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Stress-strain state and stability of composite sandwich shells with a scaling zone between the core and facings

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Abstract

A finite element model is presented for analyzing the strength and stability of sandwich shells of arbitrary configuration with an adhesion failure zone between the core and one of the facings. The model is based on the assumptions that both facings are laminated Timoshenko-type composite shells, only transverse shear stresses in the core and normal stresses in the thickness direction have nonzero values, a free slip in the tangential plane in the adhesion failure zone and unilateral contact along the normal are possible, and the prebuckling state in the stability problem is linear. Biquadratic nine-node approximations for all functions and numerical integration were used. The displacements and rotation angles of the normals toward the facings as well as stresses in the core are taken as global degrees of freedom. The algebraic problem is solved using a special step-by-step procedure of determining the contact area in the scaling zone and employing unilateral constraints for some of the unknowns. Numerical examples are also given. © 1994 Plenum Publishing Corporation.

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