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EFFECTS OF ANGULAR DISCONTINUITIES IN A QUASI-CYLINDRICAL SHELL

Summary

The present study is a part of an ample investigation on the stress field in the neighborhood of angle discontinuities (ridges and furrows) in a quasi-cylindrical shell. The structure under examination is an asymmetric vessel formed by two cylindrical shells with parallel axes and an intermediate conical frustrum. To achieve more general results both cylindrical shells are considered as infinitely long.

Previous analysis (*P. Cicala,* Calculation of an asymmetric vessel by parametric expansions, *AIMETA Res. Rep. No. 3*) *has shown that in the main loading situations (internal pressure, overall bending, axial load) the simple membrane stress configuration can be kept in equilibrium by introducing additional loads along the two junctions: their circumferential variation presents two waves. Asymptotic considerations suggested to separate a load system, called funicular loading, apt to give only axial efforts on a ring beam. This system produces local stresses in the shell strip adjacent to the junction, which are readily calculated whichever be their circumferential variation. The general junction loading, after severing the funicular system is reduced to purely tangential forces: this is the loading examined in this study.*

Recourse is made to theories for stress configurations (a) *with small number of circumferential waves* (b) *with small wavelength. In case* (b) *both analytic and discretized solutions have been constructed, adopting for the second approach a procedure presented in the AIMETA Res. Rep. No. 1.*

A part of the investigation was devoted to tests on the discretization by comparison with exact solutions: construction of characteristic solutions in an indefinite cylindrical shell, determination of the effects of a tangential loading acting on a transverse section. The matrix form system was constructed, introducing the stress and deflection continuity at the junctions and accounting for the infinite prosecution of the cylindrical shells with the aid of the characteristic solutions. Comparison of results from slow and rapid variation theories is presented and, for short wave cases, comparison of analytic and discretized calculations is shown.