

Partitioned Algorithm for Hybrid Fire Testing up to Structural Collapse

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ABSTRACT

The paper presents the development and the application of a thermomechanical partitioned algorithm based on the Finite Element Interconnecting Method (FETI) [1] to be employed in hybrid fire tests. Hybrid fire testing is an appealing methodology that intends to test in relatively small furnaces, compared to the whole building, single structural elements or limited parts of the building that exhibit a highly nonlinear fire behaviour whereas the remainder of the structure is modelled numerically with good accuracy [2]. On these premises, the paper comprehensively describes the proposed partitioned algorithm by highlighting its ability to guarantee compatibility and equilibrium at the interface between the physical substructure (PS) and the numerical substructure (NS), both for non-floating and floating subdomains as well as for nonlinear behaviour of the PS. The algorithm development focused on providing a procedure that in principle can be actually used experimentally. Thus, an error propagation analysis that takes into account errors and uncertainties, such as delay and measurement noise, is also presented. The validation carried out in a fully numerical framework, i.e. the PS is also numerically modelled, on a steel frame shows promising outcomes for future experimental implementations.

REFERENCES

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