Assessment of damage to concrete girder-slab bridges in Saudi Arabia

Al-Mandil, M.Y., Ziraba, Y.N.

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Abstract: A number of recently built concrete girder-slab bridges in Saudi Arabia have been suffering from structural distress to the deck slabs. This distress is mostly characterized by the formation of grid-patterned cracks to the soffit side of these decks. In several decks, these cracks have progressed and nucleated and eventually led to the formation of localized failures in the form of potholes, thus rendering these bridges out of service. This paper presents a typical case study of a concrete girder-slab bridge deck suffering from such localized failure. The study shows that although this deck has been adequately designed to meet the loadings imposed by the AASHTO HS-20-44 + 10% design vehicle, some of the current overweight vehicles can induce high flexural stresses, leading to the formation of severe longitudinal and transverse cracks. Propagation of these cracks into a grid pattern can reduce the punching shear capacity of the deck slab, thus paving the way for a punching shear type of failure. The case study is concluded by a hypothesized mechanism for the formation of potholes in bridge decks