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DEPARTMENT OF CIVIL, COMPUTER AND AERONAUTICAL ENGINEERING
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MSc Course in Civil Engineering for natural risk protection
Laurea Magistrale in ingegneria Civile per la protezione dai rischi naturali

MSc Degree Thesis
Tesi di Laurea Magistrale

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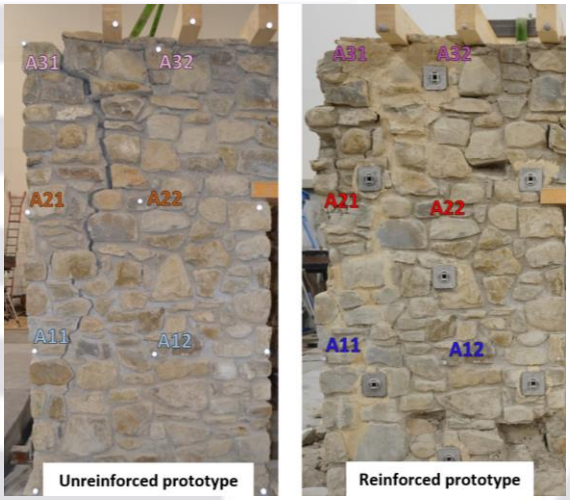
Shake table tests on a rubble stone masonry structure reinforced with UNI-CAM and RISTIL-CAM systems

Motivations and aims

Over the years, Italy has experienced a high number of seismic events, with significant impacts on the communities and architectural heritage. Within RIPARA research project, two new strengthening technologies called UNI-CAM and RISTIL-CAM, were tested, which were developed for the seismic rertorfitting of stone masonry buildings, based on the already existing CAM® system. These systems preserve fair-faced masonry, entail low-impact and improve seismic capacity.

Methods and results



Shake table tests were conducted at the ENEA Casaccia research center on a stone masonry prototype, in which the UNI-CAM system was applied to the front and right walls, and the RISTIL-CAM system on the rear and left walls. Displacements and accelerations were recorded using the 3D-Vision system, FBG sensors and accelerometers. Triaxial tests were carried out under three natural records (Norcia, 24 August 2016; Castelsantangelo sul Nera, 26 October 2016; and Amatrice, 30 October 2016) progressively scaled by 0.05g PGA. The following outcomes were obtained: crack pattern, crack width histories; PGA-displacement curves, acceleration-displacement curves, deformed configurations, fundamental frequencies and damage indices (through the Multiple Input Multiple Output-MIMO method).

Conclusions and future developments

The comparisons between the unreinforced and reinforced prototype demonstrated that both strengthening methodologies increased the seismic capacity, preventing the activation of the collapse mechanisms typical of masonry structures, providing them with an effective box-like behavior. The stiffnesses did not increase significantly, but the displacement capacities were improved. The frequencies decreased in both configurations, but in the reinforced prototype the frequency reduction was slower than in th unreinforced one.