal imaging and UAVs were developed to assist state transportation agencies in efficiently implementing these technologies.

Based on the field testing performed, a minimum of 10°F (for handheld) or 15°F (for drone mounted) temperature swing over a 6-hour period is recommended for concrete delamination detection. Even under ideal conditions, it is possible that not all existing delamination will be detected by thermal imaging.

Experience in interpreting thermal imagery is necessary to accurately identified delaminations. Temperature differentials in thermal imagery caused by delaminations do not always line up with limits as determined by manual sounding. In some cases, the areas shown by the thermal image are small than that identified by manual sounding. Additionally, temperature variations can be caused by a variety of factors that can lead to false positive identification. For this reason, cross checks with visual imagery should be performed whenever possible to reduce the probability of false positives for defects.

What are the Potential Impacts?

The use of these technologies can potentially increase productivity and accuracy of inspections by reducing the amount of time spent sounding concrete and making auditory assessment of the limits of delamination. Additionally, safety is increased for both the traveling public and inspectors by reducing the amount of time and the limits of lane closures required for traffic control and access equipment.