POLITECNICO DI TORINO

# Honors thesis

COURSE OF ARCHITECTURE

*Abstract*

**Energy performances and costs of a multifamily building.**
**A project optimization.**


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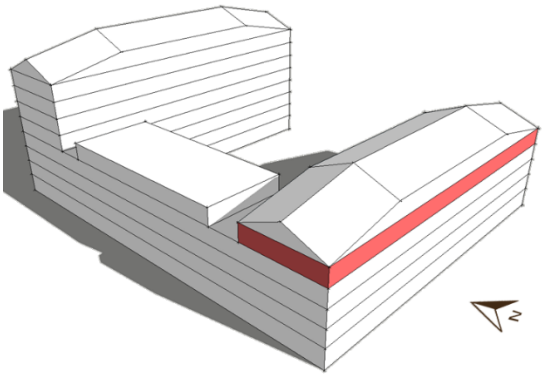
The strong dependency on fossil fuels and the worrying increase of worldwide $CO_2$ emissions keep pushing all industrial sectors towards the adoption of strategies of energy saving and reduction of ecological footprint. The building sector plays a fundamental role in this challenge and the importance of “energy efficiency” is universally recognized.
Today, the availability of technical and regulatory tools allows estimating with accuracy the energy performance of buildings. Strategies that allow the architect to work in terms of energy saving are in the first place the ones that optimize the climatic and environmental contest in which the building is located.
To evaluate the environmental and psychrometric factors into the project with precision, professionals in the field use dynamic energy simulation tools. In this work this kind of tool was used (in particularly TRANSYS –Transient System simulation tool), to calculate the energy needing of some units of a residential building recently built in Cremona (Italy) and to assign the energy class according to new Italian regulations. Dynamic simulation results were than compared to static simulation results.

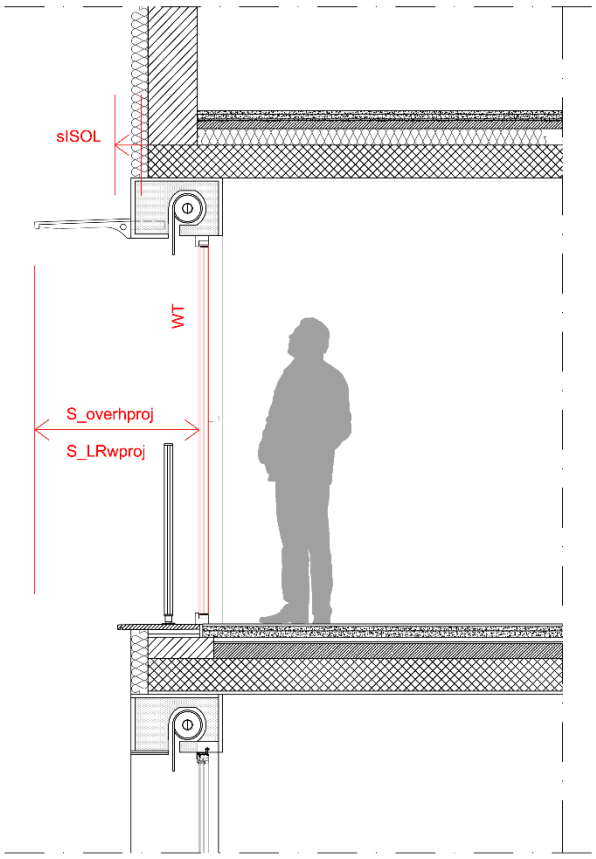
Subsequently a parametric study was executed with the aim to evaluate the incidence on heating, cooling needs and on the total consumption of primary energy of some project parameters’ variation (insulation thickness, typology and size of windows, length of overhang projection, absorption’s factors) with GenOpt (“Generic Optimization Program”).

By means of particle swarm optimization algorithm, two optimization process were carried out: the first minimizing the annual primary energy demand for heating, cooling and ventilation, the second minimizing the annual energy operational cost.
Based on optimized solutions, parameter’s optimal values related to possible savings of energy e money were found.
Lastly, other potential optimal configurations of project parameters were calculated hypothesizing to change the climate context of the building.


*Analyzed floor layout for optimization*



*Building scheme with indication of the analyzed floor (red portion)*




*Representation of some parameters considered for the optimization process*

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