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Resilience-Enhancement of Bridge Infrastructure in Changing Climate

Husham Almansour, Ph.D., P.Eng,
Senior Research Officer
Sustainable Resilient Infrastructures and Communities (SRIC),
Construction Research Centre,
National Research Council Canada,

Abstract

Global changes in temperature, precipitation, and wind patterns threaten the integrity and functionality of existing highway bridges. The expected upsurge in climate change can accelerate material and structural degradation and induce additional stresses that increase the risk of failure of critical components of existing bridges. As a result of climate change, growing rates of chloride ingress into concrete and rising rates of reinforcing steel corrosion are expected. Extreme levels and high variations of temperatures can seriously affect bridges' performance. The increase in climate loads and frequency of extreme weather events can impact the safety and serviceability of bridges and the recovery time after major storms. Infrastructure owners will decide the recovery plan and the required capacity after extreme weather events based on the bridge's importance to the transportation network. The recovery time is affected by the level of damage the bridge experiences, the required performance of the bridge after an extreme event, and the rehabilitation or reconstruction approach. Based on the bridge's significance and the required load capacity, different performance levels will be discussed as targets of the performance recovery plan of the most popular bridges,. The recovery speed presents the effectiveness of the bridge's resilience. Key cost-effective resiliency-enhancement approaches will be presented; for instance, accelerated bridge construction would provide the highest possible recovery time versus the classical in-site construction approach.