Project INSYWA 2

Development of a new Dry-Stacked Masonry block (DSM_b) and study of the effect of its geometric imperfections on the mechanical response of a masonry wall.

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Nowadays, traditional masonry blocks jointed with a mortar layer are increasingly set aside to the benefit of dry-stacked masonry blocks (DSM_b) which guarantee a high-speed of execution, a raw material economy a slightest need of skilled labour and a reuse possibility of the blocks. Former studies[1] already shown that constructions using interlocking masonry blocks and prefabricated systems can reduce the overall cost, time and manpower requirements to produce better houses quality than conventional method.

However, although having major assets on the environmental, the financial and the practical aspects, the dry-stacking system of the masonry blocks leads to huge mechanical issues owed to the geometric imperfections of the masonry blocks. Whatever the manufacturing process and the post-treatments considered, the bed joints of the masonry blocks are always rough and their final height varies according to the production tolerances. Owing to these imperfections, the stress transfer in such a masonry wall is almost unpredictable from a course to another and a stress concentration frequently happens. Hence, the cracking and the failure of the DSM_b occur earlier, which limits its serviceability load.

The current research project address the issues of the geometric imperfections of a new DSM_b and investigates the potential of a contact layer to overcome these imperfections. The investigations are articulated around four main piles:

- The development of a new optimised DSM_b,
- The study of the effect of the roughness of the bed joints of a DSM_b on the load sharing in a wall,
- The study of the effect of the height variation of the DSM_b on the mechanical response of a wall,
- The development of an innovative solution to overcomes the geometric imperfections

Based on several numerical models, thermal and analytical calculations, a new dry-stacked masonry block baptised the “M-Block” was developed at the onset of the research project.

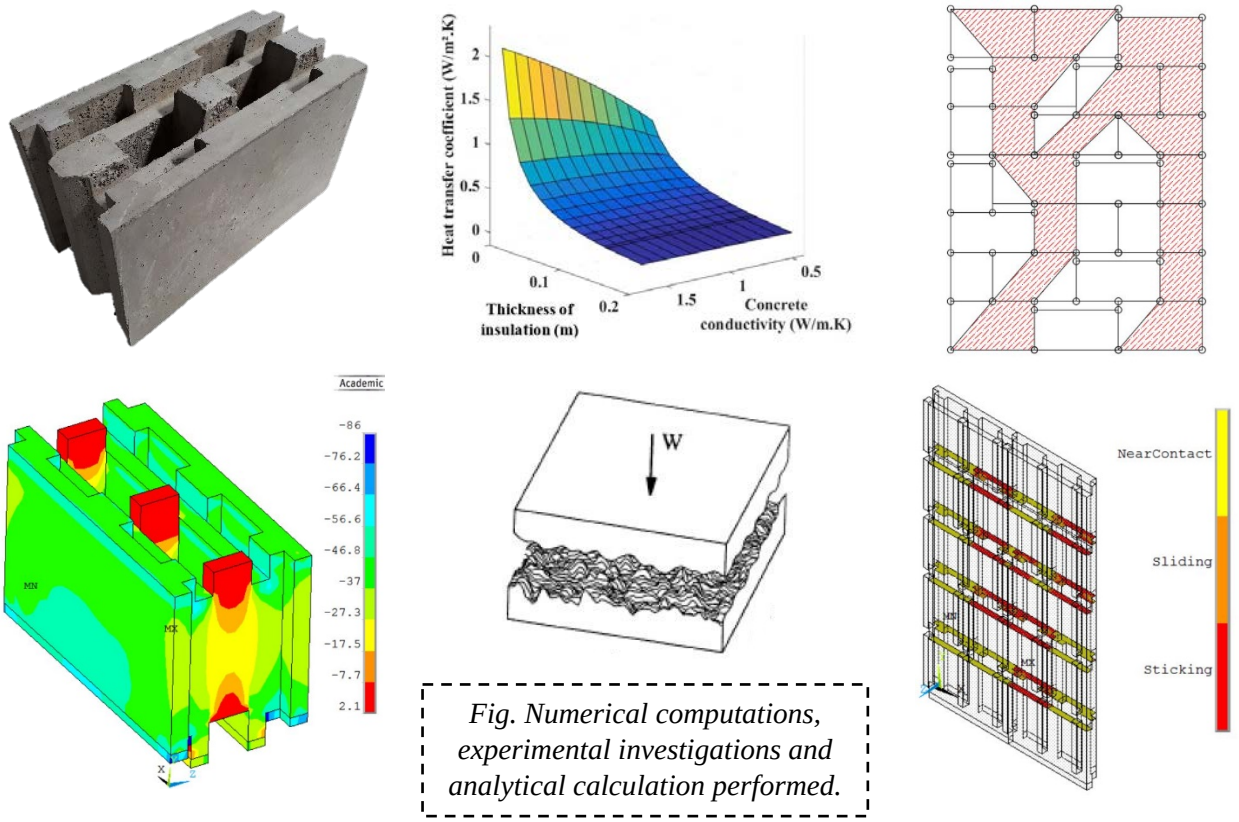

Fig. Numerical computations, experimental investigations and analytical calculation performed.

Published works:

- Impact of the height imperfections of masonry blocks on the load bearing capacity of dry-stack masonry walls, *Journal of Construction and Building Materials (Top 10 journal)*, Vol. 165, 2018, pp. 898-913.
- Prédiction de la résistance mécanique d'un bloc de maçonnerie sans joint par calcul numérique, *17e édition des Journées Scientifiques du (RF)²B*, IFSTTAR 2016.

[1] Anand K., Ramamurthy K., Laboratory-based productivity study on alternative masonry systems, *Journal of Construction Engineering and Management, vol. 129(3)*, 2003, pp. 237-242.