



The determination of resistance of marble to thermal and moisture cycles: relevance and limits of the recent European natural stone standard

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The recent European standard EN 16306:2013 specifies laboratory methodology on the determination of the resistance to thermal and moisture cycling of marble for cladding of building façades. In particular measurements of bowing and flexural strength should be performed before and at the end of the ageing cycles. Bowing is measured on specimens of dimension 30*100*400mm exposed to moisture from beneath and heating (gradually till 80°C) on the upper face. The flexural strength should be measured both on reference and on exposed specimens in order to assess the variation of mechanical properties. Additional non-destructive tests are foreseen but are not compulsory for the standard. Moreover, the Annex A of the EN 16306, contains a guidance of the limit values that could be useful for the building planner for façade panels dimensioning.

Different varieties of marble (two from Italy, one from Greece and three from Portugal) have been tested by means of this laboratory ageing test. Non-destructive tests such as the measurements of Ultrasonic Pulse Velocity (UPV), porosity, and water absorption have been executed together with the conventional flexural strength test. Image analysis on thin sections soaked with methylene blue have been analysed to further investigate the correlation between porosity and tendency to bowing.

Base on the results obtained, some consideration on the decrease of mechanical resistance and the bowing in relation to the variety of marble tested and the limit values indicated the Annex A of EN 16306 can be drawn. Besides, from the data analysed a deepened discussion has been made. It is known that bowing and rapid strength loss occur in some varieties of marble when used as exterior cladding but further considerations can be made: bowing and flexural strength are correlate and in which way? Often the bowing is related to the decrease of flexural strength but it happens that there is a decrease in the mechanical resistance of the stone also without the bowing phenomenon. Non-destructive tests are surely useful to evaluate deterioration of mechanical properties but attention should be paid to the analysis of results, correlating the information coming from UPV measures with that from porosity evaluation.