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Optimal design of steel frames accounting for buckling. (English) Zbl 1293.74343
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Summary: A formulation of a special design problem devoted to elastic perfectly plastic steel frame structures subjected to different combinations of static and dynamic loads is presented. In particular, a minimum volume design problem formulation is presented and the structure is designed to be able to elastically behave for the assigned fixed loads, to elastically shakedown in presence of serviceability load conditions and to prevent the instantaneous collapse for suitably chosen combinations of fixed and ultimate seismic loadings as well as of fixed and wind actions. The actions that the structure must suffer are evaluated by making reference to the actual Italian seismic code. The dynamic response of the structure is performed by utilizing a modal technique. In order to prevent other undesired collapse modes further constraints are introduced in the relevant optimization problem taking into account the risk of element buckling. Different applications devoted to flexural frames conclude the paper. The sensitivity of the structural response has been investigated on the grounds of the determination and interpretation of the Bree diagrams of the obtained optimal structures.

MSC:

- [74P10](#) Optimization of other properties in solid mechanics
- [74H60](#) Dynamical bifurcation of solutions to dynamical problems in solid mechanics
- [74K10](#) Rods (beams, columns, shafts, arches, rings, etc.)

Cited in **2** Documents

Keywords:

[optimal design](#); [steel frames](#); [dynamic loads](#); [buckling](#); [P-delta effect](#)

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