Insights for Creep and Shrinkage Models from Bridge Deflections

Mija Hubler

Northwestern University, USA

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Recent deflection data collected from many large-span bridges around the world confirm that the B3 model still has the theoretically most correct form and gives the most realistic shapes of creep and shrinkage curves. However, these bridge deflection data also resulted to a wake-up call: 56 large-span prestressed concrete segmentally erected box girders have already been found to exhibit excessive long-time deflections. The terminal trend of the bridge deflection is systematically similar to the shape of long-term creep. Since the B3 model is mechanism based, it has the advantage that its terminal trend can be separately controlled. Thus, an update of this model which gives the same mean terminal trend as the 56 bridges is presented. In order to fully correct the observed underestimation of long-term creep much more data must be analyzed. A new world-wide Northwestern laboratory creep and shrinkage database, which greatly expands the previous RILEM database has been collected for this purpose. The ranges of the input composition and environmental parameters are expanded to include newer cements that contain admixtures and reach higher strengths. By incorporating mechanisms associated with autogeneous shrinkage and drying which are more prevalent in newer cements an updated model for creep and shrinkage becomes feasible.

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