CALCULATION OF THE PAVEMENTS ON STEEL BRIDGES TO THE ORTHOTROPIC DECK

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ABSTRACT

The calculation of the pavements on steel bridges is not an easy problem. In fact a simplified calculation method has not yet been well defined and for this reason a finite element approach of the complex system pavement-bridge and an appropriate calculation software are needed.

Truly, an author of this paper has already provided a contribution for the design of these pavements, by means of FEM models of whole systems (pavements-bridges), a simplified method for the pavements on concrete bridges and its operating limits has been developed. This method can be identified with a calculation based on the elastic multilayer theory - represented by the layers of the pavement and of the waterproofing - spread over a rigid half-space (concrete bridge deck).

Unfortunately the steel bridges have a more complicated shape if compared with the concrete bridges because the steel deck is supported by a lot of trapezoidal stringers, aligned in the direction of travel, and by "⊥" cross girders and because there are cross braces and reticular diaphragms. Furthermore, they have longer spans and the main girders, joined below to the cross braces and upper to the orthotropic deck, are higher. Besides for the high deformability of the waterproofing and of the asphalt pavement a closer mesh, if compared with that can be used for other materials such as the concrete and the steel, is needed in a finite element analysis; in order to have an good estimate of the values of the stresses and of the strains in the pavement.

Therefore the finite element approach of the whole model (pavement-steel bridge) involves to be set up a big mesh, with many nodes and elements, and so powerful computers and long calculation times are needed.

Aim of this paper is to provide a contribution to individuate a simple structural scheme for the calculation of the pavements on steel bridges.

To this purpose a specific steel bridge, having spans > 135m, has been studied and a simple and suitable structural scheme for the calculation of the pavement has been individuated. This structural solution consists in a longitudinal continue beam, having an appropriate width, and represented by the pavement, the waterproofing, the deck and the trapezoidal shaped stringers, these latter simple supported by the cross girders. To solve this simplified model a finite element mesh has been set up.