Bridge Structures 7 (2011) 123–124
DOI:10.3233/BRS-2012-032
IOS Press

Editorial

Construction stages of a cable-stayed bridge are characterized by a sequence in which geometric configurations, restraints and consequently stress and strain patterns vary throughout the construction process. When construction of concrete bridges is made by cantilever method the influence of time-dependent phenomena becomes significant. In their study of "The influence of time-dependent phenomena in segmental construction of concrete cable-stayed bridges", Arici et al. examine an evaluation of the stay stressing procedures by accounting for creep and shrinkage in cantilever construction of concrete cable-stayed bridges. The authors propose a methodology for stay stressing with the aim of reaching the desired geometric configuration and perform a comparison with classical analyses performed by backward methodology. The paper presents suggestions to designers, in order to minimize time-dependent effects on deck and stay internal forces and to reach an optimal final configuration. Empirical design methods of bridge decks have been adopted by many highway agencies due to the economic benefit of less reinforcement requirements. However, uncharacteristic cracking patterns appeared on several bridges that were designed based on the empirical deck design methods. The most significant cracks identified on those newly constructed bridges are longitudinal cracks that run in full depth of the concrete deck and proliferate through the entire length of the bridge deck from one abutment to the other. These cracks are open of relatively uniform width and confined to the proximity of the interior girders locations. In "Monitoring of longitudinal cracks in an empirically designed reinforced concrete bridge deck", William et al. present a case study of sensor instrumentation of the deck of Star City Bridge in West Virginia, USA. The opening of the longitudinal cracks was correlated to the lateral bending of the steel girders, which adversely affect their flexural capacity as well as the axial stresses in the transverse steel rebar and diaphragm members. The paper concludes that presence of deck cracking causes shear stress in the reinforcing rebars as the load is transferred across the crack. This necessitates the development of a fatigue criteria for the steel rebars under the effect of cyclic shear loading that could be used to predict the remaining service life or to prioritize required maintenance actions. Skewed bridges are often encountered in highway design when the geometry cannot accommodate straight bridges. Highway bridges are characterized by the angle formed with axis of the crossed highway. The skew angle can be defined as the angle between a line normal to the centerline of a bridge and the centerline of abutment or pier cap. A common type of highway bridge superstructure is the concrete slab placed on steel girders. The structural analysis of these bridges can be complicated due to the geometry, boundary conditions and loading combinations. Bou Diab et al. discuss the "Influence of skew angle on live load moments in steel girder bridges" through a parametric study evaluating the effect of skew angle on the wheel load distribution in steel girder highway bridges. The authors used the finite element method to investigate the effect of various parameters such as the span length, girder spacing, and skew angle, on simply supported, one-span, two-lane, three-lane and four-lane steel girder bridges. A total of 270 bridge cases were analyzed and subjected to AASHTO HS20 design trucks positioned on each bridge to produce maximum bending in the interior steel girders. A combination of five typical span lengths, three girder spacing, and six skew angles were used in evaluating bending moments in skewed steel girder bridges. The finite element results were used to calculate the maximum bending moment in steel girders due to the various skew angles and compared to the reference straight bridges, and then compared to the reduction factors used in AASHTO LRFD Bridge Design Specifications. An increasing number of bridge failures or near failures in the past several decades has highlighted the deteriorating condition of the bridge structures all over the world and the need for new and advanced management and monitoring techniques. Traditionally, bridge health in the United States has been monitored by visual inspections according to the National Bridge Inspection Standards (NBIS). Load ratings are calculated based on the results of inspection condition ratings. Load ratings are an objective measure of bridge health but are calculated based on the results of a subjective bridge inspection via visual observations. An "initial inspection" is conducted immediately following construction completion to establish a baseline for future inspections. Following the initial inspection, "routine inspections" take place at least every 24 months, with "special inspections" to investigate any anomalies in the structure. These inspections are standardized for each state; however the inspection process is subjective because each inspector uses a combination of inspection guidelines, engineering judgment and own expertise to assess each bridge component. The value of the inspection is also limited by access to each structural element, including complex connections and bridge decks with stay-in-place forms. The visual-based nature of current assessment programs, in conjunction with the collective deterioration of bridge infrastructure, has led to the realization that a more long-term, systems-based objective approach needs to be applied to bridge management. In "Bridge design verification and structural condition assessment through digital image correlation and structural modeling", Peddle et al. employ digital image correlation (DIC) as an alternative to traditional bridge response measurement instruments such as strain gages or linear variable differential transformers, commonly referred to as LVDTs. DIC is an optical measurement technique that has the ability to capture displacement data in both two and three dimensions through high-resolution digital photography. The paper presents results from field data that used DIC to collect deflection on two bridges; a newly constructed three span continuous steel girder bridge and a short concrete slab culvert with fiber reinforced polymer reinforcement retrofit.

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