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CYCLIC LOADING OF MASONRY WALLS AND ITS ANTI SEISMIC STRENGTHENING

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Abstract: *The damage of structural masonry walls is one of the most widespread harming injuries and cause of loss of serviceability and seismic capacity for a building. Therefore a research into possibilities which would improve these characteristics have been carried out within the 7th EC Framework programme project NIKER. The retrofitting approach is constrained by conservation requirements of minimum interventions which should not severely change the structural behavior and the structural appearance, and should prefer solutions without a necessity of total structural disassembling. This article provides an overview about the research that led to applications of the steel wire ropes and geo-nets onto adobe brick walls.*

Keywords: ***Seismic retrofitting, Adobe, Brick wall.***

1. Introduction

ITAM investigated the adobe brick walls. These walls are very sensitive to earthquake. Therefore it was proposed several strengthened techniques that are applied on the wall. General overview of the strengthened techniques is specified in Table 1.

Tab. 1: Overview of the strengthened techniques.

Title	Description
ABW_1	Unreinforced sample
ABW_2	Reinforced sample by wire ropes
ABW_3	Reinforced sample by PET geo-nets
ABW_4	Retrofitting ABW_1 by PET geo-nets
ABW_5	Reinforced sample by PP geo-nets

2. Cyclic loading

Three hydraulic jacks generated the vertical load (80kN), which was transmitted to the wall by a steel 'hat' on the top of the wall. A horizontal displacement (force) on the top of the wall was introduced using a servo-hydraulic MTS actuator. Then, the vertical compressive pre-stress was combined with cyclic horizontal loading mode with a stepwise increase in the maximum cycling limits. For each step of loading defined by a maximum value of the amplitude (step = 2,5mm) of the displacement imposed by the actuator, three cycles were performed. For each step of loading, the frequency of application of the horizontal force was kept constant and equal to 0,1 Hz.

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3. Conclusions

In conclusion, the values of ultimate drift are extremely dispersed. The minimum value is related to the specimen ABW_1 and it is equal to 0,76%. The mean value of the ultimate drift of all the tests is equal to 1,24%, see Figure 1. The elastic drift is depends on the reinforcement technique. The specimens ABW_2 and ABW_5 have the greatest value, see Figure 2. The values of ultimate displacement ductility of the specimens are very low but quite homogenous, see Figure 3.

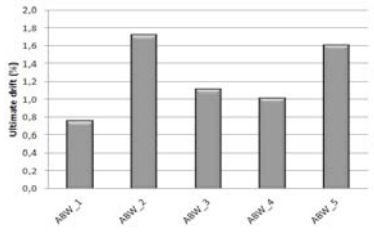

Fig. 1: Ultimate drift

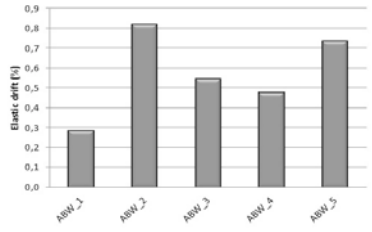

Fig. 2: Elastic drift

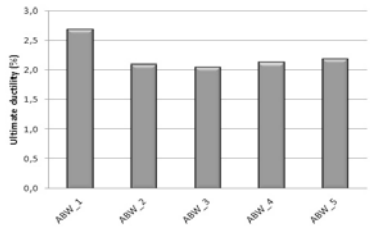

Fig. 3: ultimate ductility

Comparing the energy dissipation of the retrofitted wall by means of geo-nets (PET) with the unreinforced adobe brick wall it can be observed that the stiffness of the retrofitted wall is lower than the stiffness of the control wall, even after the intervention. Comparing the energy dissipation of the retrofitted wall by means of geo-nets (PET) with the unreinforced adobe brick wall it can be observed that the stiffness of the retrofitted wall is lower than the stiffness of the control wall, even after the intervention. Comparing the energy dissipation of the reinforced wall by means of geo-nets (PET) with the reinforced wall by means of geo-nets (PP) it can be observed that the strengthening with mortar reinforced with both geo-net is similar. However, energy dissipation is greater in the use of geo-nets (PP), see Figure 4.

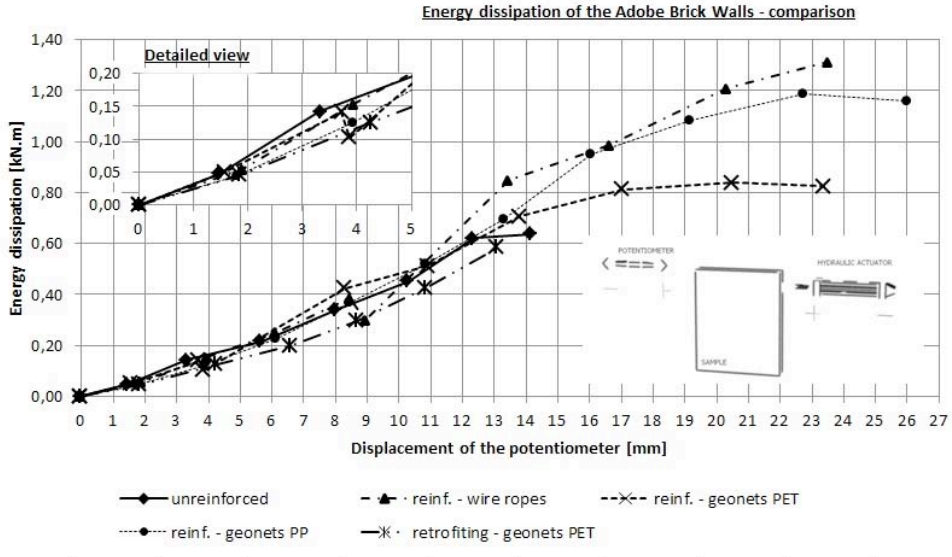

Fig. 4: Energy dissipation - comparison

4. Acknowledges

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