Przemysław Czumaj, Sławomir Dudziak, Zbigniew Kacprzyk, *In-Depth Verification of a Numerical Model for an Axisymmetric RC Dome*
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Abstract
The designers of civil engineering structures often have to face the problem of the reliability of complex computational analyses performed most often with the Finite Element Method (FEM). Any assessment of reliability of such analyses is difficult and can only be approximate. The present paper puts forward a new method of verification and validation of the structural analyses upon an illustrative example of a dome strengthened by circumferential ribs along the upper and lower edges. Four computational systems were used, namely Abaqus, Autodesk Robot, Dlubal RFEM, and FEAS. Different models were also analyzed—two-dimensional (2D) and three-dimensional (3D) ones using continuum, bar, and shell finite elements. The results of the static (with two kinds of load—self-weight and load distributed along the upper ring) and modal analyses are presented. A detailed comparison between the systems' and models' predictions was made. In general, the spatial models predicted a less stiff behavior of the analyzed dome than the planar models. The good agreement between different models and systems was obtained for the first natural frequency with axisymmetric eigenmodes (except from the Autodesk Robot system). The presented approach to the verification of complex shell–bar models can be effectively applied by structural designers.