SUSTAINABLE HOUSE MODEL FOR EARTHQUAKES AND HURRICANES HAZARDS (SHS MULTIRISK)

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Introduction

Among the hazards capable of causing natural disasters, earthquakes and hurricanes are the ones that most request the structures of the buildings and also those that present greater unpredictability. Many developing nations suffer from these threats, with severe impacts on highly vulnerable groups' social and economic development.

Objective

The aim of this poster is to present SHS (Simple Housing Solution) Project and its latest research results of SHS Multirisk, in line with the Sendai Framework for Disaster Risk Reduction (2015-2030) and the Paris Agreement on Climate Change (2015).

Materials and methods

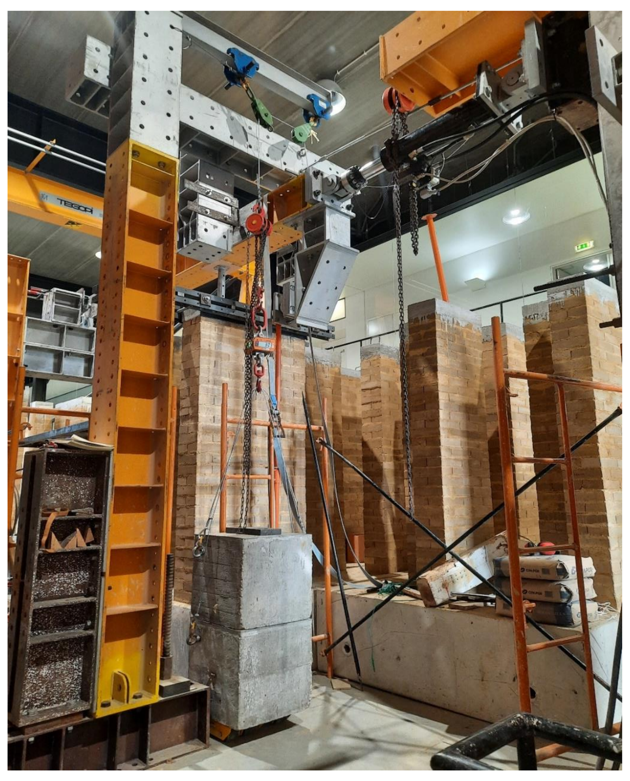
The SHS Project (Simple Housing Solution - https://shs.poli.ufrj.br/en/) consists of a methodology for (re) construction of residences and other small buildings, in a collective effort system (community labor), seeking to optimize the available resources and contribute to the organization of the chaos installed during critical situations, such as the post-disaster or the daily construction to mitigate risks. It is based on the fundamental principles for a sustainable housing recovery declared by the United Nations Development Programme (UNDP) and International Recovery Platform (IRP): environmental, technical, financial, and socio-organizational sustainability.

The main constructive technology adopted is Compacted Earth Blocks - CEBs reinforced masonry. Once the main construction material applied is the local soil, it constitutes an environmental friendly solution appropriate for the use of the beneficiaries' labor in the manufacture of blocks and houses' construction. It allows the production of blocks with manual presses and reduces greenhouse gas emissions since the blocks are not kiln-burnt, but use small proportions of 6:1, 8:1 or 10:1 of soil and cement as a binder (Figure 1).

Figure 1: Soil-cement CEB.

Results and discussion

SHS-MULTIRISK is a spin-off project in a partnership between UFRJ and UA and proposes a residence model resistant simultaneously to earthquake and hurricane hazards, within a specific range of magnitude to be defined in the design.
The process of blocks manufacturing in the proportion 8:1 (soil: cement) and building the full-scale reinforced masonry panels were basically carried out without the use of electricity and were successful, obtaining blocks with an average compressive strength of 7.29MPa and soil-cement 5:1 mortars of 11.70MPa. Both C-shaped panels (with plaster - CE, and without plaster - SE) showed good deformation capacity for out-of-plane shear, withstanding displacements at the top were about 110-120mm, forces of 5.8-8.0kN (Figure 2) and bending failure at the base of the stiffeners.



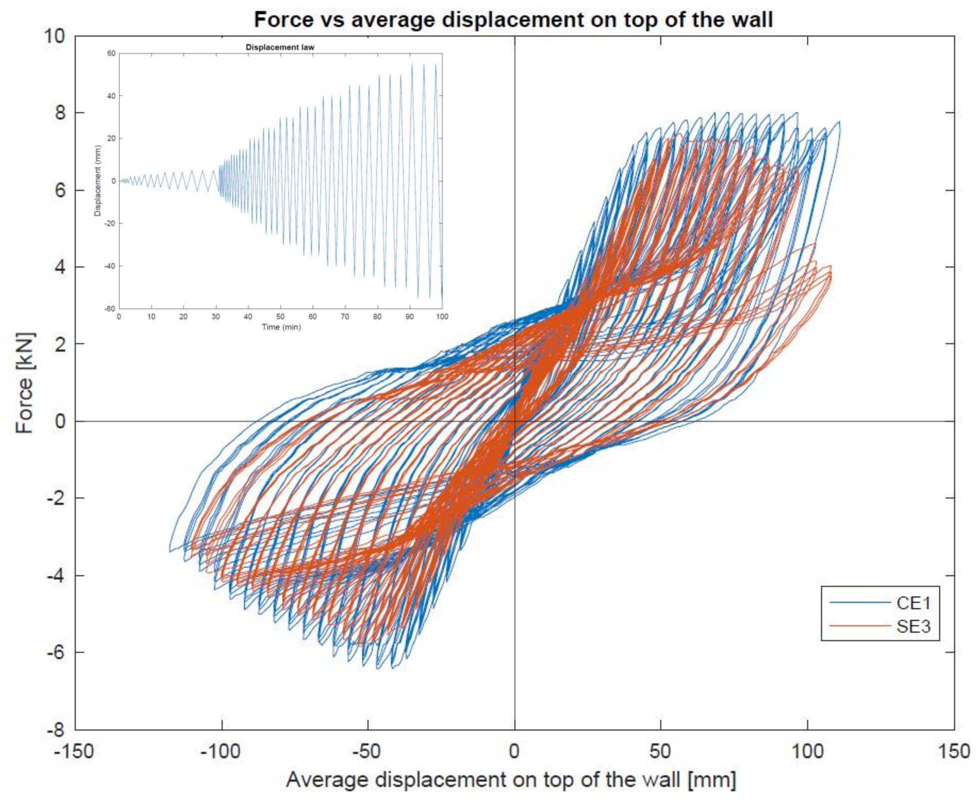


Figure 2: Shear test system (left); panels' hysteretic diagrams for out-of-plane shear (right).

Conclusion

The plaster tends to act favorably to increase the out-of-plane shear strength of the panels, improving its performance by 8%.

References

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