LONG TERM DAMAGE OF HISTORIC MASONRY STRUCTURES

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ABSTRACT

Ancient buildings often show large cracks passing through the walls or fine diffused cracks which appear to be stable for years and are not considered so dangerous to menace the structural safety. Anyway those cracks can propagate so slowly that only a monitoring system can register the worsening of the situation, until the collapse comes suddenly and unexpected. After some collapses which took place in the past decades, it is possible now to understand better the long-term damages and their causes and to prevent the failure. In fact in the past it was difficult to understand that also for masonry as for other materials (concrete and soft rocks) failure can occur under constant action (dead load) and in a long range. Now, after a vast campaign of experimental investigation has been carried out on masonry specimens also sampled from ancient walls, it is better known that masonry walls and structures under heavy state of stress induced simply by the dead load can accumulate damage for a long time and suddenly collapse. The cases of two collapses: the Civic tower of Pavia and the Cathedral of Noto will be described together with other cases of damage which where discovered thanks to the knowledge developed after the two failures. Experimental tests were carried out as accelerated creep tests and long term creep tests in order to study the long term behaviour of masonry under constant heavy action (vertical action) simulating the damage caused by compression stresses due to the dead load. Furthermore it has been shown that the creep phenomenon can be easily recognised by the crack pattern survey and interpretation.