

Shaking Table test of a pre-damaged masonry building retrofitted with a mortar-textile composite material

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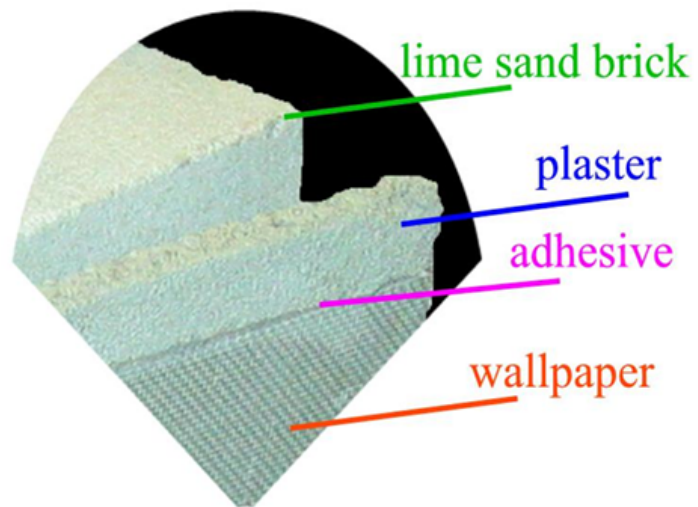
Risk Reduction – earthquake retrofitting



Reinforcement Systems

System 1: eq-top

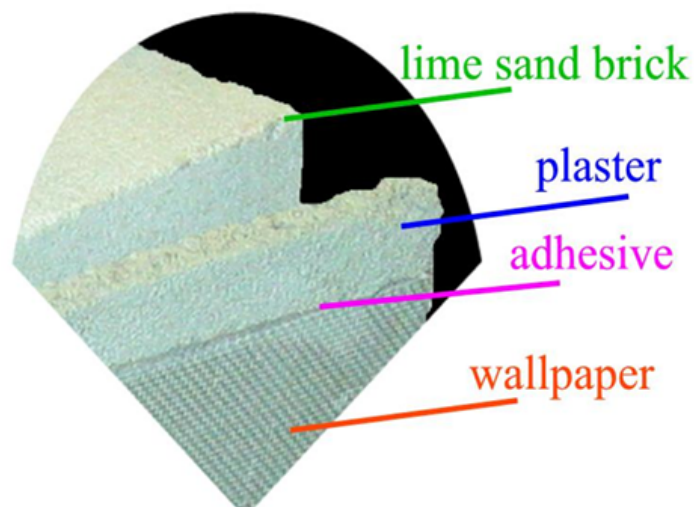
- textile application on plaster
- no removal of plaster
- special ductile adhesive
- clean solution



Reinforcement Systems

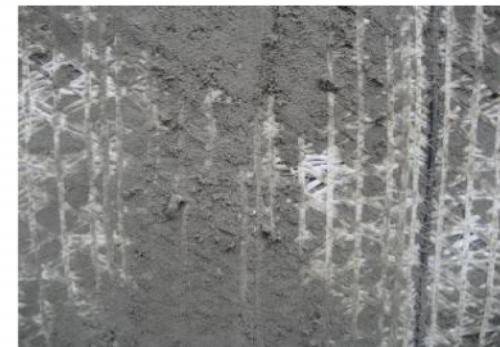
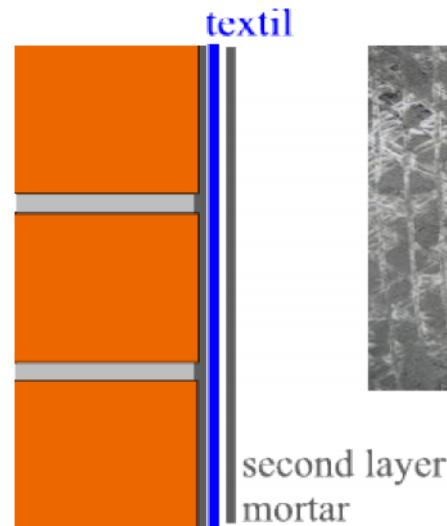
System 1: eq-top

- textile application on plaster
- no removal of plaster
- special ductile adhesive
- clean solution



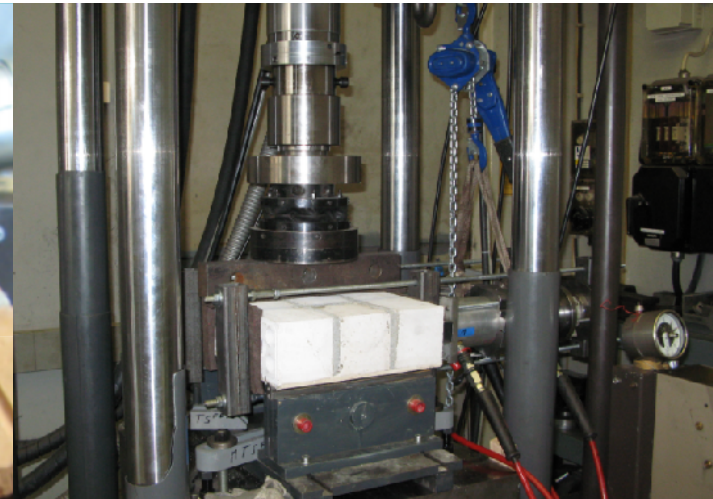
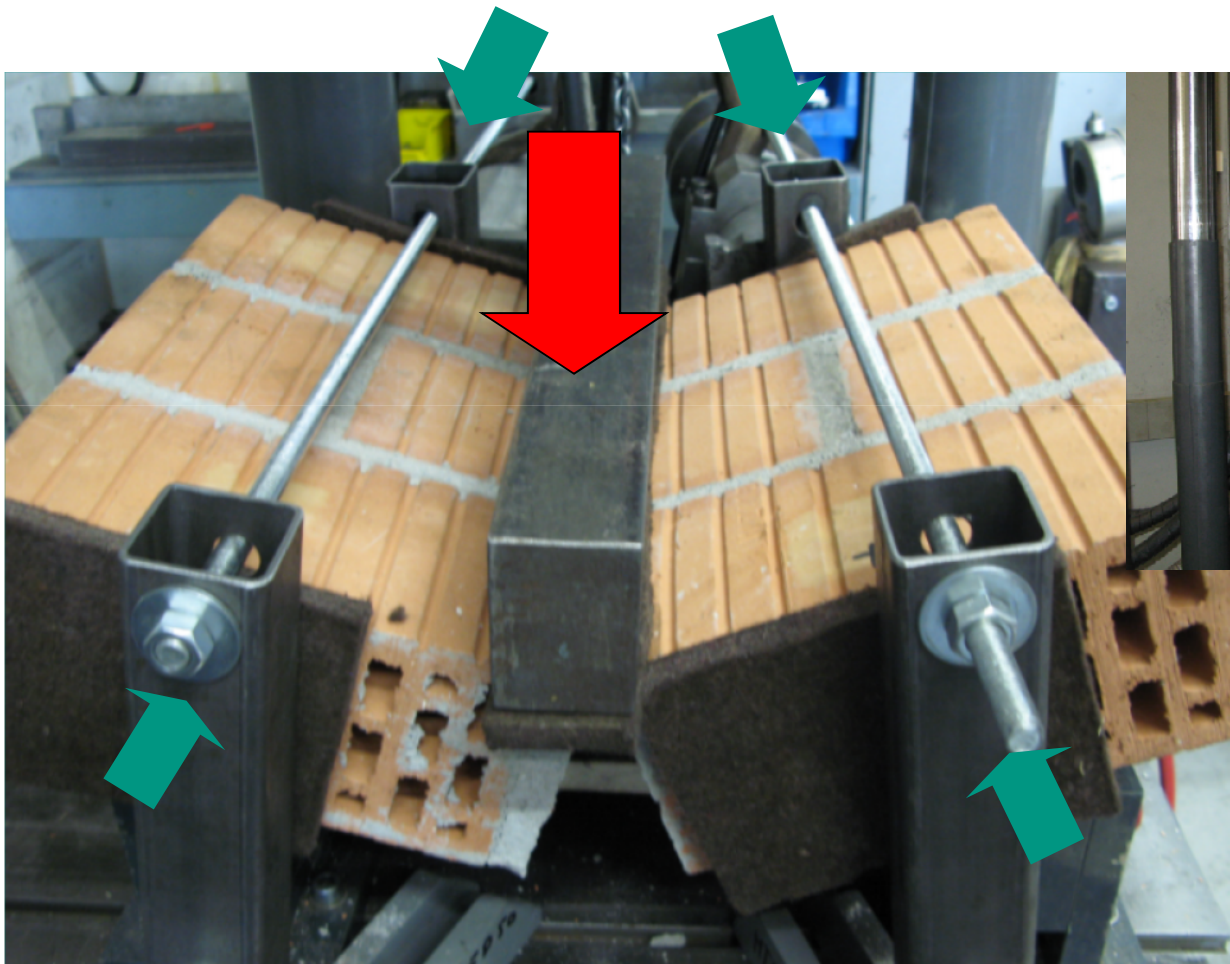
System 2: eq-grid

