



The Passive House Center

practical training, building community and spreading knowledge

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Introduction

João Marcelino



- Civil engineer
- Certified Passive House Designer
- Passive House trainer
- Passive House Building Certifier
- Founding member and board president of Passivhaus Portugal Association



Table of contents

1. Introduction
2. Goals
3. The construction phase
4. Results and feedback
5. Conclusions
6. Next steps

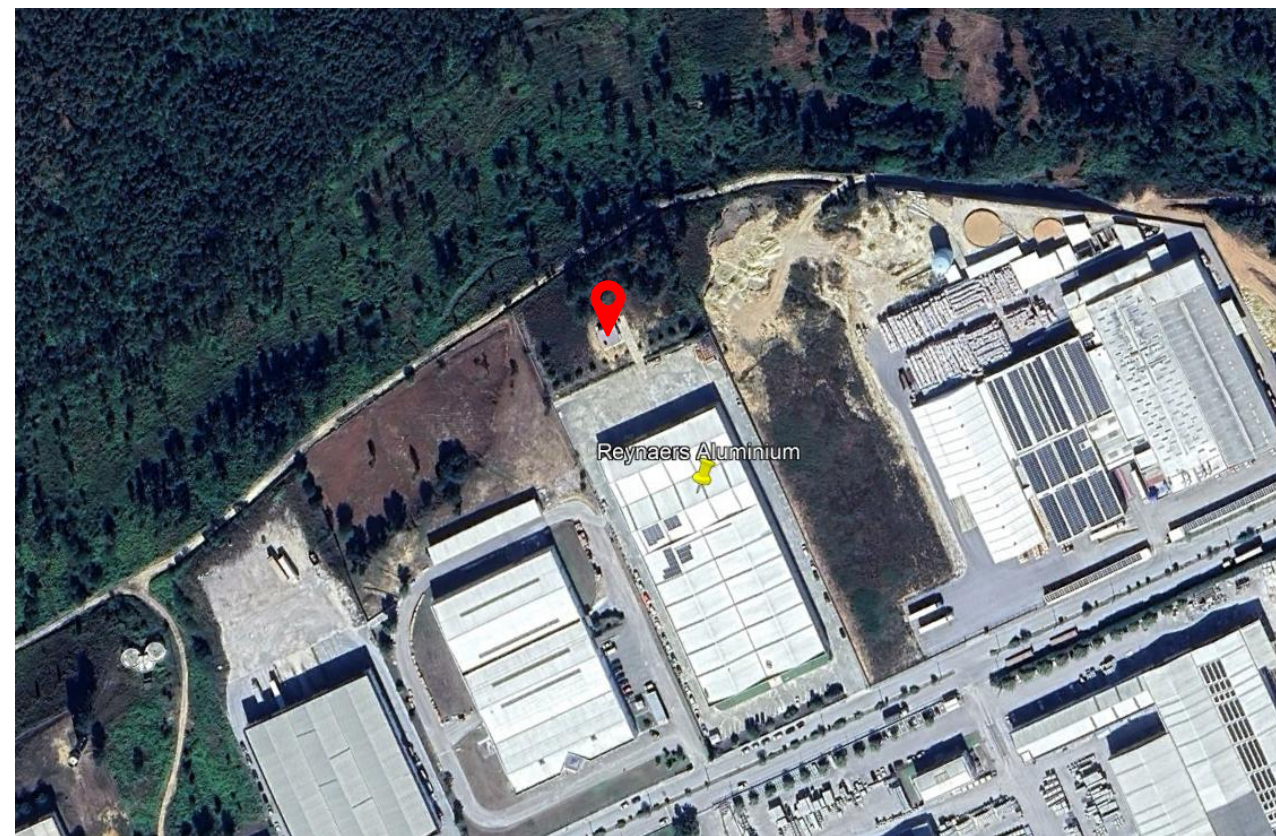
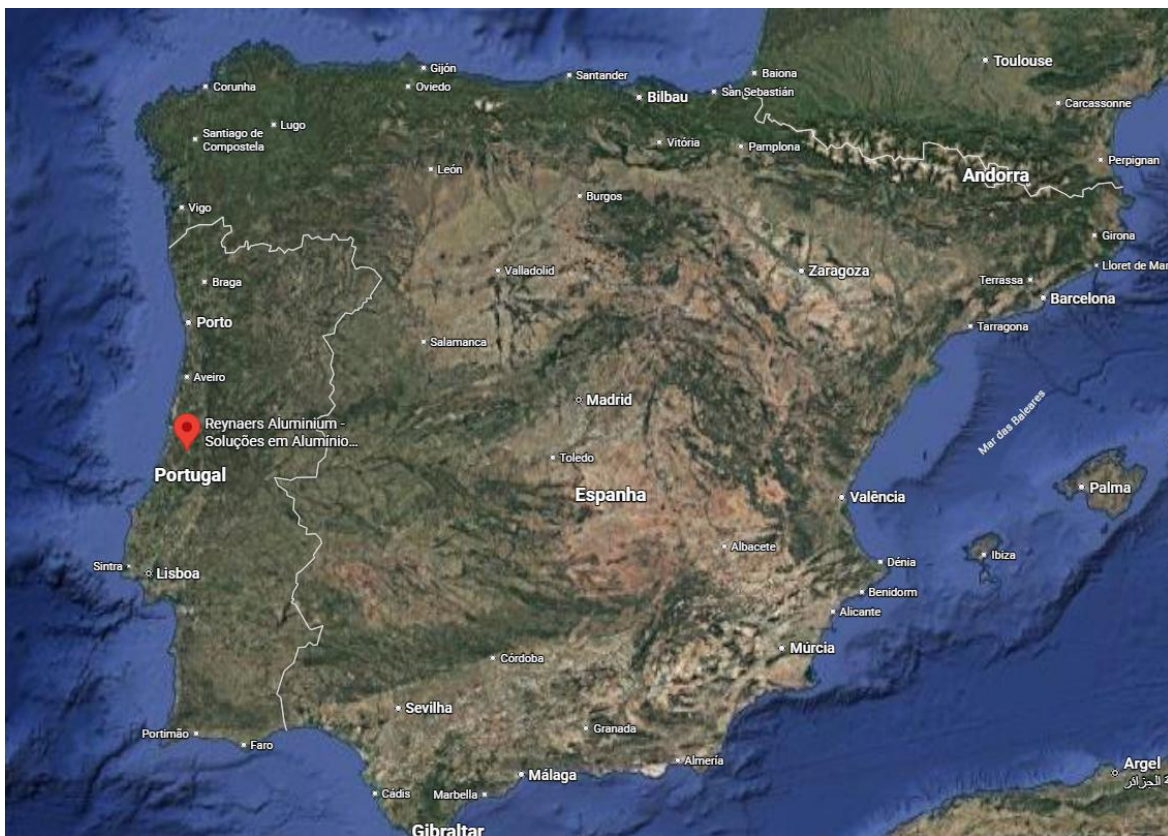


