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New Results of Structural Optimization for Post-Buckling Behaviour

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Some structures optimized for maximal instability load under prescribed volume show unstable post-buckling path. Such cases, if possible, should be avoided from engineering point of view. Hence the concept of so-called modified optimization including constraints imposed on stability of post-buckling behaviour has been proposed. The present paper gives both numerical and analytical treatment of such the modified optimization presenting general approach and showing new results. The problem of modified optimization against instability in the large is formulated and numerically solved for a compressed and transversally loaded beam placed on the rigid foundation. Analytical approach to optimization of columns for post-buckling behaviour is presented. The general behaviour of loading after buckling is allowed for. Influence of geometry changes in pre-buckling state on modified optimal designs is considered. Analytical optimization of a column loaded by an attached vessel containing liquid and numerical optimization of helical springs are given as illustrative examples.

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