- textile with 4 fibre directions
- high performance mortar
- reinforcement textile embedded in mortar



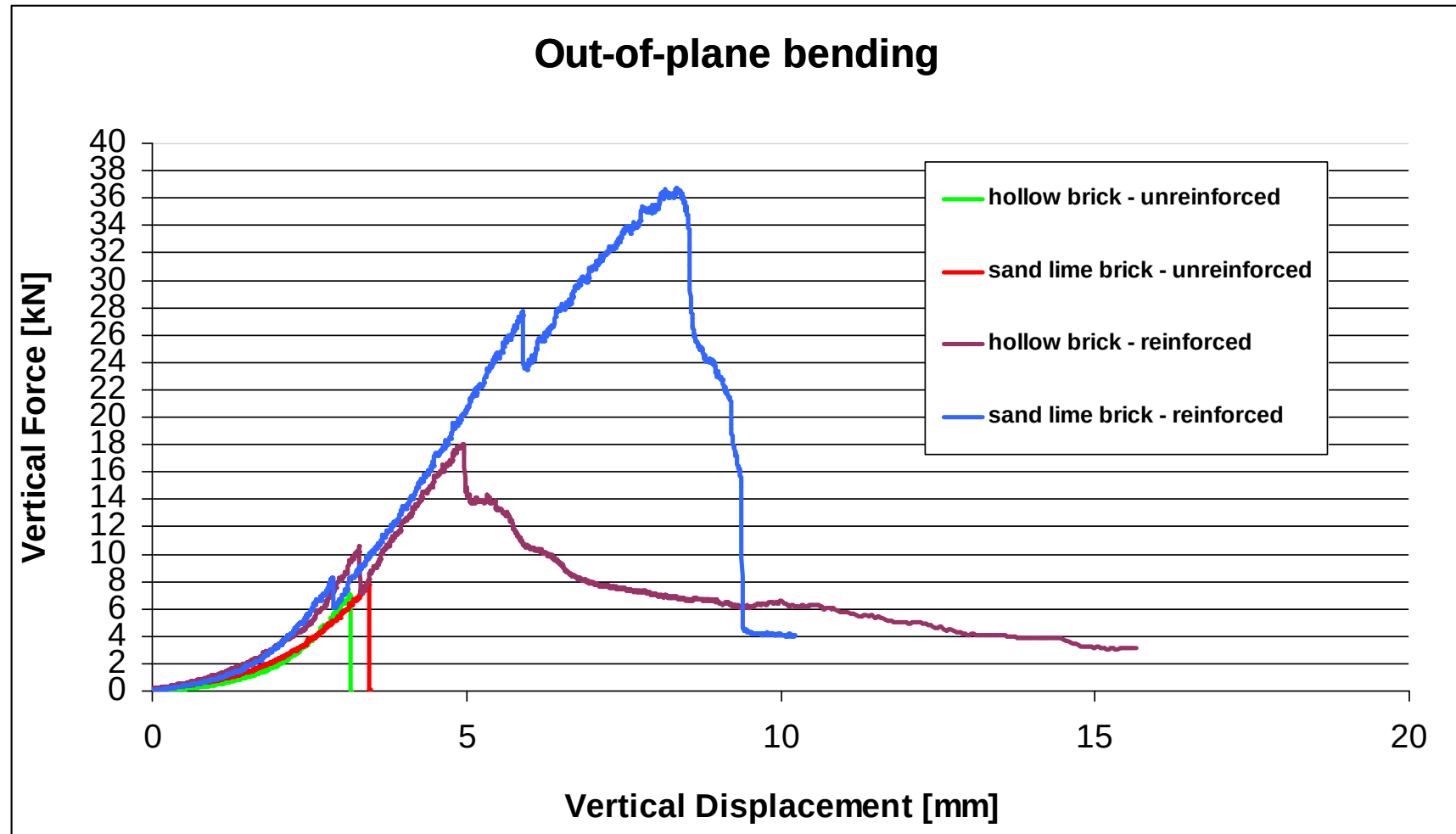
Tests - Out of plane

Axial Bending Force



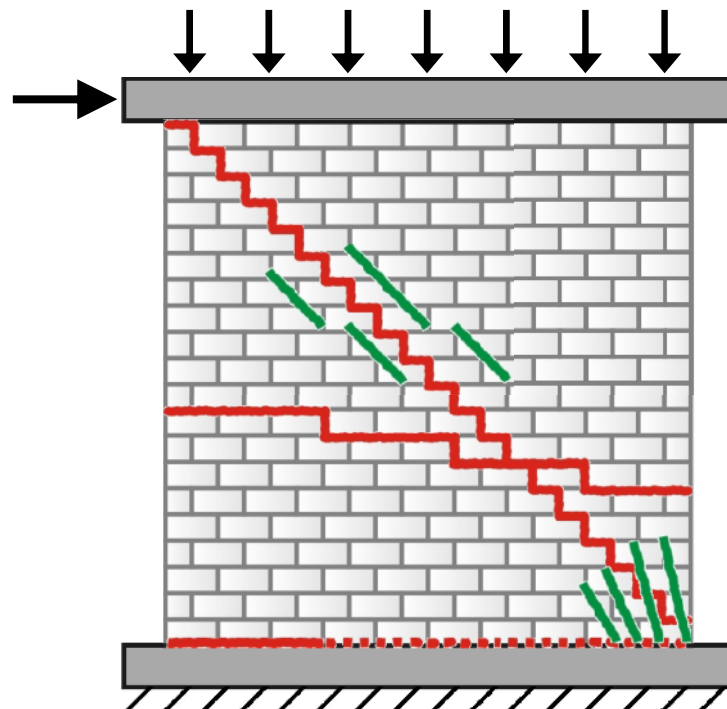
Constant
horizontal Load

