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Fire related performance of Hungarian stones, changes in strength and other physical properties

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Fire is a one of the key catastrophes that attack urban habitat. Although stones are considered as inflammable materials, fire can cause significant damages in built stone heritage. It causes irreversible changes in building stones within minutes. The aim of this work is to characterize the performance of selected Hungarian monumental stones under various heat regimes. The effect of fire and burning was simulated by using oven-based techniques under laboratory conditions. Three types of limestone, two types of sandstone and a rhyolite tuff were tested. The properties of test specimens were documented before and after heat experiments. The heat caused alterations and damages were studied by analysing colour properties, mineralogy and fabric as well as physical properties. An intensive discolouration was detected fro all rock type, but colour changes do not show uniform trends cases, and are not proportional with temperature. The simulated burning generated not only colour changes but also affected the petrological and petrophysical properties. It could be observed that all samples showed macroscopic and textural changes. The most disastrous changes occurred in limestone samples at above 600˚C due to calcination processes. The seemingly intact heated specimens were disintegrated after few hours by absorbing water vapour from the air (portlandite reaction). The porosity show an increase for all the studied stone types after heating tests. The rate of porosity change depends on the fabric and mineral composition of the stone. The average pore diameter increases due to the widening of pre-existing fissures. These changes influence the strength and durability of tested stones. The results of these experiments can be directly implied in the design and disaster prevention of built urban habitats.