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Development of a Set of Simple Formulae for Estimation of Ultimate Strength of a Continuous Stiffened Panel under Combined Loads

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Summary: The authors proposed a set of closed-form simple formulae to estimate the ultimate strength of a continuous stiffened panel under combined biaxial thrust and lateral pressure. This paper extends the application of the formulae to biaxial compression/tension stress field based on a series of elastoplastic large deflection FE analyses. It was found from the FEM results that the effect of tensile load on the ultimate strength is not so significant when compressive stress is large and the collapse mode is similar to buckling mode. On the other hand, ultimate strength interaction curve can be approximated by Von-mises yield function as a safe-side estimation when compressive stress is very small and the collapse mode is similar to plastic collapse mode. FE analysis for typical stiffened panels with consideration of in-plane shear has been also performed to examine its effect on the ultimate strength of a continuous stiffened panel. Based on the observed FEM results, a set of simple ultimate strength formulae for a continuous stiffened panel under combined loads has been derived. The validity of the proposed simple formula has been confirmed through a comparison with the FEM results and the estimated strengths obtained by some existing methods.

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