ENHANCED SYNERGIC IDENTIFICATION OF PRESTRESS FORCE AND MOVING FORCE IN PRESTRESSED CONCRETE BRIDGES

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Abstract

The estimation and monitoring of the in-service load carrying capacity of prestressed concrete bridge (PCB) structures hold significant importance, especially due to prestress losses occurring with their aging. Therefore, it becomes crucial to develop an effective methodology that requires fewer measurements, enabling the estimation of existing prestress force (PF) and moving force (MF) without relying on detailed knowledge of vehicle characteristics and the prestress bridge-vehicle interaction system. This study proposes an improved methodology for identifying PF and MF synergistically. This approach incorporates displacement measurements and integrates a load shape function (LSF) approach alongside the virtual distortion method. The identification process is improved by adopting a truncation coefficient for LSF, which eliminates ineffective elements and enhances reliability. The proposed improvement technique demonstrates commendable accuracy and facilitates timely maintenance of PCBs. As a result of adopting this approach, engineers and practitioners can assess and monitor the load carrying capacity of PCBs. Consequently, these essential transportation infrastructures can be ensured to be safe and durable for the foreseeable future.

Keywords: Prestressed Concrete Bridges, Moving Force Identification, Prestress Force Identification, Load Shape Function, Truncated Load Shape Function, Load Carrying Capacity