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Honors theses

The Citroniera and Scuderia Grande in Venaria Reale. Static behaviour and degradation analyses
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The Reggia of the Venaria Reale represents an enchanting and complex clustering of yards, building techniques and design methodologies.
The Palace is the most imposing building within the architectural and park complex that makes up the "crown of delights" of court residences, hunting lodges and splendid houses surrounding Turin.

Today, the Reggia and all its extension witness renewed interest through a restoration programme. Indeed, its refurbishing and the implementation of an area of artistic heritage are becoming the largest European investment of this end of century. Thanks to the funds given by the Italian Government and the European Union, the programme has determined many building allotments with the publication of different competitions for the work assignment.
A convention between the Regione Piemonte and the Ministero per i Beni e le Attività Culturali (Ministry of Cultural Heritage) has given the Local Administration the

authority to advertise all the competitions through the foundation of an office called "Progetto La Venaria Reale" (Venaria Reale Project).
In April, 1998 I obtained from the Ministry of Cultural Heritage the permit to carry out a Degree Thesis about the Citroniera and Scuderia Grande, built in 1722 by Filippo Juvarra. This building is composed of two parallel barrel vaulted galleries, joined at the southern extremity by a hall, designed with an extraordinary refined facade, serving as a backdrop to the royal gardens.
During the search for documents and free access permits to enter the monument, I had the opportunity to meet with the architects responsible for the Venaria Reale Back-Office.
I learned about the international competition related to the Citroniera restoration and its possible transformation in a museum.
All participants had received a portfolio including building plans and sections; during the meetings with the responsibles, it has been suggested to complete the graphics documents with summarising static analyses about the conservative conditions of the Citroniera, absolutely relevant to my thesis.
Through the Archives consultation, I identified some of the research methodologies necessary to complete and integrate the information collected during the previous years.

The Static Relation should have completed the researches already realised with an ensemble of new diagnostic technologies, for a complete definition of the new allocation for the functional recovery of the building.
This relation was commissioned to Emanuele Giletti, a civil engineer, who accepted my co-operation as a student.

In collaboration with a company called Tecnofutur Service s.r.l. (based in Modena), we carried out six analyses with flat jacks, six drillings and twelve endoscopic shots. Six excavations were necessary to define the foundation plan; the shots enabled to define the thickness of the walls; we also explored the vaults passing under the floors, so as to understand the geometry of curved surfaces.
Then, we picked up some samples of mortar from the inside of wall sections to put into effect a petrography study.
The experimental results led to the definition of a Finite Elements Model (F.E.M.), necessary to study the tension state of the different main walls.
The thesis is divided in different sections, following the chronology of testing procedures.

- Methodological analyses have been introduced by some principles of fracture mechanics, necessary to understand the results obtained on the site.
- The analysis of materials, bricks and mortar and their degradation, supported by some elements of chemistry and mechanical resistance, allowed to identify the best and most suitable methodologies in a context such as Juvarra's Citroniera. I studied all the degradation caused especially by water, in all its expressions (capillary lifting, infiltration and flowing down).
- Then came the study of the static of the building. Load analyses have permitted to check the stability of a pilaster, chosen as a sample, thanks to the modular repetition of the double gallery. The result obtained with the graphic static methodology (Mery method) has been compared with the values of flat jacks and PC (Fem method) calculations.

As a conclusion of the survey, it has been possible to define that the Citroniera and Scuderia are in good conditions and suitable, after appropriate restoration, for a new destination such as a museum or exhibition centre.

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