EngOpt2018 - 6th International Conference on Engineering Optimization
Instituto Superior Técnico, Lisbon Portugal • 17-19 September, 2018
Editors: H.C. Rodrigues, J. Herskovits, C.M. Mota Soares, et al.

Abstract ID 1026

RELIABILITY-BASED DESIGN OPTIMIZATION OF WARPING INCLUDED CURVED ON PLANE BEAM WITH CHAIN HOIST LOAD

Mariusz Pońśki, Andrzej Sluzalec

Czestochowa University of Technology, Poland
mponski@bud.pcz.czest.pl, sluzalec@bud.pcz.czest.pl

Keywords: reliability,warping,optimization,genetic algorithm

Abstract: The paper presents reliability-based design optimization of curved on plane I-section beam with chain hoist load. This type of structures is one of the most common in industrial buildings. In case of such an element stiffness against warping, which depends on the lateral bending resistance of the flanges plays important role and have to be included in analysis. Such an analysis is made incorporating Vlasov beam theory and large displacement formulation (second order theory). Material parameters such as axial stiffness, flexural and torsional rigidity, transverse shear stiffness and warping stiffness are assumed as random, as well as chain hoist load. Two approaches of uncertainty quantification are considered. First, a standard way, in which parameters are modeled as random variables with log-normal distribution and second, in which parameters are modeled as Gaussian random fields. Second approach can be used when length varying properties are considered. Two-stages reliability-based design optimization method is used. To compute the probability of failure reliability index method with Hasofer-Lind index is adopted. Design point is computed with Abdo-Rackwitz-Fiessler algorithm. Constrained optimization problem is solved using Genetic Algorithm.