Tests - Out of plane



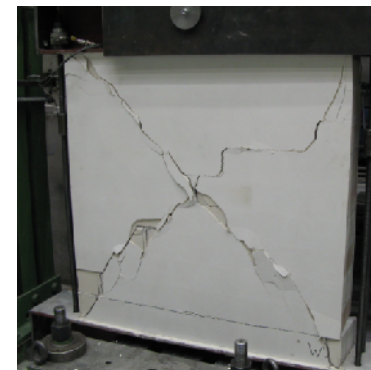
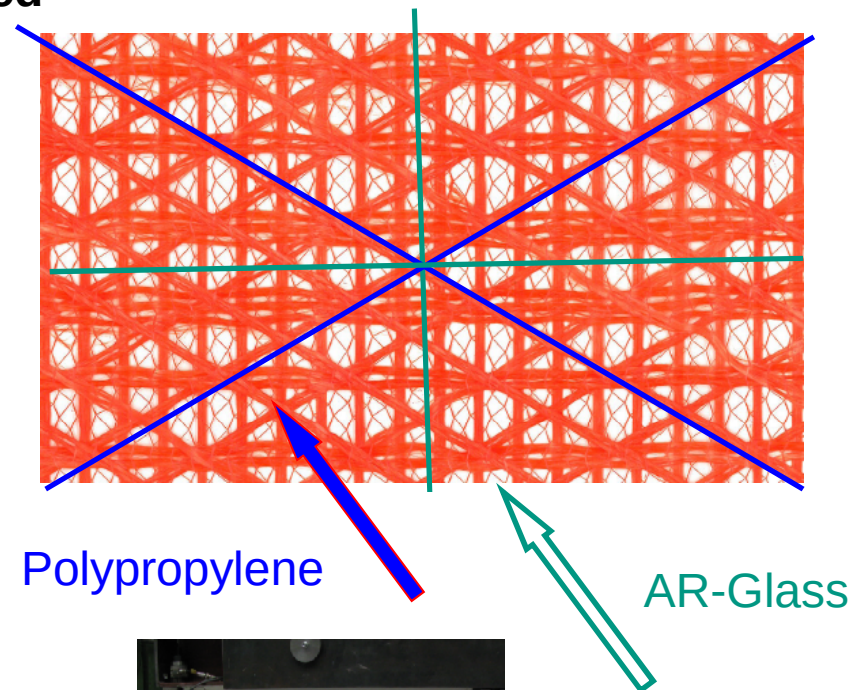
Developments for In-plane

Masonry shear wall – biaxial cyclic loaded

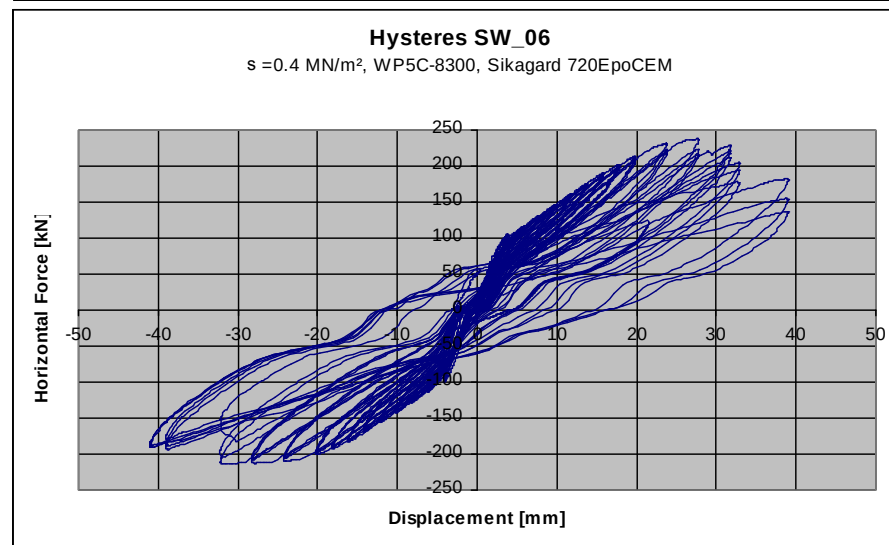
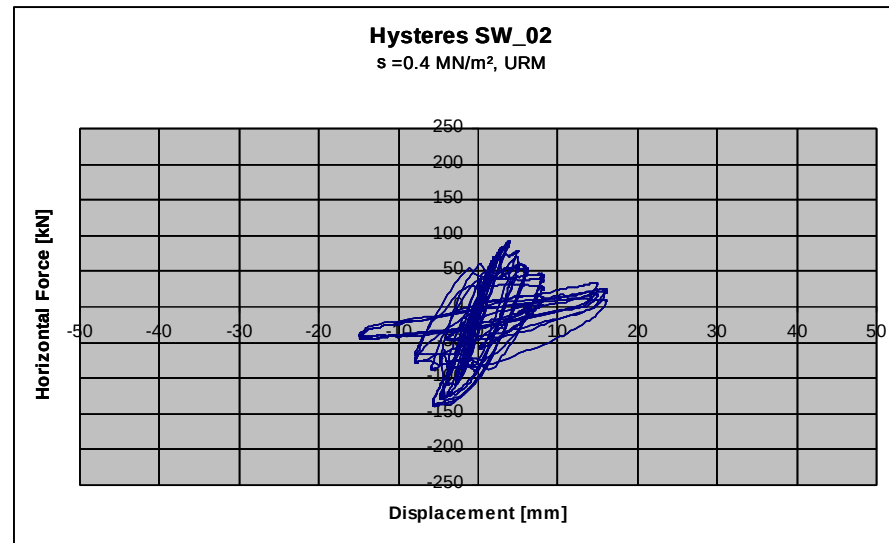


