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A new model for thin plates with rapidly varying thickness. (English) Zbl 0532.73055

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Summary: We study the bending of a thin plate with rapidly varying thickness, for example one with rib-like stiffeners or perforated by small holes. We obtain a fourth-order equation for the midplane displacement, using an asymptotic analysis based on three-dimensional linear elasticity. The coefficients of this equation represent the constitutive law relating bending moments to midplane curvature; they are explicitly determined by the plate geometry. Our analysis distinguishes between three different cases, in which the thickness varies on a length scale longer than, on the order of, or shorter than the mean thickness.

MSC:

74K20 Plates

Keywords:

bending of thin plate; thickness varies on length scale longer than, on order of, or shorter than mean thickness; rapidly varying thickness; rib- like stiffeners; perforated by small holes; fourth-order equation; midplane displacement; asymptotic analysis; three-dimensional linear elasticity; coefficients; constitutive law relating bending moments to midplane curvature; determined by the plate geometry

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