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Moisture monitoring experience in the old town of Genoa (Italy)

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ABSTRACT

The paper describes the monitoring process, which was conducted in an important and valuable religious building in Genoa: St Matteo Abbey. It has had serious problems with rising damp both in the hall, where the damage is particularly evident on the walls of the lateral aisles, and in the space below the crypt. In 2012, the Abbot decided to use an active system of wall dehumidification, which works with electromagnetic waves. The monitoring activities were carried out simultaneously and independently by Ecodry Italia and the University, under the supervision of both Superintendence (administrative architectural heritage body) and Curia (religious administrative body). During the days agreed for monitoring, measurements were taken independently by both parties in the same points with different equipment. There were four types of moisture measurements: environmental, superficial (Electrical Resistance method), sub-superficial (Electrical Capacitance method) and deep measurements (Gravimetric method). The paper includes the results of the moisture monitoring performed from 2012 to 2016. During the monitoring process, 6 survey campaigns were carried out, which, each time, investigated the same points and parameters to obtain values comparable to each other, in order to evaluate the actual effectiveness of the installed devices. The case study revealed critical issues regarding the structure of the Abbey that should have discouraged the choice of the dehumidification equipment and that inevitably reflected negatively on the outcome of the monitoring. It is therefore not possible to deduce, from such a complex case, a univocal result that proves that the installed dehumidification system is effectively decreasing the amount of moisture present in the walls of the Abbey of St Matteo, hall, and the room under the crypt.

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1. Introduction

The Abbey of St Matteo [1,2] is located within a small square in Genoa's old town. The church was built in the thirteenth century by the powerful noble Doria family. The Abbey (Fig. 1) was built in 1278 upon the remains of a previous church (1125) that had been commissioned by a member of the Doria family, but which no longer reflected the growing power of the family. In the first half of the sixteenth century Andrea Doria, a brave admiral, who was extremely influential among the European courts in the Mediterranean, commissioned new important construction work in the Abbey. He appointed Giovanni Angelo Montorsoli to renew the crypt, the chancel and the dome, although, the largest part of the work was executed in the second half of the sixteenth century. Afterwards, Giovanni Battista Castello, known as Bergamasco, and Luca Cambiaso were then appointed to radically renew the design of the Abbey [3]. They decided to significantly widen its volume

by modifying the proportion of the hall, decorating it with mural paintings and stuccoes.

During the eighteenth and nineteenth century, the Abbey was enriched by the addition of noteworthy artworks and it underwent new interventions that did not modify its shape. In 1934, the Abbey was restored by Orlando Grosso, who mostly worked on its façade with its black and white striped design [4]. The Abbey has a longitudinal plan and it is constituted by a dome built on an octagonal plan, while the choir area ends in a semi-circular apse (Fig. 2). In the same area as the choir, a crypt was built in the sixteenth century and it was decorated entirely with stuccoworks by Montorsoli. In this crypt one can also observe an altar and the tomb of Andrea Doria, who himself commissioned a few years before his death in 1560. During a restoration campaign in 1962, a previously undocumented room was rediscovered under the crypt. The room was then connected to the crypt through an iron grid placed on the vault that divides the two spaces. In this room another tomb belonging to the Doria family was found alongside an urn with unidentified relics. Next to the Abbey and directly connected to it, there is a thirteenth-century cloister with a quadrangular shape and covered by cross vaults resting on coupled columns.

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Fig. 1. St. Matteo Abbey in Genoa's old town. The Abbey is surrounded by the houses of the old town, which is also why it is difficult to see its walls and understand the complexity of its humidity problems. In addition to a significant problem of damp rising from the ground—which the present contribution deals with—there are also issues with condensation and infiltration from above. These issues with condensation and infiltration are also linked to a small private terrace above the covering of the left aisle, which complicates the drainage of rainwater.



Fig. 2. The Renaissance style of the Abbey.

The Abbey has had serious problems with rising damp both in the hall, where the damage is particularly evident on the walls of the lateral aisles, and in the space below the crypt. Humidity in churches is an old problem, as described in numerous texts from the eighteenth and nineteenth century [5,6] and shown by a series of interventions by Montorsoli in the sixteenth century to improve the crypt's aeration (i.e. the air duct reaching the roof and grates connecting the crypt and the hall). In the 1960s, the Superintendence restored the Montorsoli's crypt, as both marble and stuccoworks were deteriorating due to high humidity levels. The restoration was led by Giacomo Raitano, who, in order to find the cause for such humidity, had some marble slabs removed. This led to the discovery of the aforementioned room located under the crypt. The rediscovered space was flooded by water flowing in from two ducts, which were obscured deep down in the room. Believing this room probably worked as a sewage system for rainwater, Raitano decided to plug the water ducts. However, water adduction filtering from the ground has never ceased (with varying intensity depending on the season). During the flooding in October 2014, this area flooded again and even two months after the event, there was still 60 cm of water.

The conservation of stuccoes, marble, mural paintings and artwork in the Abbey is currently threatened by humidity as well as the formation of saline efflorescence, which lead to widespread phenomena of disintegration, pulverisation and exfoliation (Fig. 3).

The wealth of high quality decorative work in the Abbey requires every possible intervention to prevent its gradual degradation. For this reason, in 1992 the Superintendence of Cultural Heritage led an intervention of dehumidification by injecting a chemical barrier along the longitudinal walls of the hall at around 25 cm from the floor. This intervention however, did not resolve the problem—saline efflorescence is visibly depositing around the injection holes (Fig. 4) and both marble and stuccowork are already under threat of disintegration and exfoliation.

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