



The use of ultrasonic pulse velocity tests for the diagnosis of ancient masonries: the influence of the applied load

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Sophisticated non destructive techniques for the diagnosis of existing masonry structures have been developed and improved throughout the years, such as ground penetrating radar, thermography, sonic and ultrasonic tomography, laser scanner survey, etc.: by using an integrated approach it is possible to reconstruct the morphology of the masonry walls, to detect the presence of cracks and voids, achieving an accurate and reliable diagnosis of the construction, which is the basis for the restoration design. The ultrasonic pulse velocity (UPV) method can be conveniently used to check the quality of stones, but it can be used also for material characterization. Both the intrinsic characteristic of the stone (porosity, grain size, anisotropy, etc.) and the external factors (humidity, stress, temperature, presence of cracks) may affect the elastic wave propagation, thus in order to correctly estimate the ultrasonic behaviour of the material investigated it is important to know in what manner and how much the variation of the experimental conditions may modify the characteristics of the waves being measured. This aspect is of crucial importance when in situ measurements are made.

In this work the influence of the applied load on UPV results has been investigated. In particular, the research has been carried out on ashlar and on sample masonry panels made of lime mortar joints and Lecce stone, a soft calcarenous stone traditionally used in the Lecce district, South of Italy. The presence of load strongly influenced the UPV measures, due to the particular microstructural characteristic of the stone. The work aim at quantifying this influence in order to correctly interpret in situ measurements.