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The relationship between the bulk density, the apparent porosity and ultrasonic pulse velocity of highly porous limestone, examples from Hungary

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Different stone qualities in masonry walls cause considerable problems on masonry walls during restoration works. The properties of limestone show significant variations due to differences in sedimentary structures which are might not be visible at the scale of laboratory test specimens. Even at one quarry level, there could be major differences in properties due to the cross-bedding or tilted rock beds. Physical parameters of 3 typical types of porous limestone (fine-, medium-, coarse-grained) were studied under laboratory conditions in order to assess an explanation for variations in weathering forms on masonries of historical buildings. Laboratory experiments were performed to determine the bulk density, water absorption, apparent porosity, ultrasonic pulse velocity under dry and water-saturated conditions. Aim of this research is to find correlations between physical parameters of limestones and show considerable diversity in properties. Our results indicate that there is a relationship between dry and water-saturated bulk density vs. ultrasonic pulse velocity and dry and water-saturated bulk density vs. apparent porosity, respectively. It is well known that microstructure influences the damage mechanism of stones. Our research demonstrates that variations exist in the stone fabric even at quarry level, based on the samples of Sóskút quarry. The different limestone lithologies were used side by side in historical buildings; therefore our results help experts during restoration works in decay mapping of monuments.