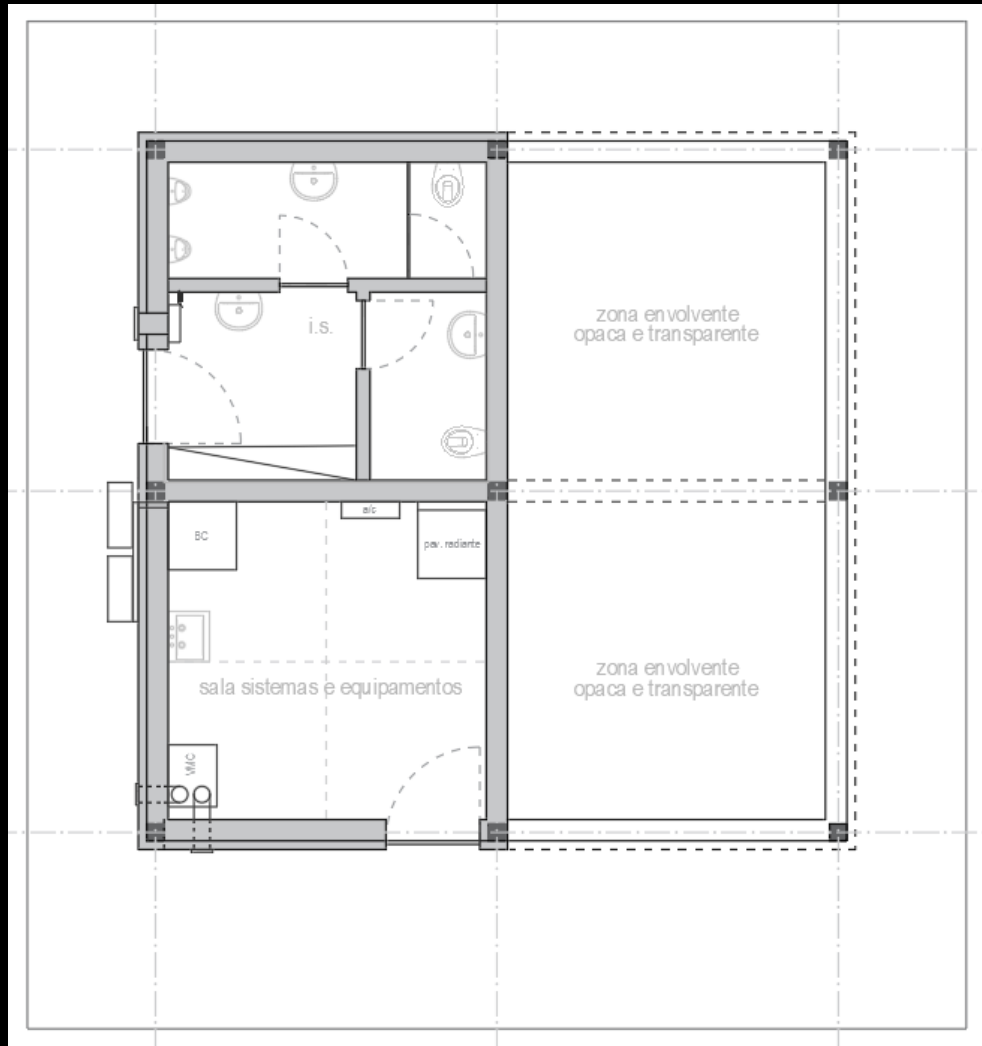
1. Introduction

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The Passive House Center (**PHC**) is located in Pombal, in central Portugal, inside the Reynaers Aluminium Portugal industrial area but with an independent access and operation.

It is easily accessible, just 5 minutes from the highway interchange.

