



Fatigue sensibility of R/C secondary elements of bridges

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Summary

The influence of fatigue may be an important but not usually contemplated aspect on the behaviour of some components of concrete structures. Here a study on the bridge approach slabs is presented. It is shown how the cyclic load causes a progressive deterioration of the compression zone of concrete and its contribution in the tensile chord between cracks. The increase of deflections and crack widths along the fatigue life is observed experimentally, under maximum and minimum loads. The growth of the remnant values of these variables evidences the important irreversibility of the fatigue degradation.

Keywords: fatigue; reinforced concrete; bridge approach slabs

1. Introduction

Design of structures subjected to traffic load is made being kind to all possible incidents capable to occur during the service life. The sensibility to repeated and maintained loads is considered in the codes of practice by means of simplifications, commonly by the limit state method, which produces successful results in the global structural analysis.

In spite of this, some uncertainties remain in the fatigue requirements, especially in secondary components designed following good practice rules. Some detailed approaches have been carried out aimed to different structural members as bridge deck slabs [1,2] or joints between decks [3,4]. Studies developed in the Laboratory of Structures at the Universidad Politécnica de Madrid have shown the important role played by fatigue of concrete in the structural behaviour of the bridge approach slabs.

2. The bridge approach slabs: fatigue sensibility

Bridge approach slabs provide a gradual transition between the structure and the embankment area in road bridges. A relevant role is assigned to this component towards a comfortable traffic. Despite of this, the slabs are not usually calculated, but built following practical guidelines or handbooks [5,6]. Moreover, reality shows that transitions are the weakest zone of many road structures from the comfort point of view.

A complete study on the real structural behaviour of the approach slabs must consider all the aspects affecting their response. Traffic analysis [7] have indicated the important incidence of the heaviest vehicles in the traffic composition (the type 3 vehicle of the EC-1[8], see Fig. 1). An additional consideration is the dynamic amplification of the static load (a global dynamic factor of 1.615 has been pointed out in [9]).