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# EFFICIENT SOLID SHELL ELEMENT FOR THE COUPLED THERMO-MECHANICAL STABILITY ANALYSIS OF THIN-WALLED STRUCTURES

**Wenya Shu[1] and Ilinca Stanciulescu[2]***

[1] Rice University, Department of Civil and Environmental Engineering, 6100 Main St, Houston, TX, USA, ws18@rice.edu
[2] Rice University, Department of Civil and Environmental Engineering, 6100 Main St, Houston, TX, USA, ilinca.s@rice.edu

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We propose an efficient and robust coupled thermo-mechanical solid shell formulation to enable the stability analysis of thin-walled structures. Of particular interest is the ability to study the snap through behavior of panels subjected to a combined thermo-mechanical environment.

Three classical techniques, the assumed natural strain (ANS) interpolation, the enhanced assumed strain (EAS) method and reduced integration with hourglass control are employed to avoid locking and improve convergence [1]. Although previous studies demonstrated that the solid shell element incorporating these techniques performs well in static and explicit transient analysis, few of them discussed the element performance in conducting transient analysis using implicit time integration. We propose an analytical evaluation of the mass matrix, which guarantees both accurate and efficient implicit transient analysis. Finally, the formulation is extended to include thermo-mechanical coupling using the isothermal staggered scheme.

Numerical examples demonstrate the accuracy of the present element in both mechanical transient and thermo-mechanical stability analyses. The present element is robust in long-duration time history large deformation simulations and is several times more efficient than the standard quadratic solid element.

## REFERENCES

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