PASSIVHAUS
Student Competition

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The Guided Labyrinth

in partnership with

TARMAC
A CRH COMPANY

PROJECT FACTS

Residential	Milan	1716m²
Building Use	Location	TFA

PASSIVHAUS STRATEGY

The passivhaus strategies were applied to the building model in sections of four variants to clearly understand the results:

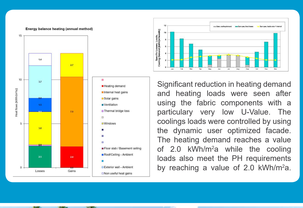
- V1 was the basecase with concrete envelope Result: High heating and cooling demand, far from meeting PH requirements.
- V2 Changes: Developed structure material to lower U-values Result: Reduced heating (met requirement) and cooling demand (not met), cooling still need to be improved, High overheating frequency.
- V3 Changes: Building façade, PV, SOLAR THERMAL, NIGHT VENTILATION, ENERGY RECOVERY VENTILATION. Mechanical cooling: recirculation air, additional dehumidification Result: heating, cooling, energy met requirement, but overheating frequency still 5% higher than set limit.
- V4 Changes: High ISO PH materials used with low U-values, Supply air cooling, additional dehumidification, Heat pump 20% covered fraction for space heating demand. Result: All PassivHaus standards met.

DESIGN PHILOSOPHY

The urban rejuvenation project was a step closer towards developing something of prime importance to the people of Milan. Several connective node points were designed in order to enguf the local public to the region A, the new residential development. The site is home to 68 good sized trees which were moved to the roof and hence therefore preserving the ecology of the site. The form of the building and the character of the facade closely attributes and associates itself to the Passivhaus regulations. The simple form allows the overall building to have a lesser surface area in contact with the external environment and hence having a very good form factor of around 1.15. This in turn leads the building to perform tremendously well throughout the year. The facade was specifically designed & tested in order to avoid the overheating in summers from June-August.

PREDICTED PERFORMANCE

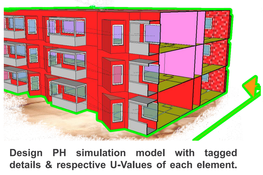
Walls 0.11 W/m²K Floor 0.129 W/m²K Roof 0.074 W/m²K Windows 0.65 W/m²K	4.0 w/m²	1.15
U-Values	Heating Load	Form Factor



Significant reduction in heating demand and heating loads were seen after using the fabric components with a particulary very low U-Value. The coolings loads were controlled by using the dynamic user optimized facade. The heating demand reaches a value of 2.0 kWh/m²a while the cooling loads also meet the PH requirements by reaching a value of 2.0 kWh/m²a.

8 apartment units per floor
Three residential storeys analyzed for PH

Treated Floor Area: 1716 m²



Design PH simulation model with tagged details & respective U-Values of each element.

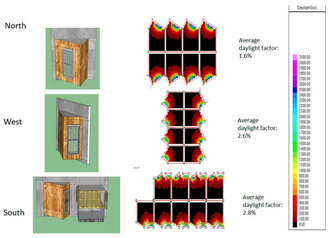
MATERIALS

Floor: "Plastbau" system(concrete with EPS panels as insulating material) on top of the basement and on the floor slab.
Window: SANCO 33.1le/16/4/16/33.1LE U=0.65 g=0.48
Building Envelope (Wall): Gypsum, Celenit cladding, Air + substructure wood,OSB, LIGNO insulation, OSB, EPS Insulation, Plaster.
Roof: Plaster,CelenitWoodcementboard, Rockwool 234 + wooden construction 21%, OSB, XPS

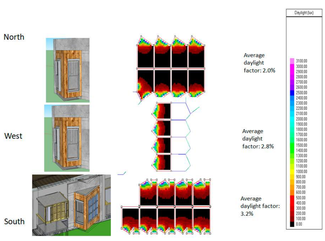
PassivHaus Standards Met:

- Heating Demand: 2.0 kWh/m²a
- Heating Load: 4.0 W/m²
- Cooling Demand: 2.0 kWh/m²a
- Cooling Load: 2.0 W/m²
- Frequency of Overheating: 7.3%
- Primary Energy: 120 kWh/m²a
- Airtightness: 0.6 1/h

IES SIMULATION BASED FACADE DESIGN TO DECREASE SOLAR GAIN FROM SOUTH



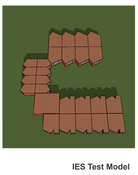
Single window design - Reducing solargain from south and west



Double Window Design – Increased Lighting from North

The optimized facade reduced the cooling loads by more than 40%

One bed apartment unit



IES Test Model

Acknowledgements

Course: Masters in Architectural Design | K14MS2 | IDea Studio
Main Tutors: Guillermo Guzman Dumont, David Edwards (PH)
External Tutors: Renata Tubelo, Carlos Marquez, Lilian Martins, Ayesha Batool, Lorna Kiamba
Supported by The Department of Architecture & Built Environment | University of Nottingham

The University of Nottingham

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UK PASSIVHAUS STUDENT COMPETITION