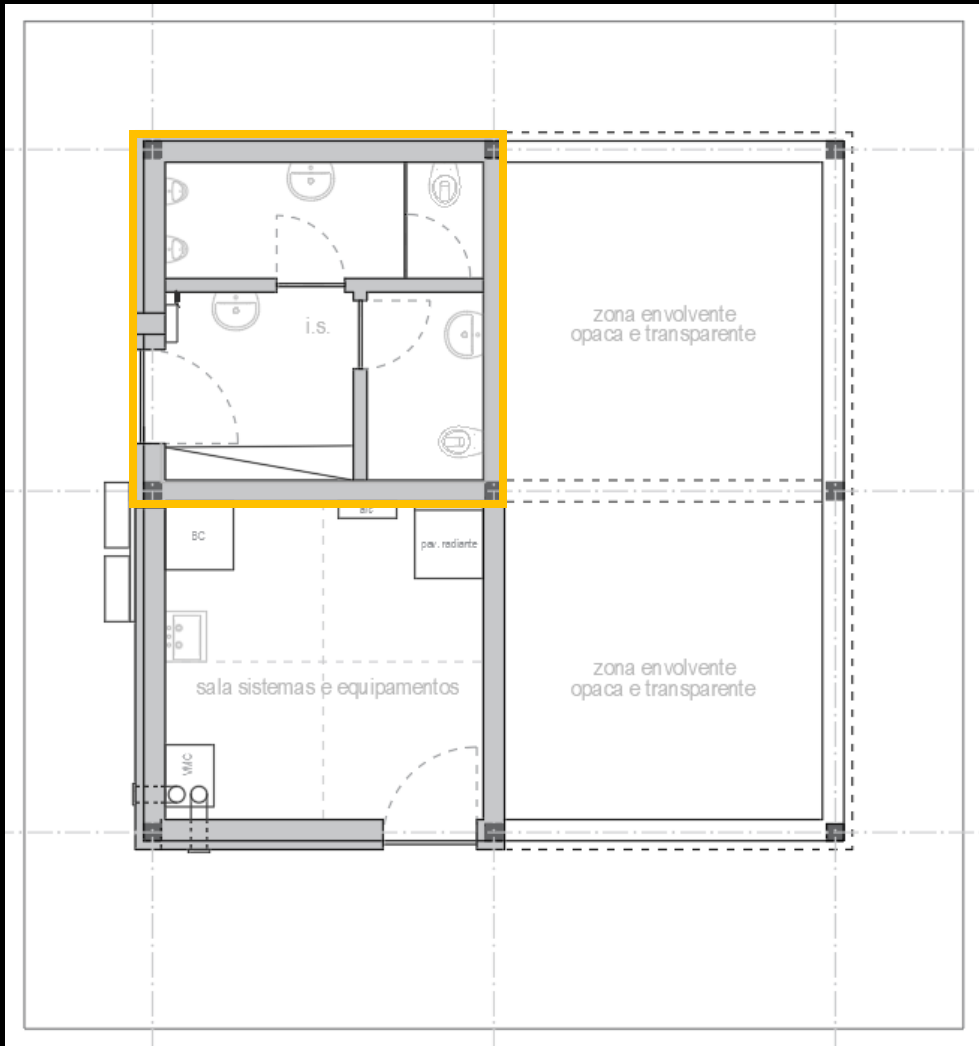




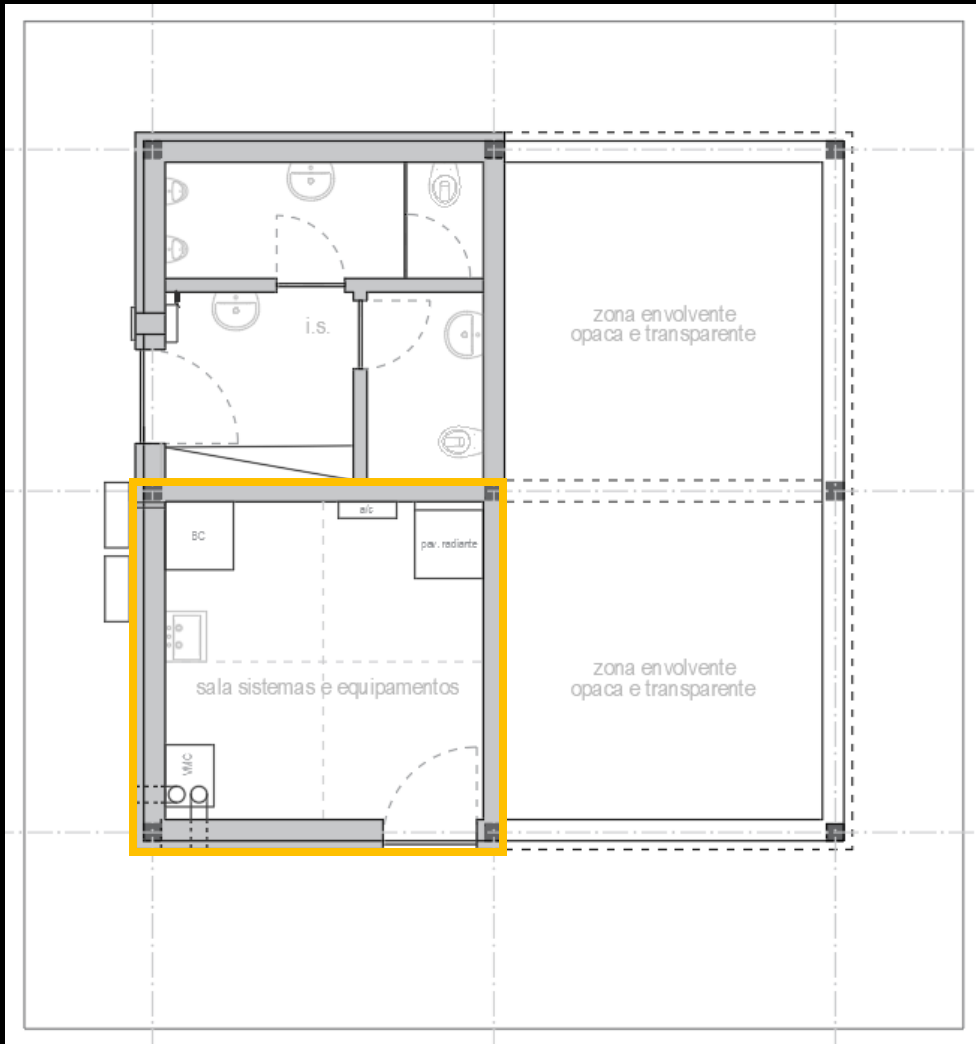
The **PHC** is a training and practical demonstration facility with 64 square meters and it is composed by four independent modules (4x4 meters each)