Cracks in the joint

Cracks in the bricks



Results - Wall Tests - In-plane



Comparison of results:

Related to the increase of **strength**:
92.22 kN to 237,88 kN

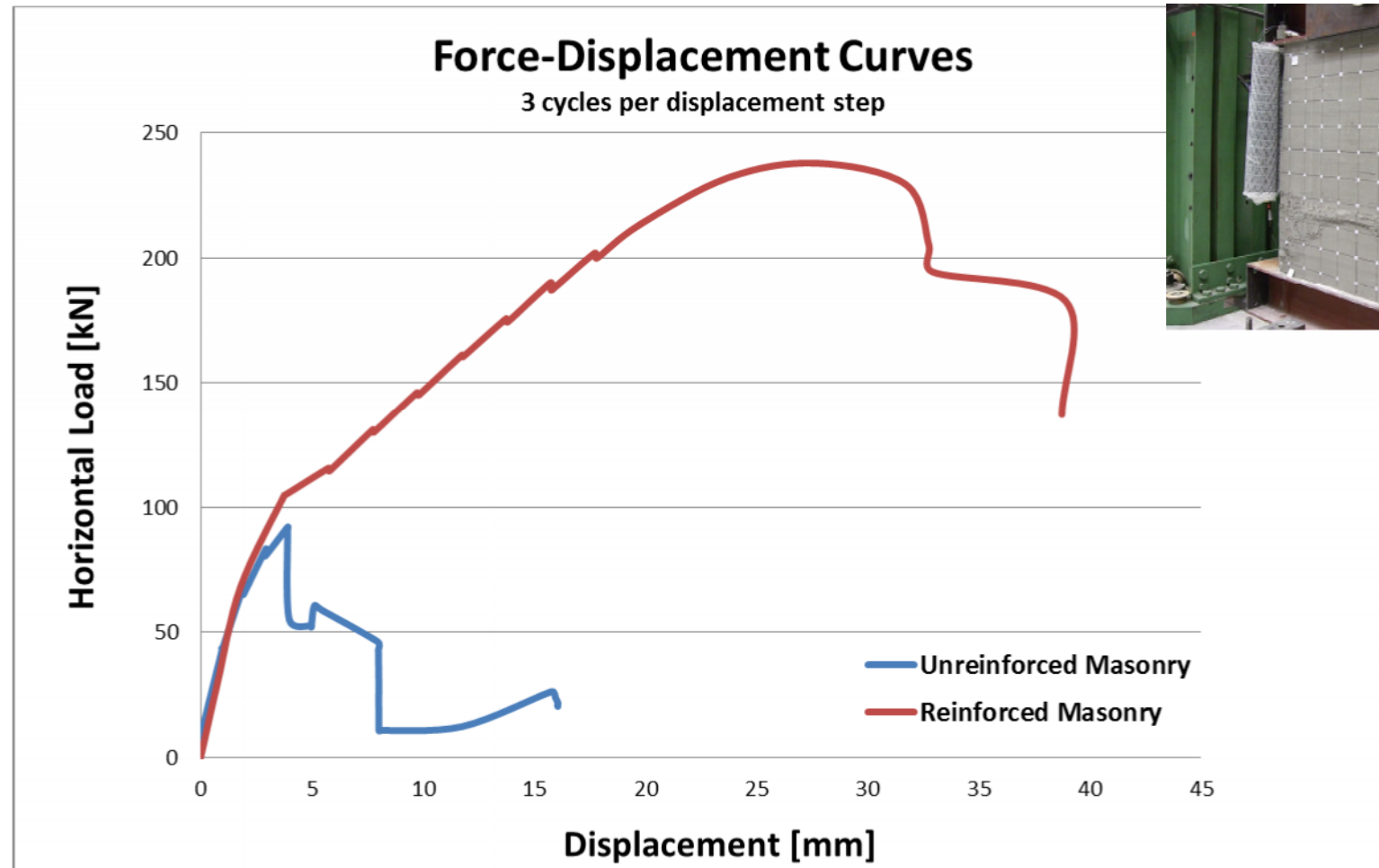
-> **258 % of URM**

But more important is the increase of
the **deformation before collapse**:
16.08 mm to 39.05 mm

