Analysis and shape optimization of variable thickness box girder bridges in curved platform

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ABSTRACT

This paper deals with the development of reliable and efficient computational tools to analyze and find optimum shapes of box girder bridges in curved platform in which the strain energy or the weight of the structure is minimized subject to certain constrains. The finite strip method is used to determine the stresses and displacements based on Mindlin-Reissner shell theory. An automated analysis and optimization procedure is adopted which integrates finite strip analysis, parametric cubic spline geometry definition, automatic mesh generation, sensitivity analysis and mathematical programming methods. It is concluded that the finite strip method offers an accurate and inexpensive tool for the optimization of box girder bridges having regular prismatic-type geometry with diaphragm ends and in curved platform.

KEYWORDS

Box girder bridges, shape optimization, finite strip analysis, Mindlin-Reissner shell theory, strain energy.