

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

Influence of the envelope on the inner environmental thermal comfort conditions. Application to the On&On prototype of self-sufficient house

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The research tries to demonstrate the influence of the thermal envelope on the internal occupancy. The study has been carried out using a wide range of tools that can simplify the technical work during the preliminary stages, beyond the fulfillment proof of a too less restrictive normative. For this reason the reference taken to define the thermal properties of the envelope is the *Cepheus project (Cost Efficient Passive Houses as European Standards)*, that offers the guidelines for heat loss reduction and energy saving optimization, with renewables.



The strategies adopted in the preparation of the external envelope act passively on the wellness of the dwelling, and the simulations, carried out with software for calculating dynamic conditions, were performed to support the model. The analysis of the self-sufficient living prototype On & On House, developed with the *Universidad Politécnica de Valencia* for the international completion *Solar Decathlon Europe Madrid 2010*, analyze the implementation of bioclimatic strategies as direct solar uptake, sunscreens, optimization of natural lighting, low transmittance envelope, thermal bridges control, thermal inertia and natural ventilation to reduce internal loads.



The analysis highlighted some critical aspects of the project, mainly attributed to the adaptation of a lightweight prefabricated building to the Mediterranean climate. The main one is about the technological aspect and is related to the problem of the thermal mass in lightweight construction: the sandwich rockwool panels, almost devoid of thermal inertia, have low thermal control potential, which is needful during the warmer months. The application of an artificial inertia system, as the change phase materials, could be a solution for this problem.

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