

Submodeling of Mega-Shell Reinforced Concrete Solar Chimneys

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Abstract : Solar updraft power plants (SUPPs) made from reinforced concrete (RC) are an innovative technology to generate solar electricity. An up to 1000 m high chimney represents the major part of each SUPP ensuring the updraft of the warmed air from the ground. Numerical simulation of nonlinear behavior of such large mega shell concrete structures is a challenging task, and computationally expensive. A general finite element approach to simulate reinforced concrete bearing behavior is presented and verified on a simply supported beam, as well as the technique of submodeling. The verified numerical approach is extended and consecutively transferred to a more complex chimney structure of a SUPP. The obtained results proved the reliability of submodeling technique in analyzing critical regions of simple and complex mega concrete structures with high accuracy and dramatic decrease in the computation time.

Keywords : ABAQUS, nonlinear analysis, submodeling, SUPP

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