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16. ABSTRACT This study developed a procedure to identify concrete bridge decks that are exhibiting the characteristics associated with falling concrete. Field exploratory work on reinforced concrete bridge decks was supported by analytical and laboratory investigations. The field work included visual inspection, non-destructive tests, and sampling of full-depth cores and powder samples from the bottom of the bridge deck. Chief variables assessed were the chance of corrosion by the half-cell potential, chloride content at the location of the bottom reinforcement, and the concrete pH level. The chloride diffusivity was estimated from the chloride profile. The laboratory investigation was performed on bridge deck beams. The beams were constructed from concrete containing chloride levels known to cause corrosion as well as from a control concrete. Beams were subjected to freeze-thaw or saltwater followed by repeated loading to simulate field conditions. The following characteristics were quantified: chance of corrosion, corrosion rate, chloride content, flexural response as a function of environmental exposure and repeated loads, and ultimate strength. The size of the porous zone around the reinforcement was determined using an environmental scanning electron microscope. Finally, a strategy was developed to assess if a bridge deck exhibited the characteristics associated with falling concrete. The strategy included visual inspection of cracking and spalling, assessment of chance of corrosion, chloride content, and pH levels. If any of these measures exceed critical levels a service life calculation needs to be performed. Based on existing mathematical models, the time to corrosion initiation and time to corrosion cracking can be predicted. The resulting time is then compared to the age of the bridge. From this information proper planning for future repair needs can be made.			
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