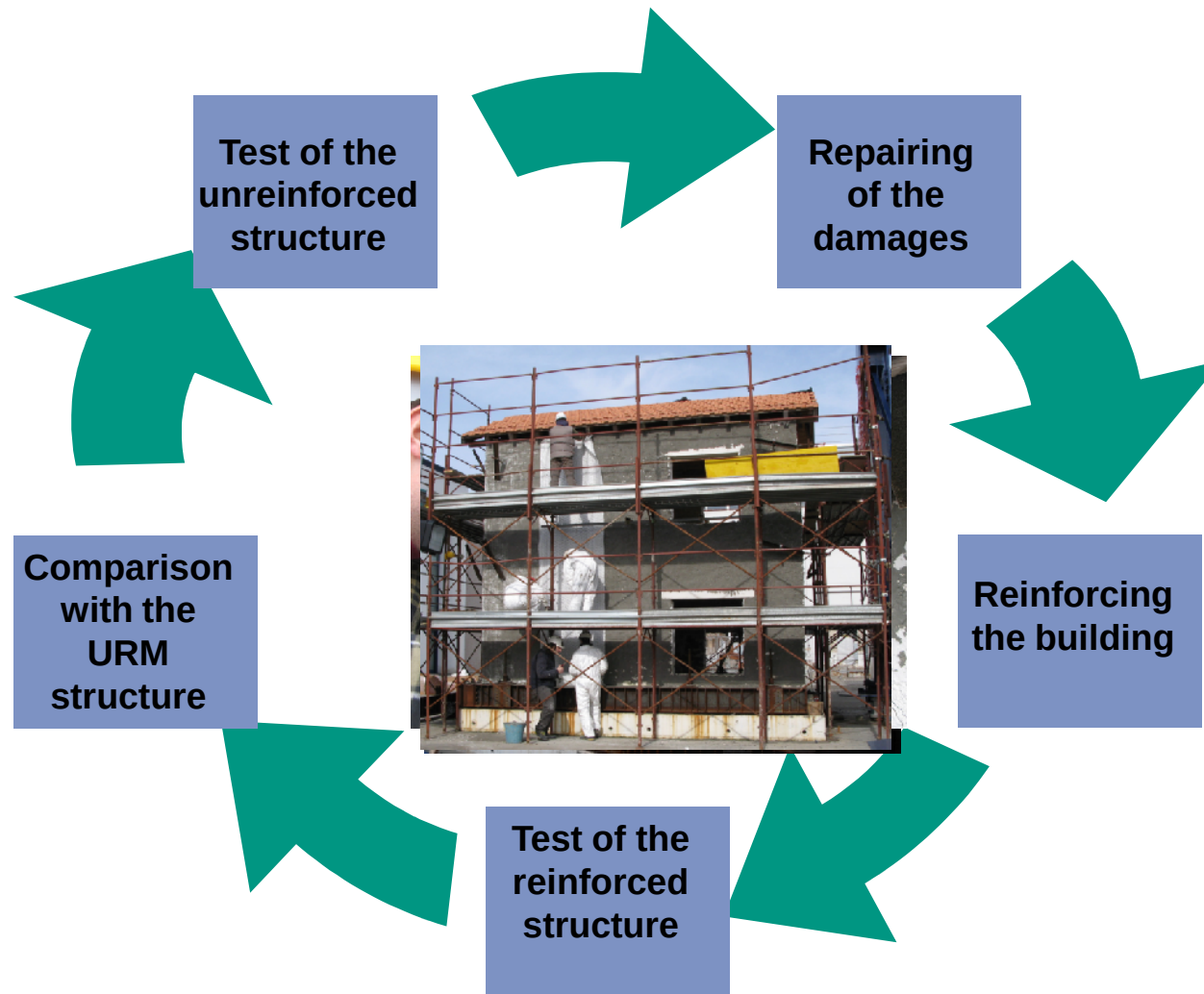
-> **243 % of URM**



Results - Wall Tests



Shaking table tests at EUCENTRE (Pavia)



Shaking table test URM

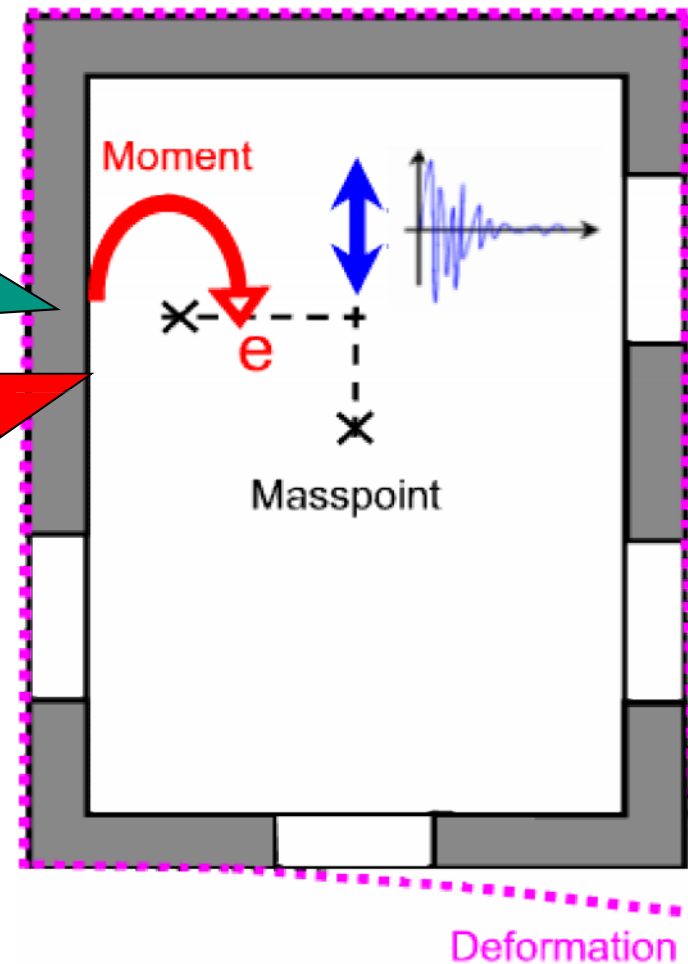


Shaking table test URM

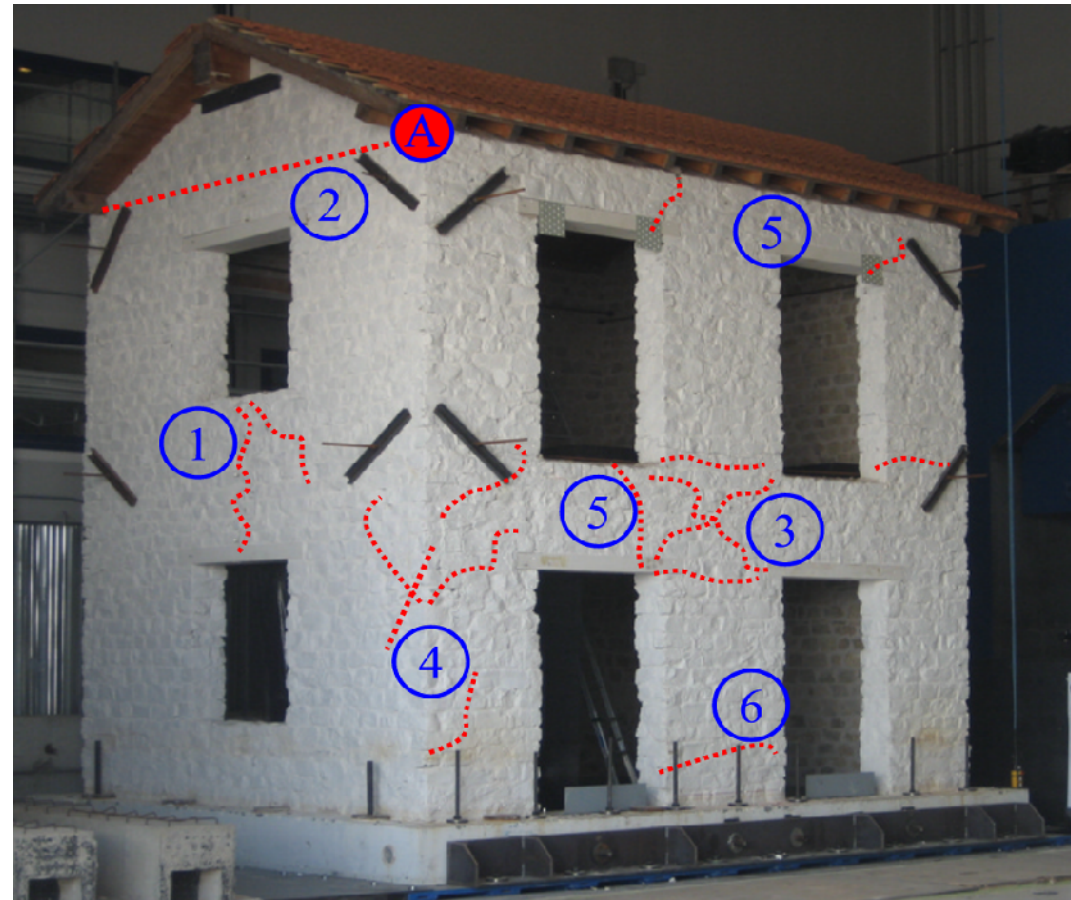
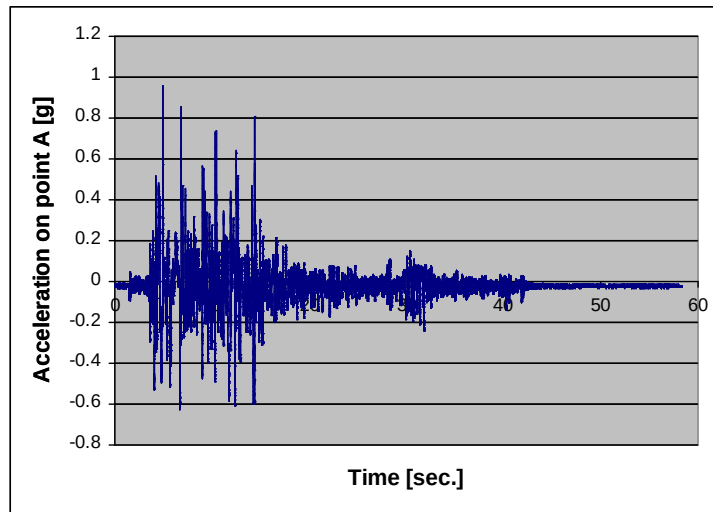
Wall without opening

