POLITECNICO DI TORINO
SECOND SCHOOL OF ARCHITECTURE
Master of Science in Architecture
Honors theses

Smar_To: from the urban reconnection to the smart grid. Urban, energy and structural renovation of an existing building

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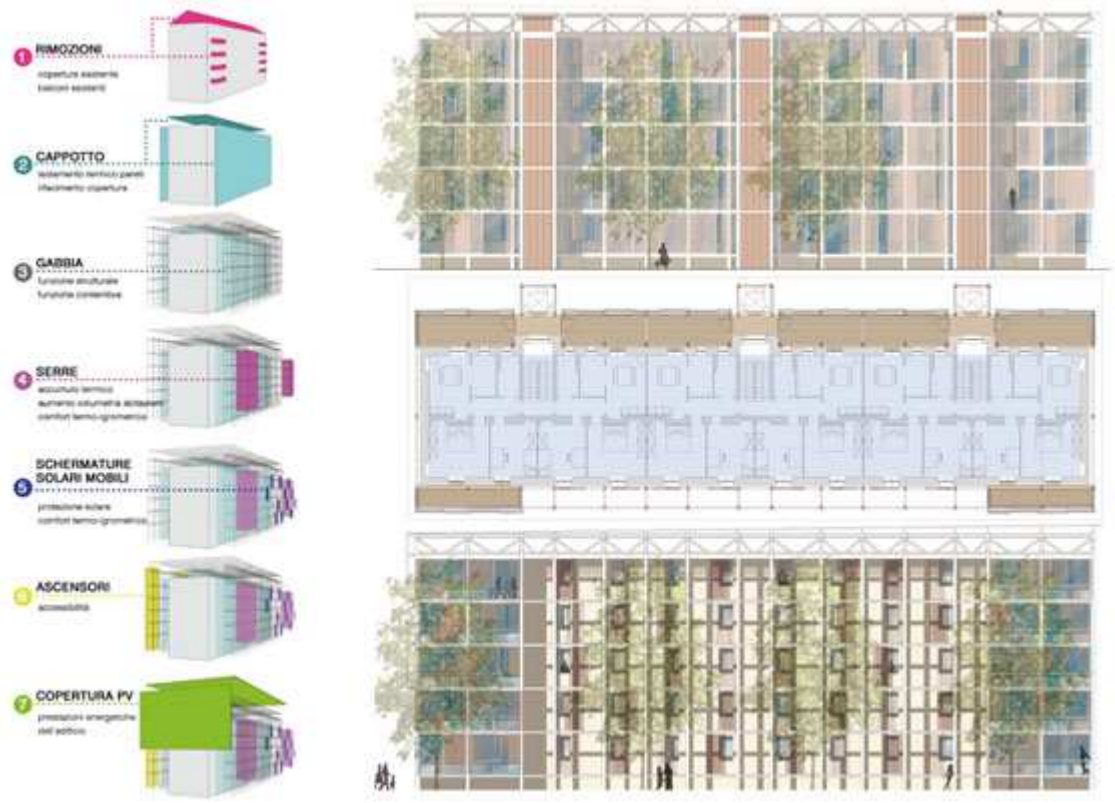
The thesis is a result of participation in the workshop "Smart Building Smart City in Torino" held in September.
During the workshop, the design team was responsible for the architectural and urban regeneration in a suburb of Turin located in the Northeast quadrant of the city, between Corso Taranto and Via Bologna.
The proposed master plan includes:

- redesign of the road hierarchy, through the inclusion of areas 30 and the increase in bicycle and pedestrian paths;
- reduction of the spaces and driveways increase in urban connections, by workstations car and bike sharing;
- arrangement of green, preserving the existing tree species and typing of urban gardens;
- re-design of public lighting, using devices in automatic adjustment of intensity, to reduce the light pollution upwards;
- inclusion of active solar technologies in coverage.

Masterplan and conceptual render design

The architectural project was designed to obtain a "cage" protection for the building that can respond to energy needs and structural posed objective of the thesis.
For each building is provided for the removal of the existing roof and balconies, in order to eliminate heat bridges. The second step of the project involves the insertion of a continuous coat that plays the whole building. The exoskeleton allows the inclusion of solar greenhouses, which allow an volumetric increase of housing, furniture and sunscreens that provide good thermal comfort inside the apartments. In addition, it was thought to flank to the exoskeleton of the elevators in a manner that each floor except the first is more accessible. Finally, there will be the inclusion of a light cover that can act as a support for solar thermal and photovoltaic.
The proposed project will totally change the architectural composition of the facade: the east elevation is more open, not having to deal with excessive overheating in the summer, while the west elevation remains firmer to enhance the shading of conservatories during summer afternoons.



Concept and architectural design

The idea steel exoskeleton is designed to adapt the building to the anti-seismic regulations Italian and then to ensure greater security in the event of a seismic event. The "cage" standing alongside the existing building, anchoring it through appropriate structural chemical anchors in order to absorb and dissipate the energy due to the earthquake. This system greatly reduces the damage seismic phenomenon ensuring structural safety both for the Limit Exercise States (LES) than for Ultimate Limit States (ULS).
For confirmation of the truthfulness of the project results the study took into account different seismic zones, such as Turin and Messina.

SITO	EDIFICIO NUDO				EDIFICIO CON ESOSCHELETRO				
	SLU	SLV	SPOSTAMENTI MASSIMI SISMA 1 [mm]	SPOSTAMENTI MASSIMI SISMA2 [mm]	SLU	SLV	SPOSTAMENTI MASSIMI SISMA 1 [mm]	SPOSTAMENTI MASSIMI SISMA2 [mm]	Quantità di acciaio [Kg]
TORINO	N.V	N.V.	24,51	20,8	V	V	14,63	11,79	174658
MESSINA	N.V	N.V	108,84	61,59	V	V	57,39	45,64	243699,8

Results of calculation and deformation modal

The energy retrofit was achieved through actions to reduce the dispersion of the housing and through the application of active solar technologies. The overlap to the existing building of an outer coat of wood fiber, replacing existing windows, the elimination of existing balconies and the re-roofing have allowed us to significantly reduce the specific energy needs of the case, passing from G to class B. Considering the energy contribution of the solar thermal, photovoltaic and the passive solar systems, the building is able to be certified as a class A +.
The exoskeleton self-supporting becomes "bones" that solves the problem of adjusting seismic and allows a "skin" energy efficient to transform architecturally and technologically in an intelligent building.
The study addressed was interesting for its potential to adapt to different contextual reality according to the peculiarities of the area and the type of construction of the base.

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