# Influence of transverse normal strain on finite, simply supported isotropic and orthotropic plates

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## Abstract

A theory which takes into account the influence of transverse normal strain on the bending of isotropic and anisotropic plates was recently formulated and applied to plates in cylindrical bending [4,9].

The work presented in this thesis includes an extension and application of the refined theory to isotropic beams as well as application to finite isotropic plates. The salient features of the work include: (a) establishment of the fact that the refined theory when applied to plates is of sixth order in bending and fourth order in a general plane problem, yielding a combined tenth order problem, and (b) the nature of the boundary conditions. The boundary conditions are specified in the exact sense and in the average sense, both in terms of stress resultants and displacement resultants.

The tenth order plate problem is solved for a plate simply supported and described as simply-fixed by Ambartsumyan, i.e., a plate that does not allow rotations parallel to supported edges. In addition, several cases of beam problems are also looked at. Comparisons are made to shear deformation theories of plates and beams and to exact solutions whenever available.

As anticipated, the influence of transverse normal strain on isotropic beams and plates is not significant. However, this influence may be more pronounced in anisotropic media and the solution technique presented for the isotropic case may be extended to include anisotropic materials.