Torsion mode through eccentricity between shearpoint and masspoint

„Out-of-plane“ - bending

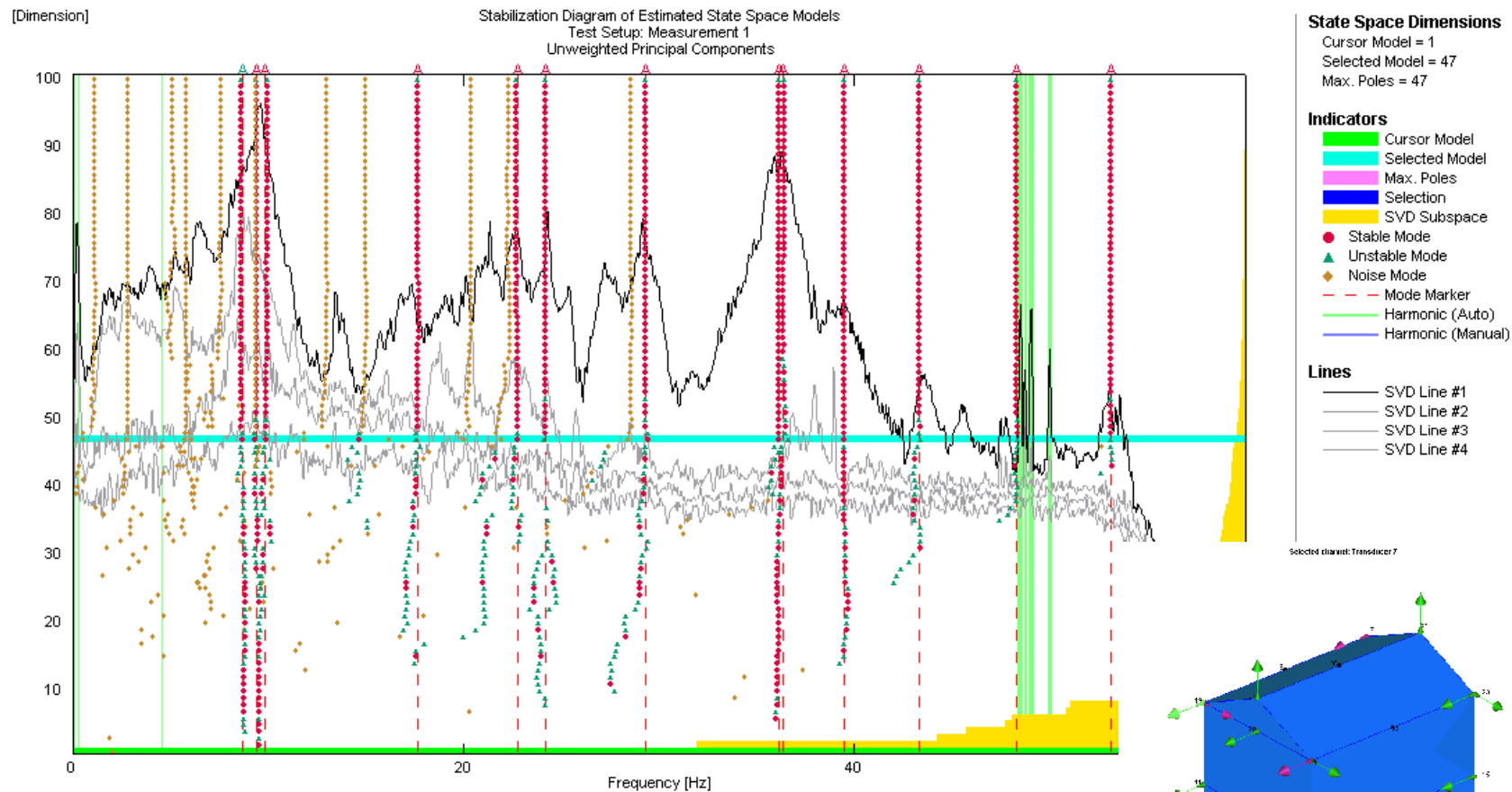


Shaking table test URM

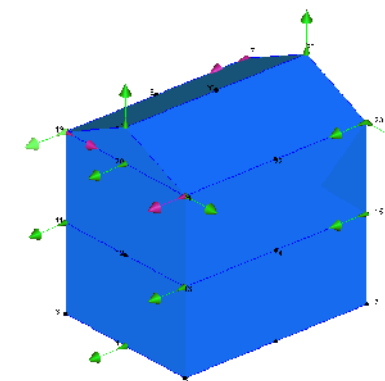


max. PGA 0.40 g

System identification - SSI - ambient vibration



9.8 Hz



Repairing of the URM building