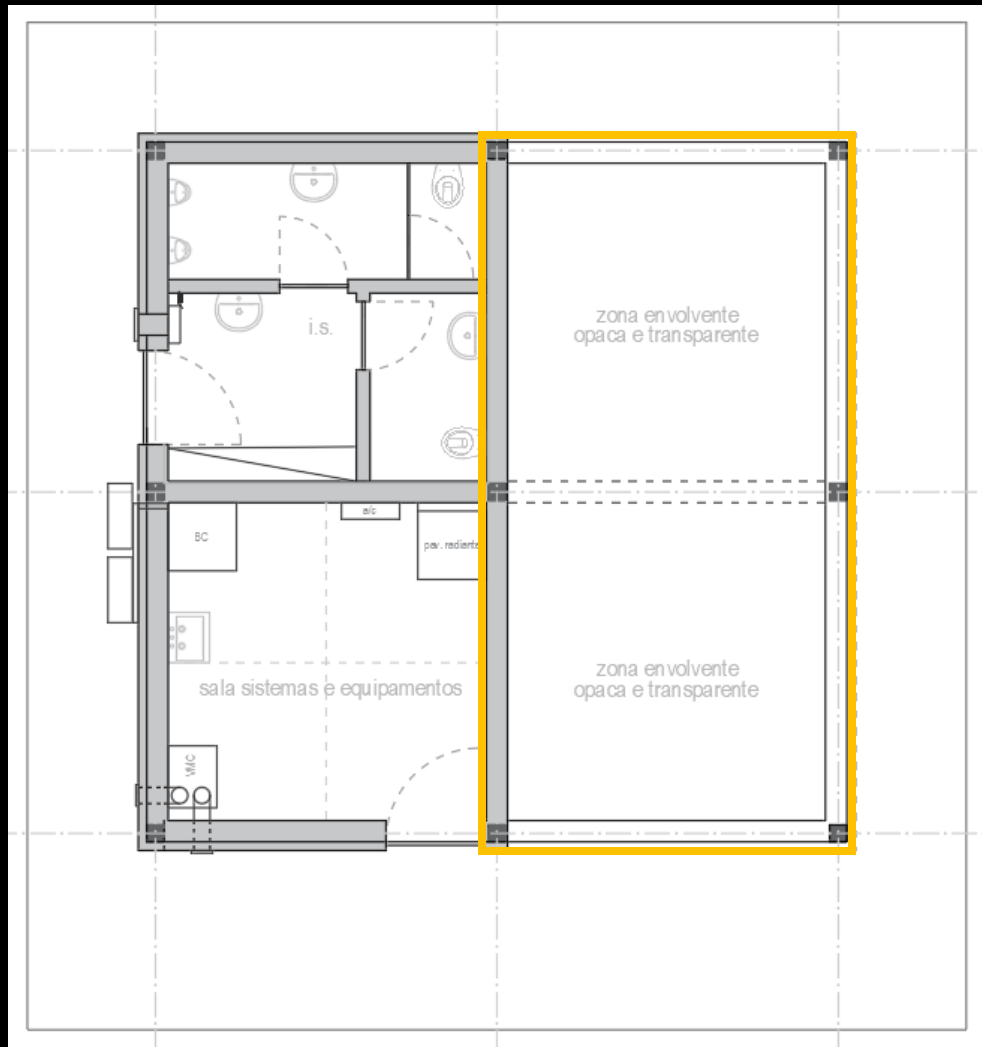


A comfortable, finished and usable w.c. installation.



A comfortable training room dedicated to **building services**.





Two open modules where each partner individually, or in cooperation, can freely simulate real situations regarding **opaque and transparent** building envelope construction.

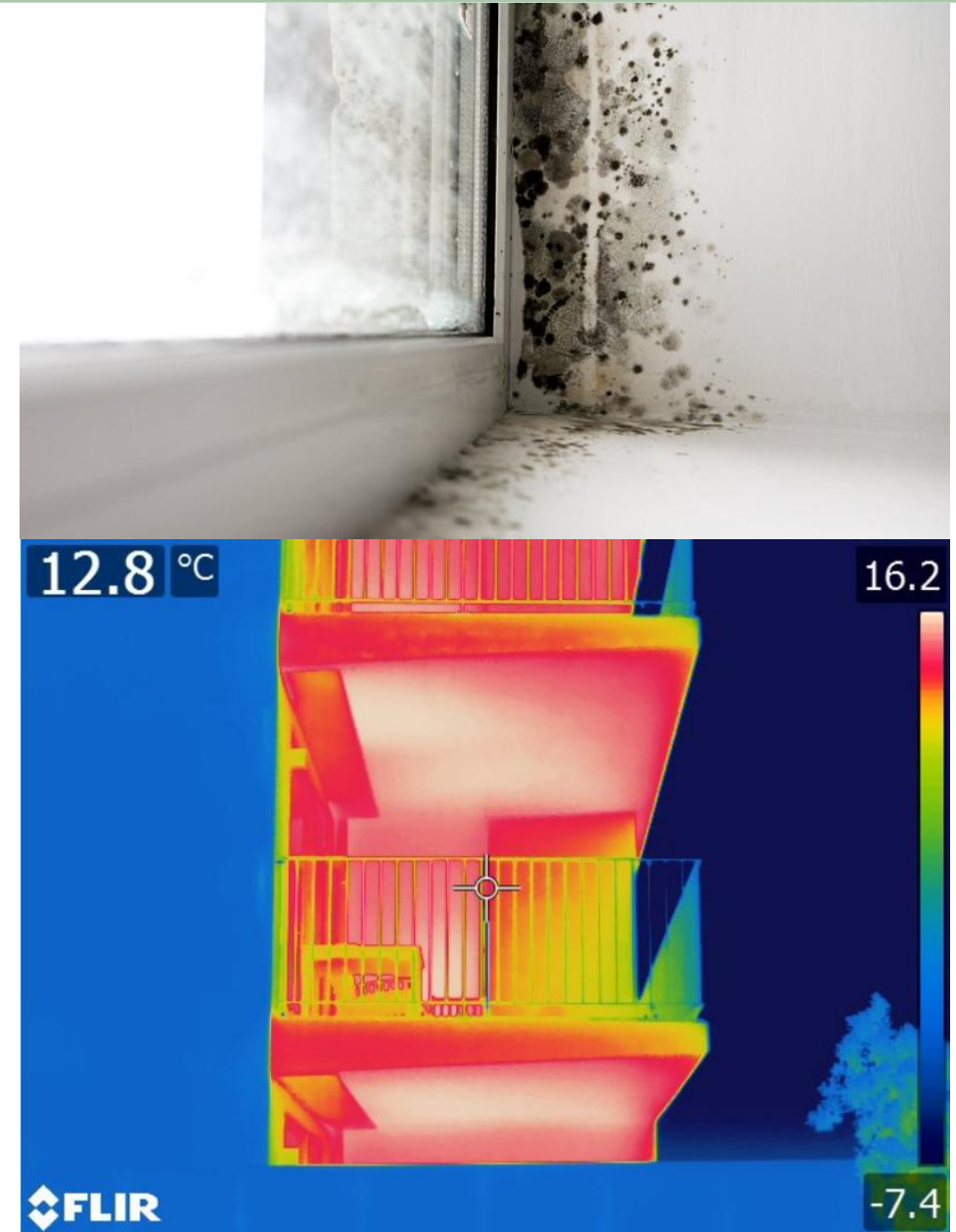


2. Goals

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The PHC has 3 main goals:

1. Supply the need to have an open facility exclusively dedicated to **overcome the main weaknesses** in construction in Portugal, such as **airtightness, window installation, thermal bridges** and **good installation of building services**;



