THE INFLUENCE OF TIMBER FLOORS ON MASONRY STRUCTURES

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Outline

Overview

- Seismic response of URM buildings
- Role of timber diaphragms

Case studies

- Belém Palace (Portugal)
- Ica Cathedral (Peru)

Workplan

Overview

Seismic response of URM buildings Role of timber diaphragms

Seismic response of URM buildings

Vulnerability

- Fragile materials
- Heavy construction
- Inadequate connections between structural elements





Timber diaphragms

Morphology



Timber diaphragms

Role

- Resist gravity load
- Transfer forces to the lateral load resisting walls
- Improve the "integral behaviour"



North façade

Ε

Parameters

- In-plane stiffness
- Floor-to-wall connections



East façade Magenes et al. (2012)

West façade

Timber diaphragms

- Inappropriate and invasive retrofitting techniques can have dramatic consequences
- Excessively stiff floors with inadequate connections to the walls
- Increase in the floors' mass
- Torsional effect
- Increase in displacements
- Activate the in-plane resistance of walls without requiring excessive stiffness of the floors





Giongo et al. (2011)

Case studies

Belém Palace (Portugal) Ica Cathedral (Peru)

Belém Palace (Portugal)



Belém Palace (Portugal)











Sonic test

- Flat jack test
- Compression test

Pilodyn









Ica Cathedral (Peru)



Ica Cathedral (Peru)



Workplan

Workplan

□ Comprehensive review of the state-of-the-art of the research topic

- Identification of building typologies of masonry structures with timber floors (geometrical and structural configuration, as well as materials) in order to understand the extent of their variety and which variables influence their seismic response
- □ Identification of possible strengthening techniques which can be applied to improve their integrity under seismic actions
- Development of numerical models for timber floors and their subsequent integration in a general approach for seismic analysis and assessment of masonry buildings
- □ Laboratory and in-situ tests to extend existing databases which are based on experimental programs developed worldwide



To be continued...

Thank you

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