

Methodologies for Stability Assessment of Existing and Newly Designed Reinforced Concrete Bridges

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Abstract : Evaluation of stability is very important in the process of definition of optimal structural measures for maintenance of bridge structures and their strengthening. To define optimal measures for their repair and strengthening, it is necessary to evaluate their static and seismic stability. Presented in this paper are methodologies for evaluation of the seismic stability of existing reinforced concrete bridges designed without consideration of seismic effects and checking of structural justification of newly designed bridge structures. All bridges are located in the territory of the Republic of North Macedonia. A total of 26 existing bridges of different structural systems have been analyzed. Visual inspection has been carried out for all bridges, along with the definition of three main damage categories according to which structures have been categorized in respect to the need for their repair and strengthening. Investigations involving testing the quality of the built-in materials have been carried out, and dynamic tests pointing to the dynamic characteristics of the structures have been conducted by use of non-destructive methods of ambient vibration measurements. The conclusions drawn from the performed measurements and tests have been used for the development of accurate mathematical models that have been analyzed for static and dynamic loads. Based on the geometrical characteristics of the cross-sections and the physical characteristics of the built-in materials, interaction diagrams have been constructed. These diagrams along with the obtained section quantities under seismic effects, have been used to obtain the bearing capacity of the cross-sections. The results obtained from the conducted analyses point to the need for the repair of certain structural parts of the bridge structures. They indicate that the stability of the superstructure elements is not critical during a seismic effect, unlike the elements of the sub-structure, whose strengthening is necessary.

Keywords : existing bridges, newly designed bridges, reinforced concrete bridges, stability assessment

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