

Structural Restoration of the Claudio Aqueduct in Rome: the 'speco'

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ABSTRACT

The preservation of the Claudio Aqueduct (started by Caligula and concluded by Claudius in 47 A.D.) is a relevant theme in the Roman context: the remains of the monument are either lined up about 15 km south of Rome to the entrance to *Porta Maggiore* from which they continue towards the center of the ancient city. The mighty remains (up to 25 m high) characterize the Roman Agro and in fact remain immortalized in paintings, views, postcards for their landscape emergency. It is therefore a work in which conservation also corresponds to the preservation of the historical image and in which interventions must be compatible with the specific wall consistency (volcanic stone block masonry, 'peperino'). The artifact has been repeatedly the subject of consolidation, since the 1st century A.D., attacked for two millennia by the weather, especially in the degradation of the stone, a rather burdensome component, and by anthropogenic actions aimed at the re-use of materials for the Renaissance construction of the Felice Aqueduct (XVI century), parallel to the Claudius and superimposed on the Marcio.

The opportunity for a consultation for the *Soprintendenza* responsible for the protection of the monument (Archaeological Park of Ancient *Appia*), as part of an emergency intervention, motivated the study that focused on a particular aspect of the artifact. The structure is made with a series of arches with a constant shape and size, resting on pylons that, to keep the floor of the duct horizontal, take on different heights in share of the campaign plan but the same size in the horizontal section. The stability of this skeleton, which is reliable overall, is not the subject of the study that is interested instead of the above portion of the 'speco' or the channel that leads the waters by gravity (for a slight slope) from the location of *Capannelle* up to the walls of Rome.

It is a tubular section consisting of the base formed by the rescheduling of the arches, the two longitudinal walls and the roof formed with lithic lintels.

The study identified the vulnerability of this portion of the structure, also considering the tax quota, in relation to the possibility of transversal collapse kinematics; first in conditions of integrity of the component elements and then in the different situations of degradation in which the edges of the wall blocks and the dimensions of the architraves are reduced, broken in different ways.

The analysis carried out on the study of hypothetical kinematics was then verified with a simple but effective modeling carried out with the help of blocks of the same stone and a reclining table that allows, as in Giuffrè-Ceradini's experiments, to establish a value for load multipliers, and subsequently for accelerations, which trigger the hypothesized mechanisms.

In summary, the outcome of the analysis leads to the assertion that the original structure had good resistance to seismic actions and that the reduction of the degradation intervened makes it possible to return to that degree of security. The reinforcement hypothesis therefore foresees, as an intervention of greater consistency, the insertion, where necessary, of reversible horizontal bars, capable of restoring the continuity of the lintel.

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