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Characterization of Finnish Building materials under salt frost artificial ageing

Nike M. Luodes (1), Akseli Torppa (1), Heikki Pirinen (1), Rossana Bellopede (2), and Paola Marini (2)

(1) Geological Survey of Finland, KUOPIO, Finland (nike.luodes@gtk.fi), (2) Politecnico di Torino, TORINO, Italy (rossana.bellopede@polito.it)

Under a national project co financed by the Confederation of Finnish Construction Industries RT (CFCI), the Finnish Natural Stone Association and the Geological Survey of Finland (GTK), and thanks to the cooperation with the Polytechnic of Turin a comprehensive number of Finnish natural stones has been tested according to SFS EN standards for national CE marking and according to non standardized methods for research purposes. The aim was to evaluate the effects of combined salt and frost weathering caused by de-icing salts and to research a possible correlation between laboratory's accelerated decay and site weathering.
The materials tested (60 stones in total) are mainly silicate rocks showing good resistance to the weathering. Results have been affected in some cases by uncertainties connected to the variation of material quality. Some materials have been from new quarries and variation of their properties has been higher than the effects of artificial weathering. Material sampled from crop presented higher weathering level and the additional artificial weathering has induced small variations.
Results have shown that material weathering has been better represented by variation of flexural strength compared to uniaxial compressive strength. The most probable reason has been that small changes of planarity and perpendicularity had greater effects on the compressive strength than variations by weathering.
Fifteen representative typologies of natural stones have been tested with non standardized methodologies to study the changes of the material and finding a possible correlation with methods used on site. Schmidt rebound test and Ultra Pulse Velocity (UPV) have been used on site to assess the durability of stone on construction. Materials tested in laboratory have shown less variation between rebounds compared to site tests, this can be because of a more controlled environment and saw cut surface instead of rocky or chiselled ones. Laboratory tests showed an average lost in velocity in the three directions of the specimens of 5 - 10% after the cycles, except for quartzite, for which probably the natural heterogeneities had affected the result. In order to evaluate the possibility to see changes induced by the weathering research has continued at microscopic level. Two materials that resulted durable from physical tests had been tested as pilot materials. Fine grained granite Kuru Grey was checked with Advanced Mineral Identification and Characterization System (AMIC S) linked to Scanning Electron Microscope to find difference between chemical/mineral compositions of fresh samples and samples after salt-frost cycles.From the results got the material didn't show changes. In the tests performed on polarization (petrographic) microscope the Qz-diorite (Korpi Black)showed microcrack frequency increased between fresh material and weathered one along one direction, being unchanged along the other, this did not influence variation in compressive value as the material showed homogeneous results.