

ACCELERATING CONCRETE BRIDGE DECK EXAMINATIONS

GROUND PENETRATING RADAR INSPECTION OF LARGE INFRASTRUCTURE ASSETS



IMPROVING THE SPEED, COST-EFFICIENCY AND RELIABILITY OF BRIDGE DECK INSPECTIONS.

The MTC has demonstrated the effectiveness of vehicle-mounted Ground Penetrating Radar [GPR] inspections of bridges to examine the integrity of both the asphalt surfacing and underlying concrete deck in a rapid, non-destructive manner that requires no long-term road closures.



We are unleashing excellence through efficiency. This project is a resounding success with meticulous planning and thorough learning on alternative ways of inspecting our assets. Bridge decks don't need to exclusively rely on manual processes and hand-held equipment for a detailed inspection. Vehicle-mounted GPR might well be part of the solution.

Dr. Patricia Silva, Senior Research Engineer; Safety, Engineering and Standards; National Highways



THE CHALLENGE

Bridges represent a critical part of the highways infrastructure and deterioration of these assets is a concern in terms of both public safety and economic burden.

Bridge decks are currently examined by closing the section of highway, stripping the asphalt surface layer and conducting manual testing on the exposed underlying concrete, before re-surfacing and re-opening the highway. This process is slow, manual, costly and can cause significant disruption to road users.

There is a strong desire to identify an alternative approach that is fast, quantitative and does not require extensive closures as a result of stripping road surfaces.

MTC'S SOLUTION

- ▶ The MTC has demonstrated how Ground Penetrating Radar [GPR] technology can be used to transform the current approach to bridge deck maintenance.
- ▶ A vehicle-mounted GPR array system was used to rapidly scan a bridge asset that was planned to undergo a full conventional intrusive bridge deck examination that would enable validation of the results.
- ▶ By using both commercial software and bespoke analysis, a large variety of insights and visualisations were generated that provided a comprehensive understanding into the bridge structure and indications of potential defects.

THE OUTCOME

- ▶ The inspection solution was able to accurately map sub-surface structural features such as rebar, post-tensioning cable ducts and voiding barrels.
- ▶ The system was also able to identify regions of rebar degradation that correlated well with regions of spalling and delamination subsequently identified by a full, intrusive principle examination of the bridge deck.
- ▶ Insight into the road surfacing was also gained such as mapping surface deterioration (cracking and potholes), surfacing thickness mapping as well as assessing the asphalt-concrete deck interface that could indicate regions of water ingress.

BENEFITS TO THE CLIENT

- ▶ The inspection approach demonstrated was completely non-destructive and a short cycle time (<45 minutes for an 80 m bridge) and it was clear that inspection through the asphalt road surfacing had minimal impact on the capabilities of GPR.
- ▶ This means that road surfacing stripping is not required for this technology which removes significant costs and disruption to road users.
- ▶ Importantly, the results obtained will allow for better cost certainty for bridge maintenance activities, allow for targeting of intrusive examinations and obtain a digital mapping of assets for improve data traceability.

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