TRACK- STRUCTURE INTERACTION IN LONG RAILWAY BRIDGES

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ABSTRACT

The concept design for long railway bridges shall take into consideration the need to balance imposed deformations of the deck, due to thermal effects, shrinkage and creep in concrete and composite structures and induced stress effects in the rails.

The need to reduce the number of rail expansion devices requires moderate lengths of continuous superstructures and so the introduction of expansion joints in the deck.

In seismic zones, the concept design of the bridge shall balance the advantage of short continuous lengths of the superstructure, to reduce track-structure interaction effects, with the inconvenient of transferring the seismic forces to a limited number of piers. Of course, the use of seismic devices to dissipate energy, reducing the seismic actions on piers and foundations, is nowadays a usual solution to overcome these difficulties.

The bridge design shall take into consideration a variety of other variable actions inducing stresses in the rails due to longitudinal displacements, namely associated to braking forces and vertical actions. Due to the continuity of the rails on the structural expansion joints, the deformations of the deck induce stresses in the rails that need to be checked. The main design criteria are now specified in Eurocode 1 – Part 2.

The concept design for two long railway bridges, located in seismic zones, is discussed in the present paper. Prestressed concrete and steel-concrete composite superstructures are considered.

To check track-structure interaction, a numerical model based on EC1-Part 2 and UIC 774-3 was developed and results are presented for one of these viaducts.