

# Identifying wetting areas of a concrete deck slab by time-lapse surveys using ground-penetrating radar

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Concrete deck slabs of bridges are damaged by moisture and wheel loads and they are sometimes rapidly deteriorated. The rapid deterioration sometimes progresses under repaired areas with overlaid asphalt. We cannot sometimes identify the deteriorated area from the surface by visual judgements. Therefore, non-destructive survey methods are desired to be developed. Ground-penetrating radar (GPR), which has a fine quality of resolution, is one of promising techniques. However, the standard way to identify deteriorated areas from anomalous areas on GPR sections frequently mistakes the deteriorated areas, because the phase shift of GPR reflection waves is influenced by many causes, moisture, a thickness of pavement, material types of pavement, undulation, and so on. Thus, we propose a new way to identify different areas using time-lapse surveys. Rapid deterioration of concrete deck slabs has an influence of moisture. Water content of a concrete slab will fluctuate. We can identify different areas to analyze records acquired between in dry season and after raining. This report first shows a result of an infiltration region estimated by two records, which were acquired before and after pouring water on a concrete slab model. Second, we show a survey result of an infiltration region of bridge slab in service. We could estimate an infiltration region using time-lapse records and shows a result compared to a deteriorated area determined by excavation. In this results, time-lapse method can clearly identify regions of changing water content. However, high degrees of accuracy for survey positions are required to apply subtraction analysis.

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