POLITECNICO DI TORINO
FIRST SCHOOL OF ARCHITECTURE
Master of Science in Architecture Construction City
Honors theses

Build on: upper floor addition of ATC housing estate in Via Pietro Cossa, Turin. Energetic and economic optimization of the interventions on the existing one and of the planning of new constructions

by Elisa Nigido
Tutor: Gustavo Ambrosini
Co-tutors: Guido Callegari, Vincenzo Corrado, Paolo Rosasco

The aim of this thesis is to calculate the consequential economic saving from different levels of energetic performance both in the case of the improvement of the buildings that in that of the planning of new constructions.

The work starts in the workshop to *Build On Trasforming Architecture* held by G. Ambrosini and G. Callegari, whose theme is the use of the coverages for the retraining of existing complexes and the installation of new functions, limiting the consumption of ground.

After a first part of analysis of the Italian and European strategies of intervention, with particular attention to the existing examples in Turin, I decide to focus the study on a case of our city with the collaboration of ATC in Turin. The wish of analyzing a case of social housing was born , for instance, from the importance that the economic factor invests in both the ATC, that realizes and manages these complexes, and above all, for the end user.

I analyzed therefore the complex of Via Pietro Cossa in Turin, constituted by six buildings in line and two towers, respectively of six and eight floors, that needed improvements and is lent to the upper floor addition of the buildings.

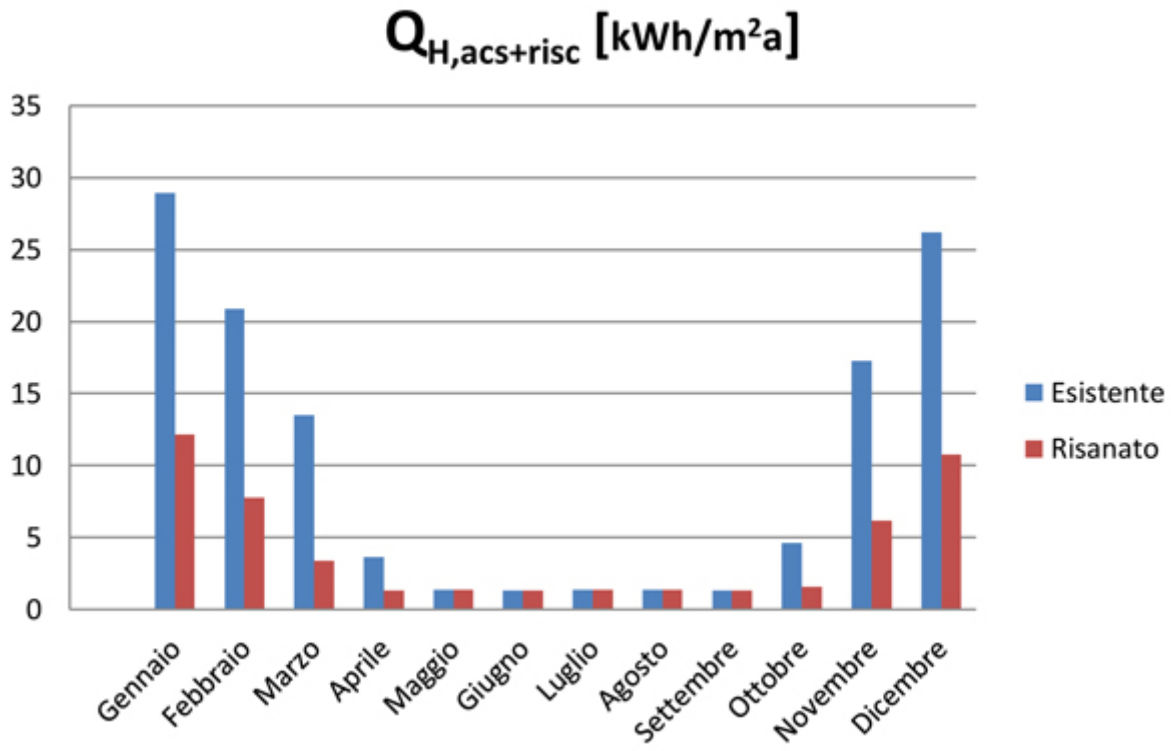
After preliminary analysis about the structure, the urbanistic parameters and economic convenience of the intervention, I started the energetic analysis on a building type of the complex.

