

POLYTECHNIC OF TORINO
FACULTY OF ARCHITECTURE 1
Degree in Architecture
Honors theses

**Problems of reinforced-concrete structures' decay. Rehabilitation techniques.
Dissertation about the case of Public Works Hall of Turin**

As years go by reinforced-concrete constructions' decay has reached considerable sizes.

As far back as the eighties, reinforced-concrete has been considered the "eternal material", both able to forgive any mistakes and requesting no upkeeping expenses. The traditional structural planning, based on mechanical strength checks and computational aspects, proved inadequate with advantage to a more global and segmented conception.

Considering all decay types, that is physical, mechanical and chemical, and their rehabilitation techniques, I've closely examined the ones concerning the Public Works Hall of Turin.

The building has been planned by the architects Mario Passanti, Paolo Perona and Giovanni Garbaccio since the thirties but it's been built only at the beginning of the sixties.

It's now in bad conditions: at visual examination, it doesn't show any stability problems, but an extensive superficial decay, particularly on the northern and western façades.

The restoration of the façades has been necessary to solve decay problems. If this kind of decay had advanced, the security of the users and the statics of the building would have been compromised.

My degree thesis is divided into the three main ambits of the planning work and consolidation: anamnesis, diagnosis, therapy.

The anamnesis discusses two aspects: the first is more general and consists in getting information about the building techniques, the materials used at the moment of the construction and their gradual decay.

The second one is more specific and acquires all historical, urbanistic and constructive ups and downs of the building.

The diagnosis has been organized in this way: technical papers acquisition; photographic and geometrical survey of the cracks; diagnostic survey through undamaging instruments (such as mini core borings and small removals by stone chisel); visual and instrumental searching in order to evaluate the building's present conditions and their effects on durability. (In case of concrete by: mercury porosimeter, phenolphthalein test, X-ray diffractometer (XRD), differential thermal analysis (DTA); in case of iron rods by: chemical analysis with optical spectrometer, metallographic analysis with optical microscope).



Therapy considers restoration techniques when concrete has suffered carbonation and iron rods have been oxidized causing cracks and spalling of the external concrete: realkalization, use of silanes, removal of carbonated concrete and restoration with fibre-reinforced at contrasted expansion grout.

Load-bearing restoration of the combined compressive and bending stress of the pillars in the eastern arcade has been made by wrapping with unidirectional carbon-fibre materials.

The plan includes the quality choices of the project, their feasibility assessed by the right structural calculus (by means of a calculating program called Dolmen) and the designs, accompanied by photographs of the various stages of the building yard.



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