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Field Investigation for Deck Slab Deterioration of In-Service Bridges in Korea

WooSeok Kim[1], Chan Jeoung[1], Yoseok Jeong[1], Ilkeun Lee[2]
[1]Chungnam National University
99 Dakhak-ro, Yusung-gu, Daejeon, Republic of Korea
wooseok@cnu.ac.kr; tony0946@hanmail.net; yoseoksi@gmail.com
[2]Expressway & Transportation Research Institute
208-96 Dongbudaero922-gil, Hwaseong, Gyeonggi-do, Republic of Korea
lik@ex.co.kr

Extended Abstract

This study intends to investigate deck slabs of in-service bridges in Korea and determine most influencial parameters of exposed environments. Bridge deck slabs are crucial structural members directly supporting traffic loads and thus deteriorate earlier than other structural members. Thus, frequent maintenance plan is required for bridge deck slab and in fact many agencies spend most of their maintenance budget to repair and rehabilitate the bridge deck slabs.

In this study, 747 bridges were randomly selected to represent cold and moderate temperature region. The selected bridges have 6 to 44 years of service age with an average and median of 17.4 and 14.0 years, respectively. To investigate the damage of bridge deck slab, GPR (Ground Penetration Radar) system mounted on a vehicle and travelling at 80 km/h was used. Deck slab damages were estimated through permittivity of deck slabs by radiating an electromagnetic pulse and measuring the rebounded pulse magnitude and timing.

Based on the collected GPR data, damage ratio was determined based on Korea Expressway Manual [1] and compared to eight key parameters: (1) annual average snowfall days; (2) annual average snowfall; (3) annual average number of freeze-thaw days; (4) annual average winter temperature; (5) altitude; (6) service age; (7) quantity of deicing chemical usage; and (8) equivalent traffic volume. Correlation for each parameter was determined to establish the influence of each parameter to deck slab deterioration and service age, number of freeze-thaw days and deicing chemical usage exhibited the highest correlations. Some studies reported traffic volume has a significant influence on bridge deck slab damage [2], but in this study traffic volume did not exhibit strong correlation. This was because the service ages of sampled bridges were young and traffic load tends to accelerate damages if initial damages exist [3]. To better predict of deck slab deterioration, mean and standard deviation was computed for collected data at each age, and was modelled using a normal distribution to represent uncertainties in deck slab deterioration. This study finally developed a deck slab deterioration chart along with service age. This chart can be used for bridge maintenance and budget planning.

References

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