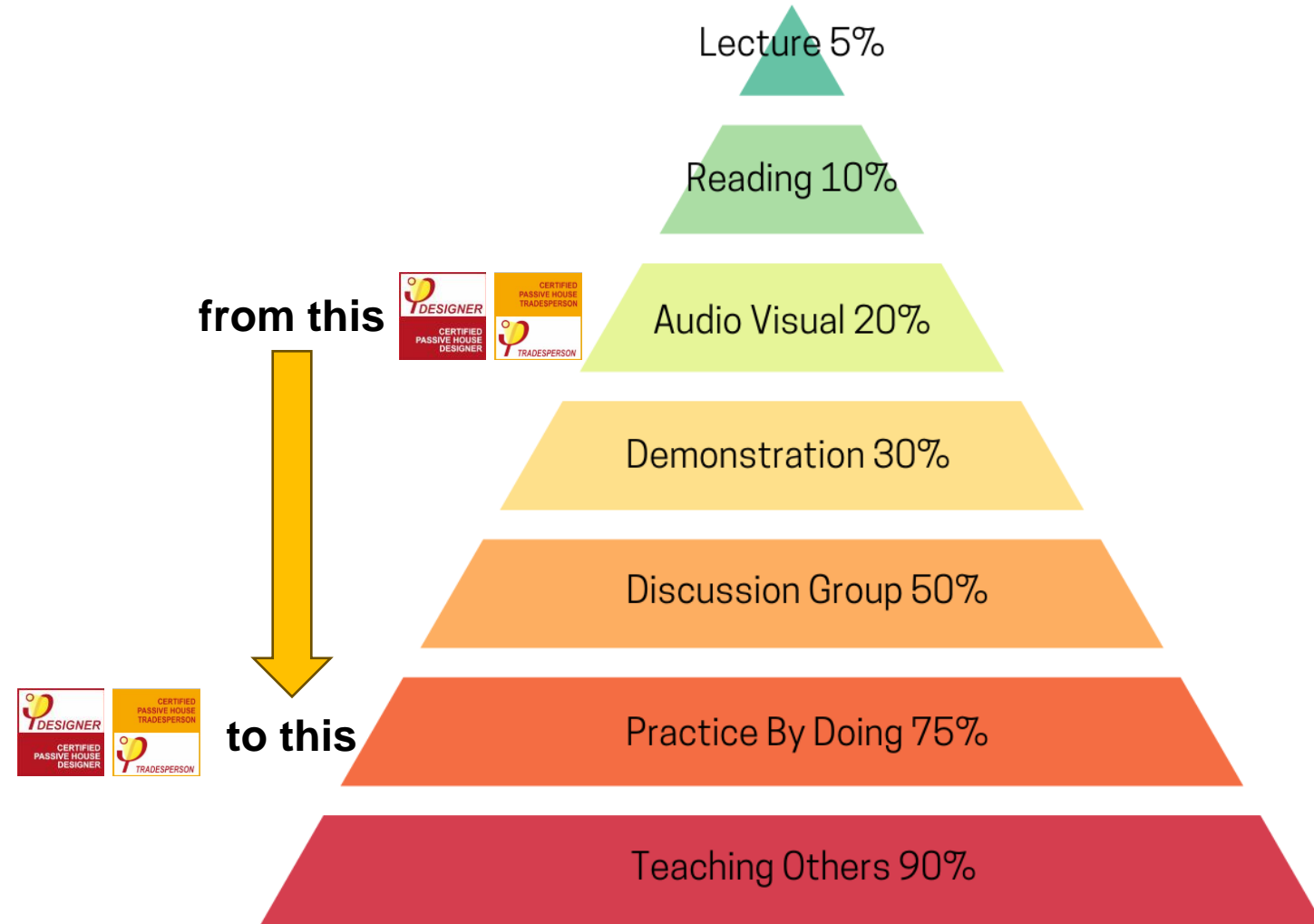


I see thermal bridges.

2. Goals

The PHC has 3 main goals

1. Supply the need to have an open facility exclusively dedicated to overcome the main weaknesses in construction in Portugal, such as **airtightness**, **window installation**, **thermal bridges** and **good installation of building services**;
2. Provide the Passive House network in Portugal with a **training facility to gather the Passive House community** along the entire year;



The Learning Pyramid

Rates of Learning Retention Based on Method
Based on the Original from the National Training Laboratories Bethel, Maine

2. Goals

The PHC has 3 main goals

1. Supply the need to have an open facility exclusively dedicated to overcome the main weaknesses in construction in Portugal, such as **airtightness, window installation, thermal bridges and good installation of building services;**
2. Provide the Passive House network in Portugal with a training facility to gather the Passive House community along the entire year;
3. Encourage **team work between different involved partners** and highlight its benefits;



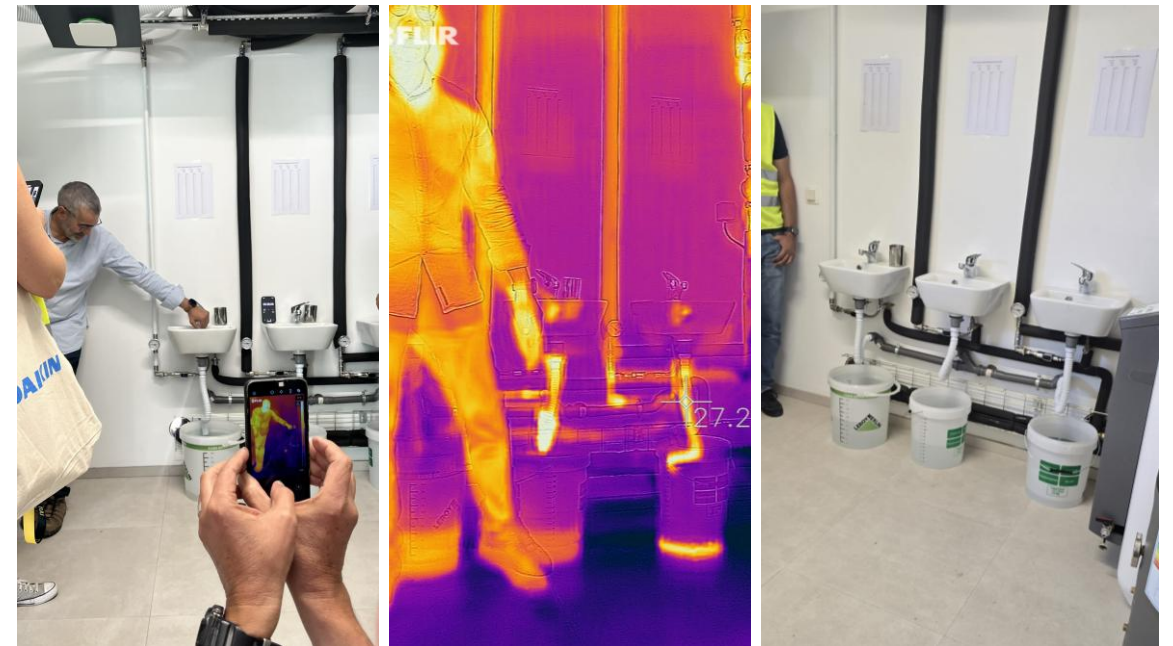
2. Goals

Workshops

The workshops are to be **practical and demonstrative**, based on a hands-on approach.

The number of participants should never exceed 20 people, to guarantee a better interaction.

The **target audience** are **builders and installers, architects and engineers, and general public.**



3. The construction phase

3. The construction phase

The project was promoted by Passivhaus Portugal Association, developed by Homegrid and financed by the PHC partners, making a total of **28 partners** (each partner company holds an equal share).





