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# EVALUATION OF OUT-OF-PLANE DEFORMATION OF MASONRY INFILL WALLS DUE TO IN-PLANE LOADING BY DIGITAL IMAGE CORRELATION

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## 1. Introduction

Effects of in-plane and out-of-plane loading are generally observed separately [1, 2] but recent investigations [3] are trying to combine the influence of in-plane damage on out-of-plane strength. In this paper, out-of-plane effects caused by in-plane loading are observed trough digital image correlation.

## 2. Experimental investigation

Test setup, model description, and behaviour of tested models under in-plane loading can be found [1].

This paper presents an extension of previously published results, providing unique insight into out-of-plane behaviour of tested models caused by in-plane loading.

### *2.1 In-plane behaviour*

Response of tested models was evaluated according to limit states. Three limit states were considered based on a certain damage mode and overall global behavior (Fig. 1) [5].

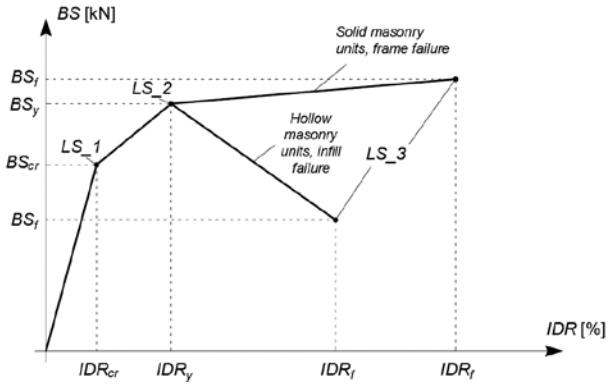


**Fig. 1.** Backbone curves and limits states of tested models.

### *2.2 Out-of-plane deformations*

Out-of-plane deformations were observed in terms of displacement mode and only qualitative representation is given. It was observed that displacement mode was highly influenced by masonry unit robustness. Shift from plate like to rigid body behaviour of infill walls was related to masonry unit robustness. In the range of small in-plane deformations, out-of-plane effects were related to imperfections. When a certain in-plane limit state was reached, out-of-plain deformations mode changes accordingly (Fig. 2 and Fig. 3). Only masonry infill type was considered while frame properties were constant.

## 3. Conclusions and recommendations

Out-of-plane deformation mode of masonry infill caused by in-plane loading was investigated based on conducted experimental research on models with varied masonry unit robustness and frame properties. Conclusions were drawn as follows:

- masonry unit robustness played a major role in terms of both in-plane and out-of-plane behaviour,
- masonry infills constructed of solid clay units exhibited plate like behaviour, characterized by inflection points,
- masonry infills made of hollow clay units behaved in a rigid body fashion,
- frame properties influenced out-of-plain behavior only in case of infills made of hollow clay units,
- out-of-plane deformations caused by in-plane loading are to be taken in account

when coupled actions (in and out-of-plane loading condition) are considered.

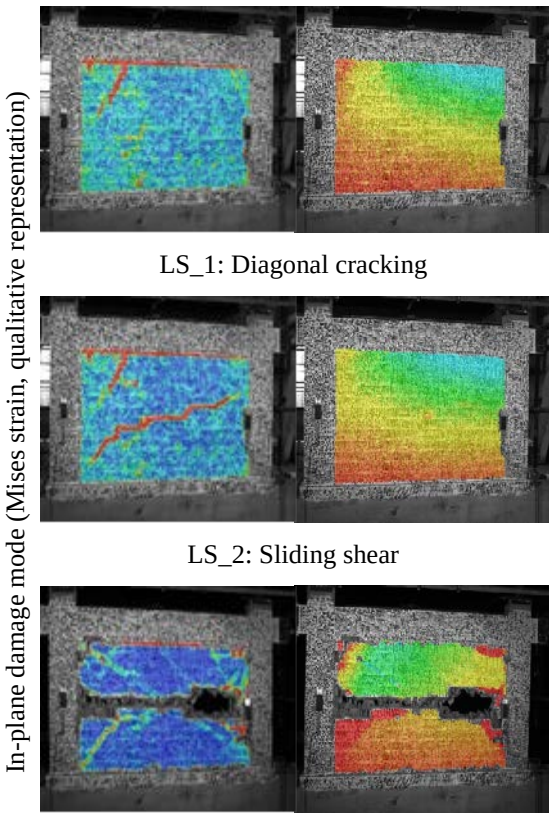


**Fig. 2.** In-plane damage and out-of-plane displacement mode for sample *O4_bpm*.

## Acknowledgements

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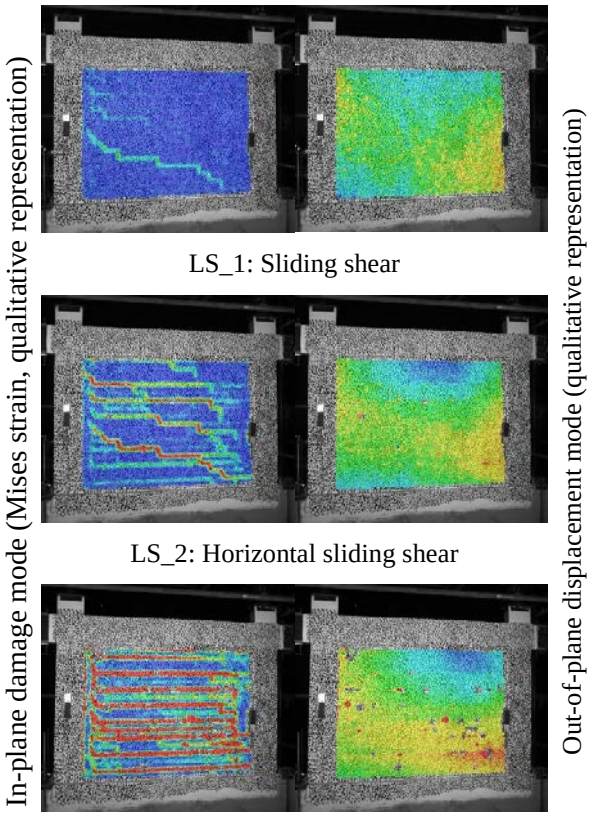


**Fig. 3.** In-plane damage and out-of-plane displacement mode for sample O4_cpm.

## References

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