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Structural performance and durability issues of vernacular schist masonry

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ABSTRACT

Stone masonry is recognized as one of the most common vernacular construction techniques used around the world. Although centuries of proven resilience and high adaptability to context, structural stone masonry was in the last decades, in countries such as Portugal, progressively replaced in construction industry by industrial and concrete-based materials and building systems. Nowadays, with the loss of the old masons, an important part of traditional stone masonry constructive know-how is endangered. In face of growing concerns regarding heritage preservation, researchers are aware of the need to scientifically know such structures. Being less studied, vernacular schist rubble masonry was selected as case study and tested to determine mechanical behaviours and durability parameters. The potential of retrofitting such structures was also assessed [1]. 18 double-leave test wallets (60 cm x 60 cm x 30 cm), with soil used as bedding and joints mortar, were built following local building tradition [2], and prepared according to 3 different setups of 6 specimens each: *i*) non-coated; *ii*) with commercial lime coating; and *iii*) with commercial lime coating and injected with lime-based grout. The experimental campaign was designed and implemented in stages for a period of three years: *i*) stones and mortars experimental characterization; *ii*) axial compression testing of reference specimens (3 of each set); *iii*) specimens salt accelerated aging by full immersion wet-dry test (20% NaCl solution) [3]; *iv*) followed by compression testing. Damage progression was monitored throughout the salt testing by visual inspection, mass variation and sonic testing [4]. Results confirm rubble masonry's low mechanical performance, high deformation capability to readjust and sustain loading. Grout retrofitting improved rubble walls' stiffness and loading capacity on an average of 10 times. Results aged walls show a consistent loss of strength in non-coated (washing of mortars and chemical damage) and coated walls (high internal moisture content). No consistent strength loss was observed in retrofitted walls, proven its potential in the protection rubble masonry against water and salt penetration, thus improving global durability.

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