Marking of the building location
Sept. 2022



Marking of the building location
Sept. 2022



Insulation of the foundations
July 2023



Pouring of the floor slab
July 2023



Pouring of the floor slab
July 2023



Pouring of the pillars

Aug. 2023



Thermal brick placement
Aug. 2023



Pouring of the roof slab
Aug. 2023



Pouring of the roof slab
Sept. 2023



Leveling layer
Sept. 2023



Waterproofing layer
Sept. 2023



XPS from foundations
Sept. 2023



Façade insulation
Sept. 2023



Façade insulation

Sept. 2023



Roof solution
Sept. 2023



Workshop 1: Roof System Installation
Sept. 2023



Workshop 1: Roof System Installation
Sept. 2023



Workshop 2: Window installation

Oct. 2023



Workshop 2: Window installation

Oct. 2023



Window installation

Oct. 2023



Window installation

Oct. 2023



Window installation

Oct. 2023



Building services room
Feb. 2024



Building services room

Feb. 2024



General View

Feb. 2024



Outdoors
Apr. 2024



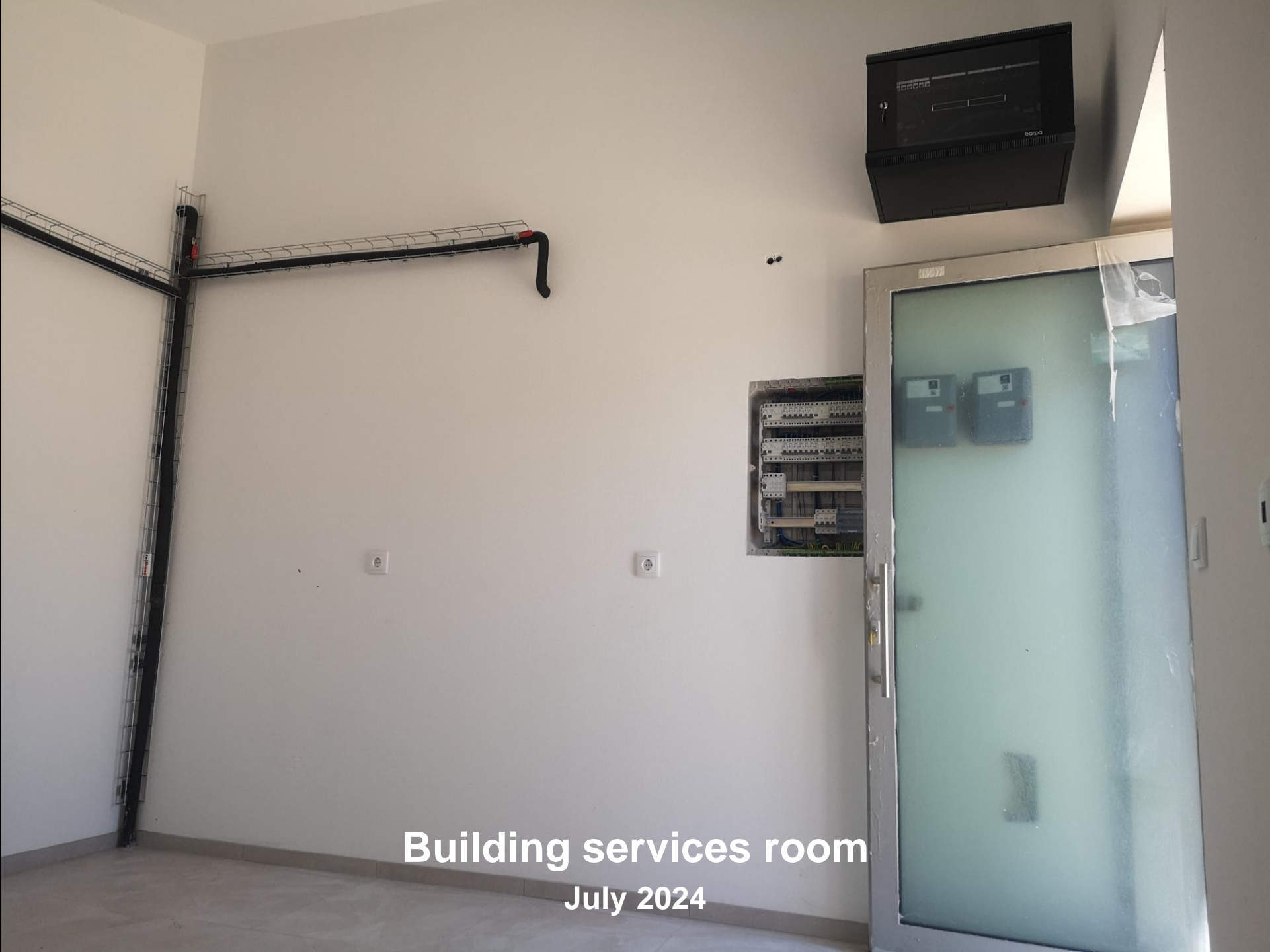
Workshop 3: Installation of underfloor heating
Apr. 2024



Workshop 3: Installation of underfloor heating
Apr. 2024



Building services room
July 2024



Building services room
July 2024



Building services room
Oct. 2024



General View

Oct. 2024



General View

Oct. 2024



General View - Conclusion

Oct. 2024

4. Results and feedback

4. Results and feedback

The PHC was concluded in the second semester of 2024. **Until the end of 2025**, which is considered the year zero of the PHC, there were held **9 practical workshops**, involving **17 partners** and hosting **180 participants** in total. Five of the workshops occurred during the construction phase of the building. There were also **3 group** visits so far. All filmed and posted on our website.

In the following years there will be the **capacity to organize up to 50 annual workshops** reaching a potential **audience of 1000 participants annually**.

You can see all the information about the workshops in our website!

<https://passivhaus.pt/passive-house-center/>



Workshop 6: Opaque and transparent envelope

Nov. 2024



Workshop 7: Opaque and transparent envelope

Nov. 2024



Workshop 7: Opaque and transparent envelope

Nov. 2024



Workshop 8: Opaque, transparent envelope and shading
Oct. 2025



forster

Workshop 8: Opaque, transparent envelope and shading

Oct. 2025



Workshop 9: Building Services

Oct. 2025



Don't waste energy
on hot water.

