

## Reinforced Concrete Bridge Deck Condition Assessment Methods Using Ground Penetrating Radar and Infrared Thermography

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**Abstract :** Reinforced concrete bridge deck condition assessments primarily use visual inspection methods, where an inspector looks for and records locations of cracks, potholes, efflorescence and other signs of probable deterioration. Sounding is another technique used to diagnose the condition of a bridge deck, however this method listens for damage within the subsurface as the surface is struck with a hammer or chain. Even though extensive procedures are in place for using these inspection techniques, neither one provides the inspector with a comprehensive understanding of the internal condition of a bridge deck – the location where damage originates from. In order to make accurate estimates of repair locations and quantities, in addition to allocating the necessary funding, a total understanding of the deck’s deteriorated state is key. The research presented in this paper collected infrared thermography and ground penetrating radar data from reinforced concrete bridge decks without an asphalt overlay. These decks were of various ages and their condition varied from brand new, to in need of replacement. The goals of this work were to first verify that these nondestructive evaluation methods could identify similar areas of healthy and damaged concrete, and then to see if combining the results of both methods would provide a higher confidence than if the condition assessment was completed using only one method. The results from each method were presented as plan view color contour plots. The results from one of the decks assessed as a part of this research, including these plan view plots, are presented in this paper. Furthermore, in order to answer the interest of transportation agencies throughout the United States, this research developed a step-by-step guide which demonstrates how to collect and assess a bridge deck using these nondestructive evaluation methods. This guide addresses setup procedures on the deck during the day of data collection, system setups and settings for different bridge decks, data post-processing for each method, and data visualization and quantification.

**Keywords :** bridge deck deterioration, ground penetrating radar, infrared thermography, NDT of bridge decks

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