Experimental and numerical investigation of timber-filled steel tubes (TFST) composite frame with Timber Buckling-Restrained Braces filled steel tubes under cyclic and lateral loading

PhD student
Nima Tabarestani

PhD program
Civil Engineering (Warwick University and FCT, Nova University of Lisbon)

Supervisors
Stephen Hicks (Warwick University) and Rodrigo Moura Gonçalves (FCT, Nova University of Lisbon)

Co-supervisor
-

Period
2022-2025

Funding
EUTOPIA scholarship (EUTOPIA-PhD-2021-64)

Summary

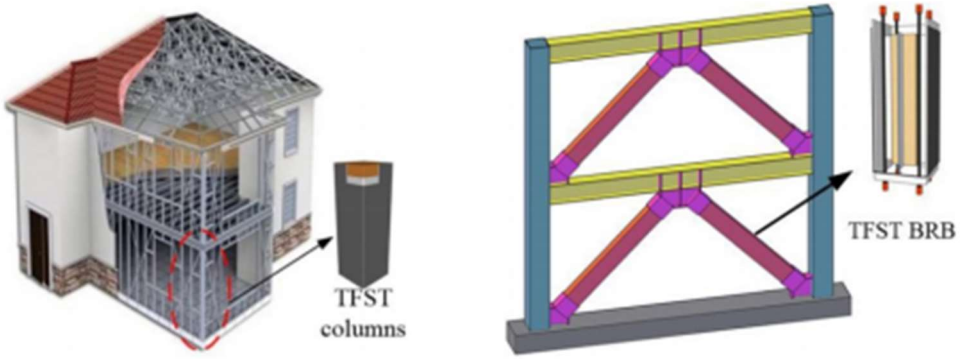
This research aims to evaluate and develop experimental and numerical models of novel and efficient timber buckling-restrained braces on composite and timber-filled steel tube frames under lateral and cyclic loading, to obtain high ductility and energy dissipation capacity. Timber has a low environmental impact, great sustainability and performance when compared to other lateral force resisting elements such as concrete and steel shear walls or brace frames.

A 1/3 scale frame is designed in this study. The timber-filled steel tubes are designed to present an economical and practical use of the structure. The effects of the constraint ratio, restraining component size, specimen length, thickness, the type of external steel tubes, which provide a solution for corrosion of the timber restraining, and the failure modes, ductility, stiffness, energy dissipation capacity, hysteretic behavior, energy dissipation capacity, are investigated based on the experimental test and analytical results and expand on numerical models.

The outcomes from this experimental and numerical modeling project will lead to crucial information required for the design of reliable and eco-friendly timber buckling-restrained braces and develop an analytical model that will bring new insights into the stability phenomena and behavior of novel specimens, and will pave the way towards this structural element becoming a choice for future large-scale composite and hybrid structures.

Keywords

-



Timber buckling restrained brace in timber-filled steel tube composite frame.