A comparative study of bridge deck condition assessment by high frequency GPR antennas

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DELAMINATED DECK AND CHAIN DRAG
DECK DELAMINATION
Infrastructure Condition Monitoring Program

Good

Bad

ICMP

8
Air Launched: **Fast Overview**

ICMP
Ground Coupled: **Detailed Imaging**
Bridges of Warren County
Municipal Drive Bridge
Church Street Bridge
Infrastructure Condition Monitoring Program

Church Street Bridge
Infrastructure Condition Monitoring Program

ICMP
Municipal Drive Bridge

* West Bound Not Tested
Red Lines Indicate Completed Impact Echo Tests
DATA PROCESSING

• RADAN and Bridge Assessment Module

• Combine 2-D GPR files into a single 3-D file

• Create a deterioration map

  1. time-zero correction, migration, and rebar reflection mapping
  2. interactive interpretation
  3. contour map of the deterioration data

ICMP
Raw data for 1.5 GHz antenna (a) and 2.6 GHz antenna (b) at 24 scans/foot
Processed data and rebar picking

1.5

2.6

ICMP
Processed data and rebar picking for 2.0 GHz air launched antenna at 24 scans/foot
Church Street Bridge

[Color-coded diagrams showing measurements along x and y axes.]
Impact Echo

**Good (Intact) Condition**

Impact Source \(\rightarrow\) Receiver

**Fair Condition**

Impact Source \(\rightarrow\) Receiver

**Poor Condition**

Impact Source \(\rightarrow\) Receiver

**Serious Condition**

Impact Source \(\rightarrow\) Receiver

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**Normalized Amplitude vs. Frequency**

- **Rt.287 - 2360 - Good**
- **Rt.287 - 2546 - Fair**
- **Rt.287 - 2550 - Poor**
- **Rt.287 - 2594 - Serious**
Summary and Conclusions:

- Evaluate 2.6 GHz ground coupled antenna on bare concrete decks
- comparison with existing high frequency 1.5 GHz ground coupled and 2.0 GHz air coupled antennas
- 2.6 GHz provides significantly more detail compared to the 1.5 GHz
- strong scatter from the aggregate in the concrete above the rebar level becomes clearly visible.
Summary and Conclusions (cont’d):

- The immediate benefit is higher confidence in the results
- IE points to similarities
- IE points to differences
- Disadvantages of lower resolution of images from the air coupled antenna are compensated by the capability to conduct surveys of bridge decks at highway speeds.
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