Workshop 9: Building Services

Oct. 2025

4. Results and feedback – workshop 9: Systems and equipments

Heat generation characteristics in Passive Houses

Space heat demand Heating load (approx.)	< 15 kWh/m ² a 10 W/m ²	Heating
Heat demand DHW depending on occupancy	18 ... 35 kWh/m ² a	DHW
Typical distribution losses	15 kWh/m ² a (not useful) 5 kWh/m ² a (useful)	

up to 2.3 X

What we are measuring in some projects in Portugal:
up to 5 X

Consequence 1: **Heat distribution losses** get relatively **high**.

Consequence 2: **Heat distribution** concepts have to be **re-considered!**

Consequence 3: **Pipes and components** require **proper insulation!**



Our goal: To test different ways of DWH distribution

We want to evaluate the **water efficiency and the hot water distribution** of 3 solutions (2 typical solutions vs. PH standard), until we reach a temperature of 40°C at every tap!

- 1 15 m piping with no insulation
- 2 15 m piping with 19mm insulation (no return)
- 3 15 m piping with 19mm insulation (flow + return)



How much water was wasted? until we reach a temperature of 40°C at every tap

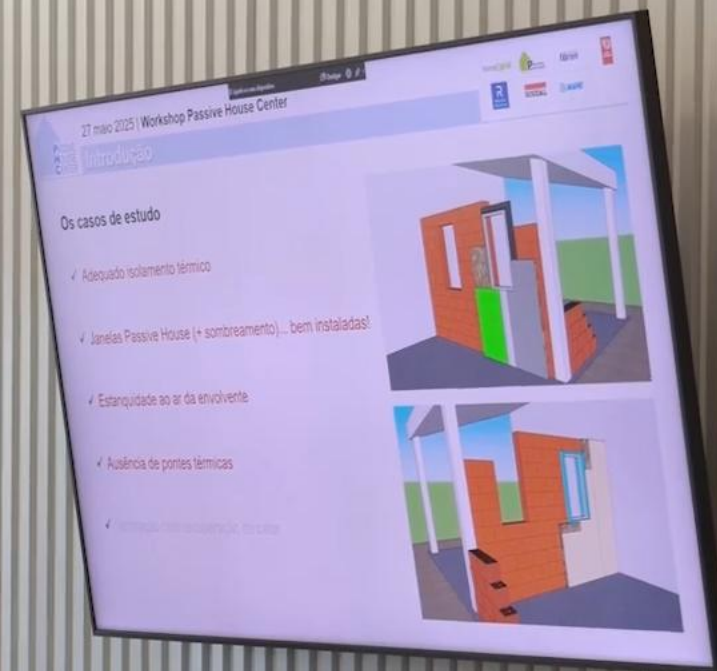
- 1** 15 m piping with no insulation **9L**
- 2** 15 m piping with 19mm insulation (no return) **6L**
- 3** 15 m piping with 19mm insulation (flow + return) **<0.5L**



Learning by doing!

Let's see the example of one workshop!





1. Theoretical Introduction



2. Practical component – case study 1



Pré-aro em XPS FIBRAN – Eliminação de pontes térmicas em vãos técnicos



3. Practical component – case study 2

4. Results and feedback

“The Passive House Center is a **living lab** where **anyone can join and experiment Passive House construction.**”

Augusto Silva, Client

“This is a space where **you can build and rebuild as many times as you want**, and that’s very important.”

Joana Fraga, PH Designer

“It is **good to see the solutions**, but it is even **better to get your hands on it.**”

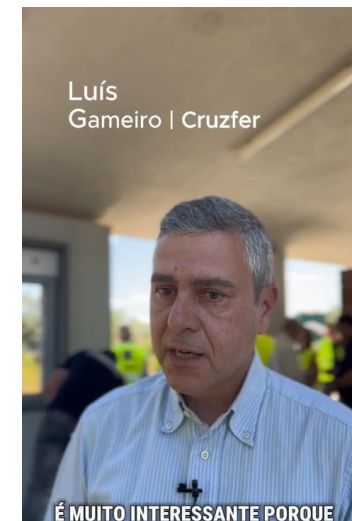
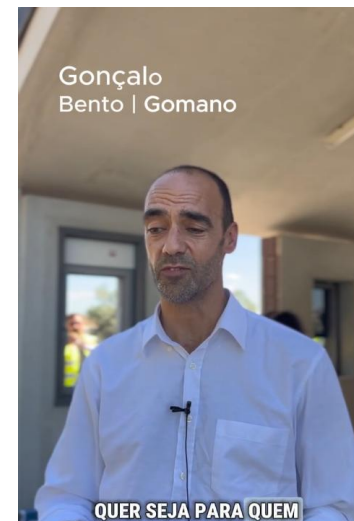
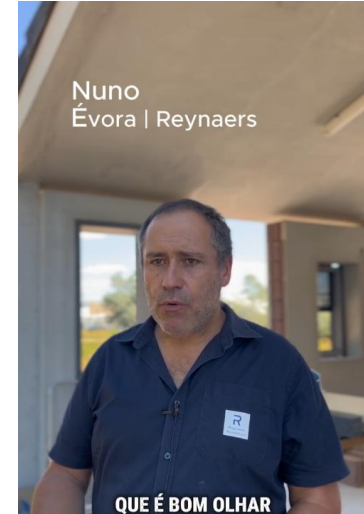
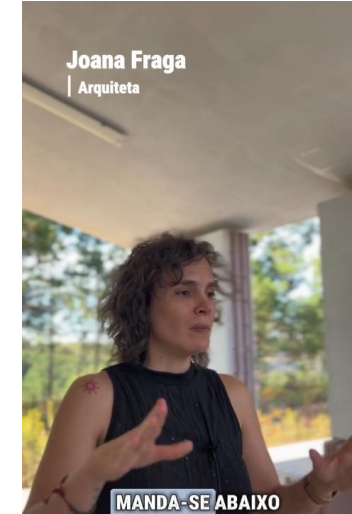
Nuno Évora, Reynaers

“Passive House Center **allows us to study solutions with our clients** and **show them how they are assembled.**”

Gonçalo Bento, Gomano

“Here we can **collaborate with other companies to develop better solutions**, and **learn from each other.**”

