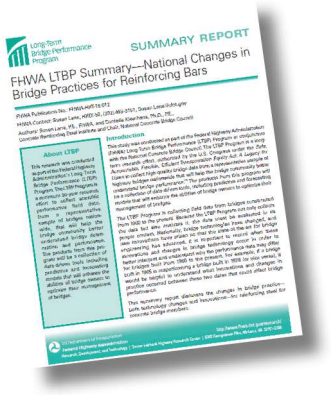
FHWA Publishes Reinforcing Steel Practice Timeline

by Dr. Danielle D. Kleinhans, Epoxy Interest Group of the Concrete Reinforcing Steel Institute



The effort to create the reinforcing steel practice timeline was conducted as part of the Federal Highway Administration's (FHWA) Long-Term Bridge Performance (LTBP) Program. The LTBP Program is a minimum 20-year research effort to collect scientific performance field data from a representative sample of bridges nationwide that will help the bridge community better understand bridge deterioration and performance. The products from this program will be a collection of data-driven tools including predictive and forecasting models that will enhance the abilities of bridge owners to optimize their management.

The first of the material timelines, titled "FHWA LTBP Summary—National Changes in Bridge Practices for Reinforcing Bars," has been published and outlines the changes in reinforcing steel practice and specifications from 1910 through 2015. Further summaries on cement and concrete additive materials have been proposed.

The FHWA and their contractors for the LTBP Program continue studying and collecting field data from bridges constructed since 1960. Comparisons between the bridges will be made from the data. However, all involved recognize that technology has changed significantly over the past 50+ years, in particular, the materials that are used for bridge construction. The FHWA reached out to industry, specifically the National Concrete Bridge Council (NCBC), to better understand important developments in various steel-reinforced concrete bridge materials.

The Need for Corrosion Protection

Bridges in much of the United States are subjected to deicing chemicals during the winter months, and bridges located in a marine environment are subjected to seawater. Many deicing chemicals contain chloride ions. As snow and ice melt, water carries these chloride ions down into the pores of the concrete surface. When present in sufficient concentrations, chloride ions cause the reinforcing steel to rust and corrode. Rust causes the reinforcing steel to exfoliate, causing stress within the hardened concrete. As the rust expands, it cracks the concrete, and a spall can develop adjacent to the corroded steel reinforcement.

Specialty reinforcing bars were developed to address issues related to corrosion or to provide increased tensile strength. The types of specialty-reinforcing bars include epoxy-coated, galvanized, dual-coated, low carbon-chromium, and stainless steel. The timeline calls out the development dates of U.S. reinforcing bar specifications published through ASTM International and the American Association of State Highway and Transportation Officials (AASHTO). Reference is also made to several improvements to quality initiated by industry within the epoxy-coated reinforcement specifications.

The "FHWA LTBP Summary—National Changes in Bridge Practices for Reinforcing Bars" can be found on FHWA's website at: https://www.fhwa.dot.gov/publications/research/infrastructure/structures/ltbp/16012/index.cfm.

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1989	ASTM revised standard A775/A775M in the following ways[20,53]: • Changed the damage threshold value of the total surface area in each 1-ft length of bar from 2 to 1 percent. • Introduced an "anchor profile," which is a measure of surface roughness after blast cleaning and prior to coating. Measures for anchor profile include maximum peak height and exposed surface.
1990	ASTM revised standard A775/A775M to include a provision that states that all damage to the epoxy coating incurred prior to the shipment of rebars to the job site must be repaired.[21,52,53] FHWA issued a memorandum on certification programs that encouraged owner agencies to require certification of producers involved in federally funded projects and specifically named the CRSI's upcoming Epoxy Coating Applicator Plant Certification Program.[22]
1991	CRSI began a voluntary certification program for epoxy-coating applicator plants.[52]

Example Timeline Entries.