Using the Cost Optimal Methodology, designed by Vincenzo Corrado and Energy department of Politenico of Turin, I studied the relevant packages of energy efficiency measures for the buildings improvements. I decided to employ five measures (external wall insulation, thermal insulation of cold zones, roof thermal insulation, floor thermal insulation, window thermal insulation) and I calculated five levels of energy performance and their cost.

	Level of EEO					Level of EEO				
	1	2	3	4	5	1	2	3	4	5
No. EEO	Parameter values [kWh/m²K]					Cost of EEM [€]				
5	0,271	0,247	0,192	0,156	0,143	€ 280.766	€ 285.766	€ 292.774	€ 298.121	€ 300.814
5	0,246	0,213	0,19	0,17	0,154	€ 9.411	€ 9.781	€ 10.152	€ 10.525	€ 10.893
5	0,27	0,228	0,191	0,155	0,142	€ 139.806	€ 141.738	€ 142.777	€ 144.053	€ 144.695
5	0,423	0,352	0,301	0,264	0,209	€ 44.166	€ 44.449	€ 44.729	€ 45.008	€ 47.256
5	3,147	2,369	1,871	1,6	1,343	€ 0	€ 65.774	€ 54.544	€ 73.444	€ 77.935

The five energy performance levels and their cost

After inserting the data in the calculation method, the program simulates the building so to find the optimal package of measures and estimates the consequent reduction of energy needed for heating and hot water.



Reduction of energy need for heating and hot water before and after buildings improvement

After having found which works were to be done and the physical proprieties of the materials to use, I proceeded with the project and the cost analysis. The objective of the upper's floor addition design was to create the greatest possible number of apartments, accessible to the disabled people. For the upper floor addition a cost optimal methodology was used; I designed two solutions with different energy performances and tested the best. The first solution had a good performance, like an Italian energy class B, but the second solution had a best performance, like a Italian class A. To decide which was the optimal solution, considering the initial expense, maintenance costs and the energetic save, on a 30 years interval, I calculated the cost of each solution and I simulated the two levels in the program.

Finally, thanks to the data analysis, it is possible to calculate annual economic saving for the improvement of energy performance both for existing building and for a new construction. This saving it's calculated for all the complex, for a typical building and for one apartment of 60 mq.

RISPARMIO ENERGETICO COMPLESSO	PRESTAZIONE ENERGETICA	SUPERFICIE	CONSUMO ANNUO	COSTO ENERGIA*	COSTO TOTALE ANNUO	RISPARMIO
	[kWh/m^{2}a]	[m^2]	[kWh/a]	[€/kWh]	[€/a]	[%]
EDIFICIO ESISTENTE	121,94	15.900,93	1.938.959,53	0,10	193.895,95	
EDIFICIO RISANATO	49,98	15.900,93	794.728,53	0,10	79.472,85	
RISPARMIO	**71,96**		**1.144.230,99**		**114.423,10**	**59,01**
SOPRAELEVAZIONE SOLUZIONE 1	47,11	4.151,98	195.599,78	0,10	19.559,98	
SOPRAELEVAZIONE SOLUZIONE 2	38,73	4.151,98	160.806,19	0,1	16.080,62	
RISPARMIO	**8,38**		**34.793,59**		**3.479,36**	**17,79**

Energy and economic saving for existing building and new construction

For further information, e-mail:
Elisa Nigido: elisa.nigido@gmail.com