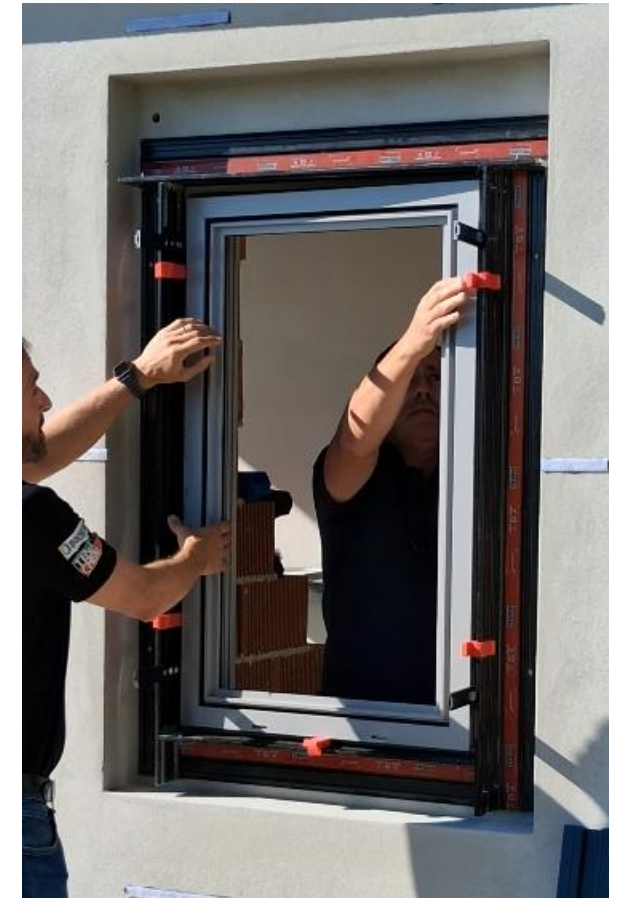
Luis Gameiro, Cruzfer



5. Conclusions

5. Conclusions

The **organization of each workshop**, which involves different partners (in some cases up to five partners), **takes a lot of effort to coordinate** but it is **very rewarding to see the team work, even between rival companies**.



5. Conclusions

This approach has a **huge replication potential** and also the **potential to scale up**, because it can be **implemented in additional locations** in order to **promote the development of the Passive House standard** in each region.



5. Conclusions

It was very rewarding seeing partners understand that their solutions only work if they are part of a bigger picture, and this means to be in harmony with other partner's solutions. This was a very important push for companies to team up and work together on solutions that can easily be implemented on Passive House buildings.



6. Next steps

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Passive House Center Day

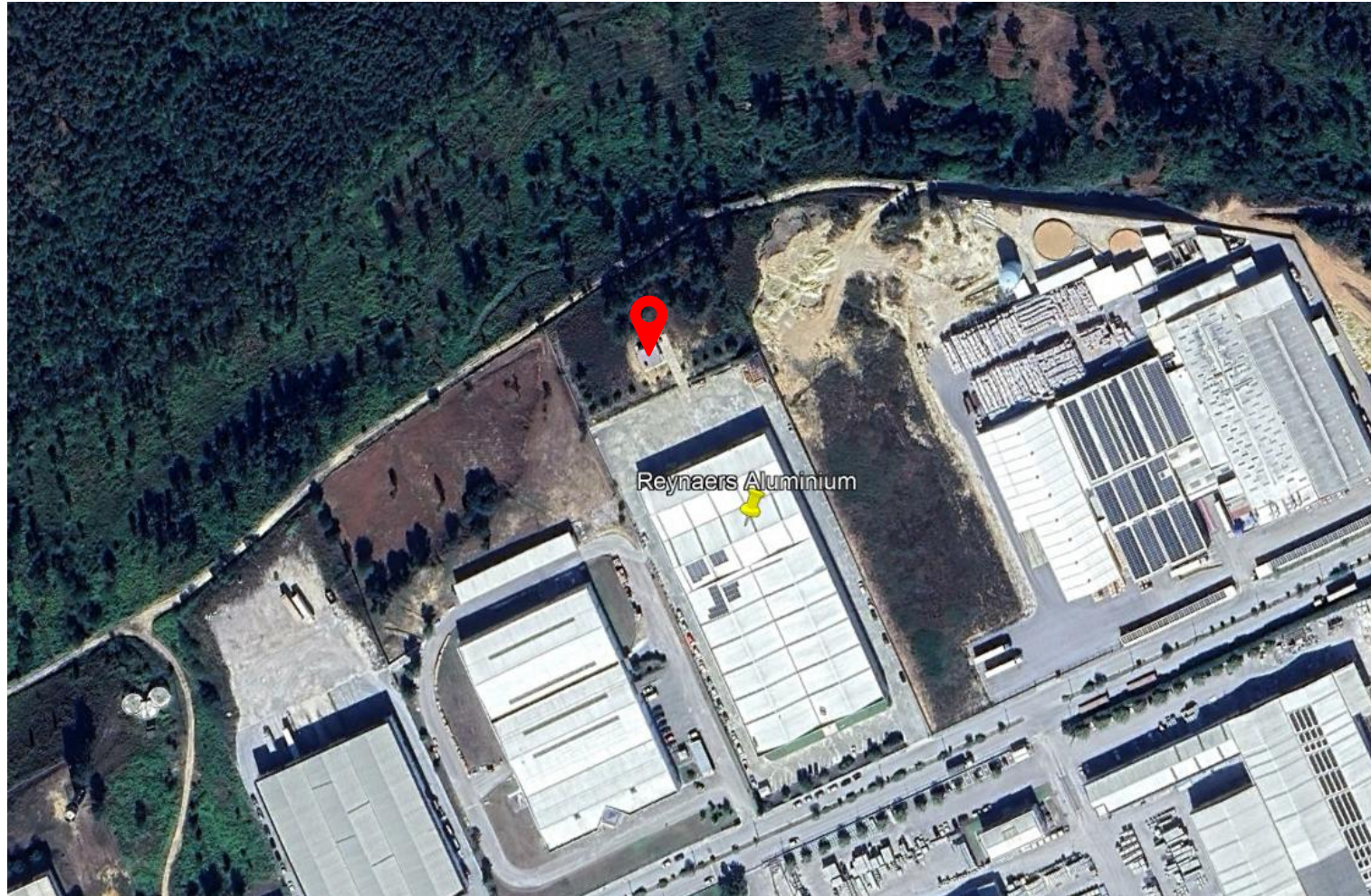
- **5 simultaneous workshops** happening **5 times** during the day;
- Blower door Test;
- Reach up to 75 people (15 people per workshop);
- More than 3 partners per workshop;
- Everything is recorder and posted on our website;



6. Next steps

New Passive House Center Modules!

New PHC modules will be built using lightweight construction (LSF and wood).



6. Next steps

Agroforestry system

At the end of each workshop we invite the participants to plant some trees: oaks, fruit trees, herbs...

We want people to realize the power they have to help nature regenerate!





Thank you!





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