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DYNAMICS OF THIN-WALLED COMPOSITE BEAMS WITH RANDOM FIELDS IN THE HYGRO- THERMAL CONSTITUTIVE COMPONENTS

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Abstract. In this paper we analyze the dynamic behavior of thin walled composite beams (TWCB) considering hygroscopic and thermal effects in the constitutive equations. A model of shear deformable TWCB is employed as the basis for deterministic calculation that are carried out in the context of the finite element method. The deterministic model incorporates the effect of hygro-thermal stresses and strains in the classical way however considering them as uncertain due to the randomness associated to the material of the matrix (in the absorption of humidity) while the composite beam is constructed. The variability of the stiffness and mass properties of the composite beam is assumed as random field taking into account the elastic coupling between bending, twisting, shear and axial motions together with the hygroscopic effect.

The probabilistic model is constructed appealing to the Maximum Entropy Principle in order to derive the probability density functions, according to increasing levels of entropy (i.e. with less number of constraints or less information).

The analysis is performed in the frequency domain by comparing the probabilistic models with different levels of information (i.e., given the mean and/or the bounds, etc.) with previously developed probabilistic approaches such as the ones with parametric uncertainty.

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