Shaking table test Reinforced



Shaking table test Reinforced

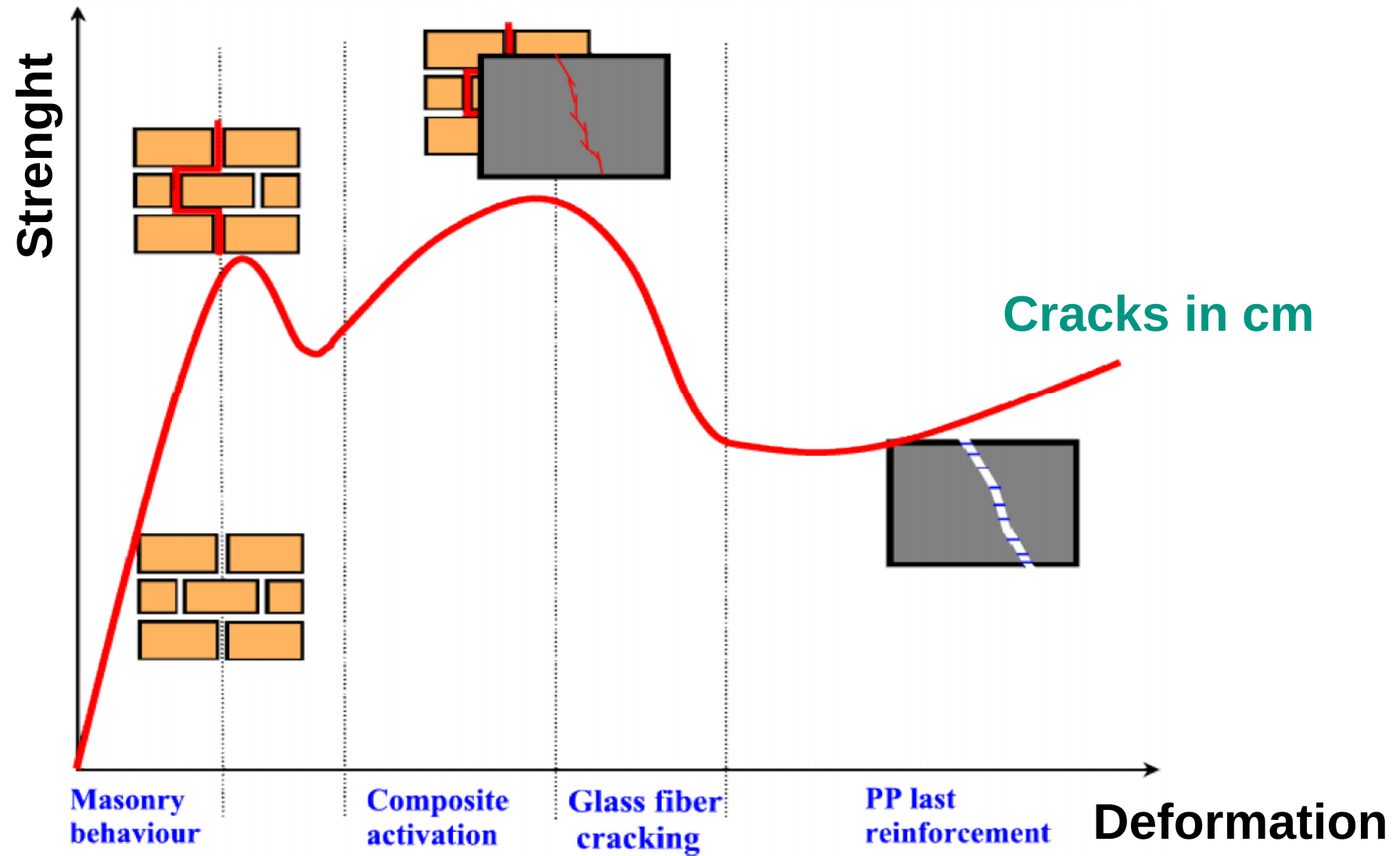


More than 0.6 g

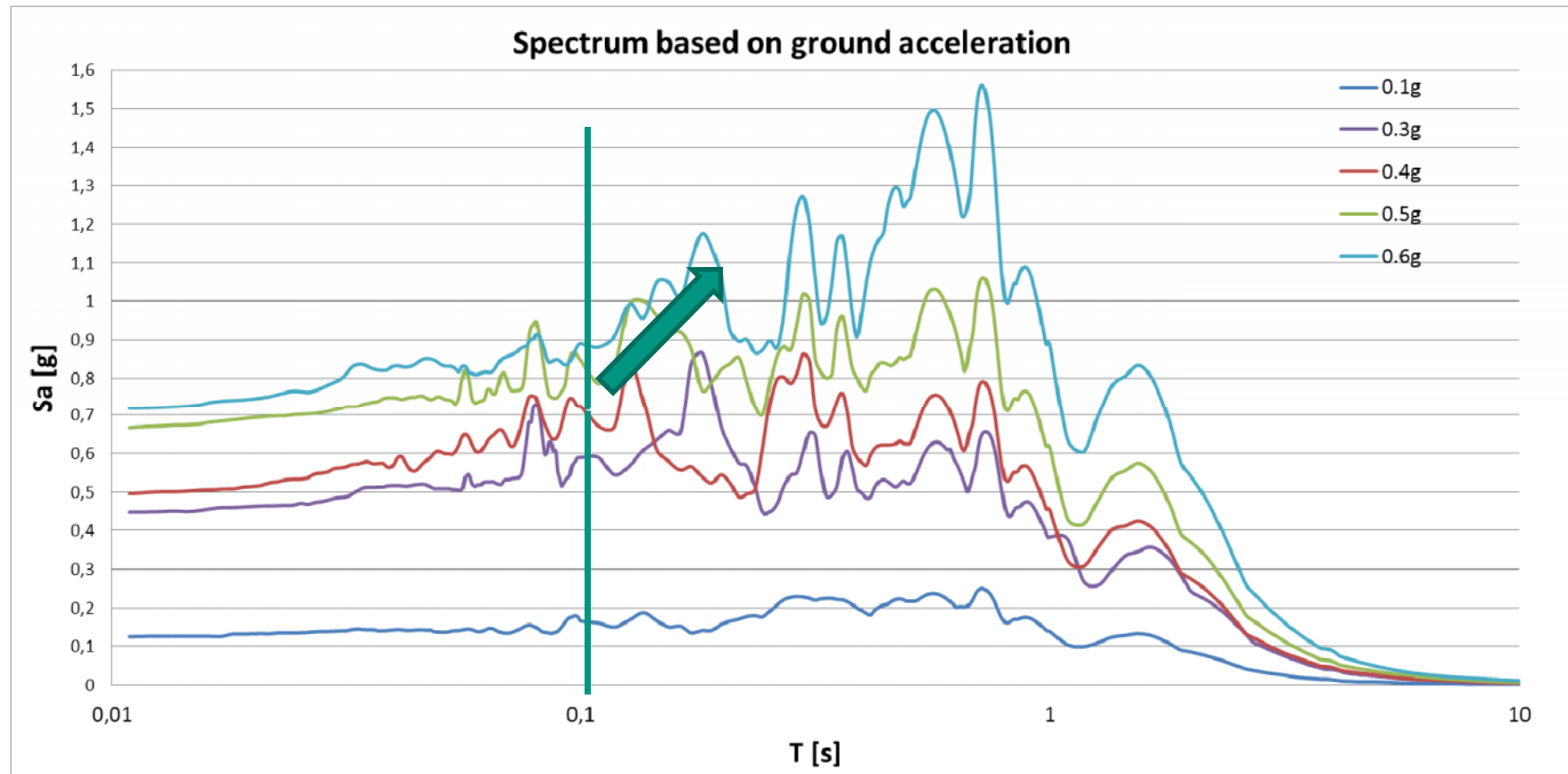


Increase of 50 %

Composite behaviour



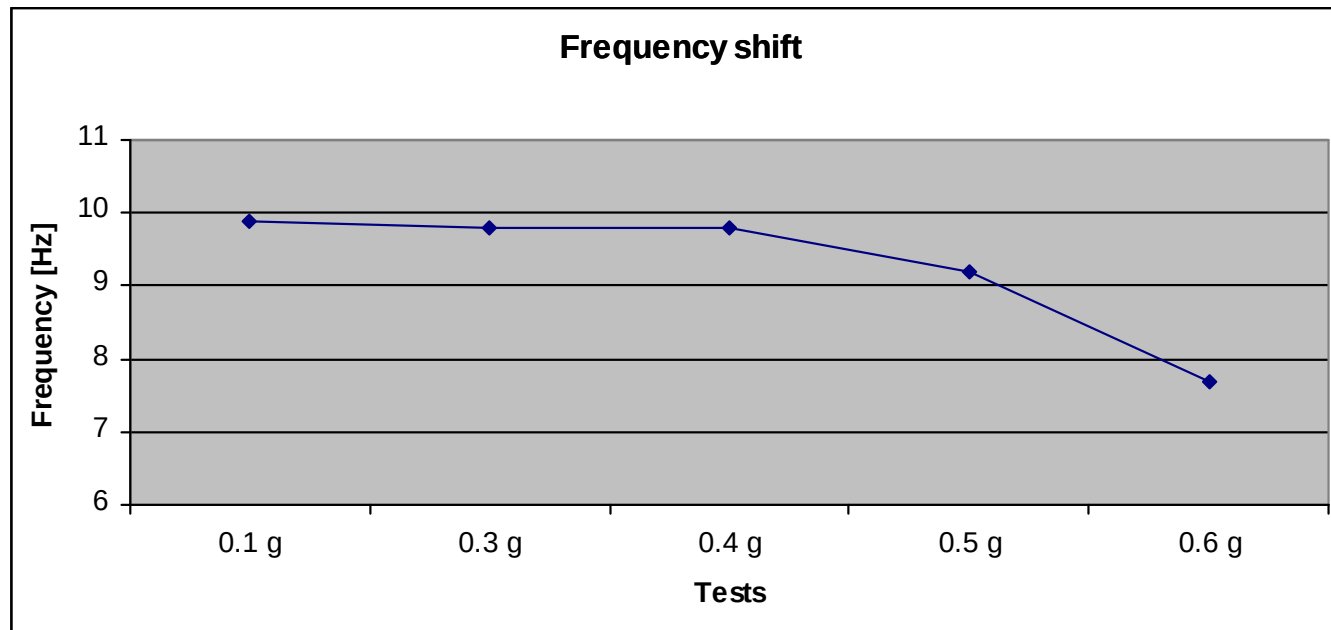
Shaking table test Reinforced



$T=0,102 \text{ s}$

$f=9.8 \text{ Hz}$

