A multi-level structural assessment strategy for analysis of RC bridge deck slabs

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Abstract

A multi-level structural assessment strategy for evaluation of response and load carrying capacity of reinforced concrete bridges deck slabs are presented [1]. The strategy is based on the principle of successively improved analysis methods in structural assessment. It provides a structured approach to the use of simplified as well as advanced non-linear finite element analysis methods. The proposed methods were used for analysis of previously tested slabs subjected to bending and shear type of failures. As expected, the advanced methods gave an improved understanding of the structural response and were capable of demonstrating higher, yet conservative, predictions of the load-carrying capacity. The proposed strategy clearly provides the engineering community a framework for using successively improved structural analysis methods for enhanced assessment in a straightforward manner.

Keywords: Multi-level assessment; reinforced concrete slabs; non-linear finite-element analysis; load-carrying capacity; bending failure; shear-type failure.

1 Introduction

It is of high importance to have accurate methods for assessment of load-carrying capacity and mechanical response for bridges, buildings and other structures. The existing infrastructure and built environment represent approximately 50% of the national wealth in most European countries, and the maintenance and repair of these structures constitute around 50% of the expenditure in the construction industry, Long *et al.* [2]. Furthermore, there is an increased demand for greater load-carrying capacities and reassessment of transport infrastructure. For bridges, the bridge deck slabs are among the most exposed parts and are often critical for the load-carrying capacity.

In the assessment of existing structures, it is often economic to use more accurate and detailed calculation models to better detect the real load-carrying capacities, than what is motivated in the design of new structures, [3]. With non-linear finite element (FE) analysis, the structural response for a given set of actions can be simulated realistically. For reinforced concrete (RC) structures, the influence of concrete cracking and crushing, reinforcement yielding and the

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