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Characterization and monitoring of processes affecting stone materials applied to historical and contemporary buildings in Brazil

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Degradations of stone materials in historical and contemporary Brazilian constructions were investigated through in situ investigations and the application of non-destructive methods. These investigations of weathering and their possible progressions involved macroscopic descriptions and long-term observations with monitoring through photo analysis. From the set of buildings surveyed, three were chosen, observing the following elements: age of construction, environmental conditions, types of application and content in stone materials. Subsequently, macroscopic descriptions provided lithological information, such as mineralogy and textural features, and the extent or degree of degradations with separation of those that caused depreciations to the constructions. In all three buildings chosen the material studied has granitic composition, with a predominance of feldspar about quartz and presence of subordinate mafic minerals. The rocks have more or less developed gneissic structure. In sequence, the monitoring of the degradations with periodic photographic control was put into practice. Of the set of degradations present in the different buildings chosen, attention was given to a type common to them. In all three cases they were chosen detachments parallel to the surface of plates or plates applied to external areas of the buildings. The first case involves a historical building from the 18th century with surface degradation for blocks of a garnet biotite gneiss with fine granulation, homogeneous structure and well developed foliation. The second case involved the investigation of surface degradation in blocks from a porphyritic feldspar-gneiss to an early twentieth-century construction. In this case, the gneiss differs because it contains large k-feldspar crystals. The third case is related to the surface degradation of plates two centimeters thick of a cordierite - gneiss. With medium granulation, it presents aggregates of cordierite crystals showing some substitution for biotite. This material was used in the covering of a building of contemporary construction, of ends of century XX. In general, all the detachments observed result of blistering processes, most certainly caused by expansion of clays produced by feldspar alterations, for example due to rising humidity. In the first case, as the building is in an urban environment with high rates of pollution caused by intense traffic, the blistering was certainly preceded by the formation of black crusts, whose remains are still visible. In the third case, it is clear that the building is degraded, but only on the plates applied at its base and, therefore, closer to the floor. This situation indicates that the plates of stone materials with problems were affected by the upward humidity, which also contributed to the presence of efflorescence in the areas with superficial layer expansion. These presences confirm the circulation of saline solutions in this part of the building. From the analysis of relations between time, application format and conditions for degradation, it is concluded that the situation found in the newest of the buildings can be identified as the most severe of the three.