

The first Passive House Plus office building in Portugal – an optimization process

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Introduction

This work explains the defined strategies and solutions to optimize the office building performance and scenarios to reduce its construction costs in comparison with the initial design. Additionally, this work mentions the major challenges during both the design and the construction phases.

The Danosa headquarters in Portugal has 800 square meters of treated floor area and it is integrated in a larger industrial Danosa complex. The initial design that was concluded in 2022 did not take into account the Passive House performance. Being a Passivhaus Portugal partner for almost ten years, Danosa decided to implement the Passive House principles and obtain the certification. The construction started in July 2023 and was concluded in October 2024.



Figure 1: Danosa headquarters in Portugal, east façade.

Challenges

Design stage

In regard to the design, the major challenge relied on the transparent envelope, because the building has a very high window to floor area ratio and the majority of the window area is facing east, which can harm the optimal relation performance/cost-benefit. Also, in the initial design, no external shading was defined. In this particular case, not every improvement measure was possible to implement due to the pretended building aesthetics.

Construction stage

During the construction phase the focus of all the stakeholders was in achieving the required airtightness level. When the first blower door test was performed the leaks were identified and corrected and a couple of weeks later, after a new blower door test, it was finally obtained the results to comply with the Passive House standard.



Figure 2: The challenges during the construction phase: thermal bridges and airtightness.

Results

Certification

The Passive House Plus certification was achieved, resulting in the first certified Passive House office building in Portugal.

Construction costs

The construction costs revealed a minor reduction when compared with the initial design, due to the savings related to heating and cooling equipment. If more design optimizations were allowed, a larger reduction in construction costs could be achieved.

Building operation

There is no available performance data concerning the building operation. The feedback from the users highlights the thermal comfort, the low heating and cooling energy consumption and specially the acoustic comfort due to the proximity of a train rail [Falcão 2025].

Lessons Learned

This work demonstrates that the Passive House certification is a perfectly achievable goal in warmer climates, even when building was not designed initially as a Passive House. It also reveals that the design optimization to comply with the Passive House standard can lead to the reduction of construction costs, in the presented context.

References

- [Falcão 2025] Falcão, Inês: *contribution to the debate of the Session 1 of the 13th Passivhaus Portugal Conference 2025*. Available here: https://www.youtube.com/watch?v=9PNMuV_oXi8