Frequency shift of the reinforced Building



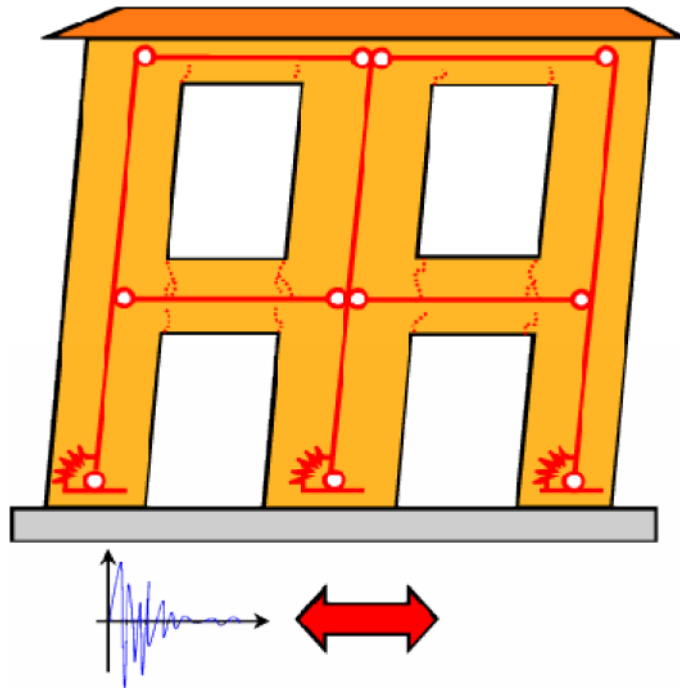
9.8 Hz



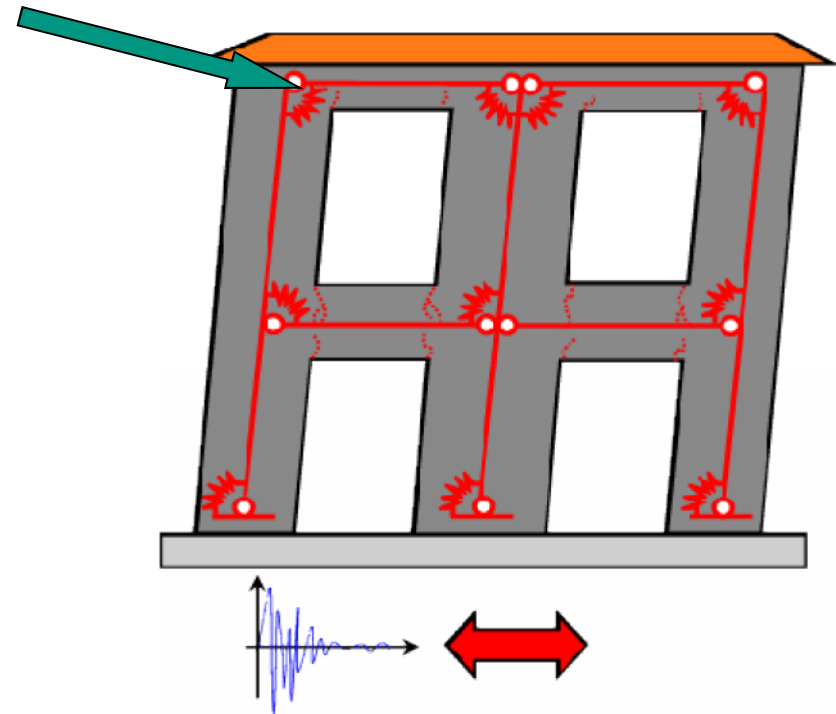
7.8 Hz

Shaking table test Reinforced

Damping Springs



Unreinforced Building



Reinforced Building



Increase in stability

Field Application in Italy



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