Comfort advantage of Passive House hotels and step-by-step EnerPHits

Susanne Theumer
Architect, energy consultant
Passivhaus Institut, Darmstadt, Germany

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All sorts of interesting projects worldwide

First Passive House skyscraper / Vienna, Austria

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Bed & Breakfast in Mexico-City, Mexico

First Passive House in Mexico. No heat recovery! | Mexico City, Mexico INHAB
Defining the target – Building certification

A certified residential Passive House has:

- A very low space heating demand of \( \leq 15 \text{ kWh/(m}^2\text{yr)} \) or a very low heating load of \( \leq 10 \text{ W/m}^2 \).

- An airtight building envelope that was tested with an \( n_{50} \) value \( \leq 0.6 \) air changes per hour (average value of over & under pressure test).

- A very low primary energy demand of \( \leq 120 \text{ kWh/(m}^2\text{yr)} \) including all energy used in the building.

- A very low frequency of overheating of \( \leq 10\% \) above 25 degree celcius.

- Comfortable temperatures and fresh air in all rooms.

* Per \( m^2 \) of treated floor area (TFA): For the calculation please see www.passipedia.org
Hotel in Changxing (Shanghai), China

First Passive House Guest House Landsea | Changxing, China  Ruge Architekten

ID 4153 www.passivehouse-database.org
Climate regions in China

Urumqi
Harbin
Beijing
Shanghai
Lhasa
Chengdu
Kunming
Shenzhen

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Outside climate conditions in Shanghai

- moderate winter temperatures
- please note: in south of China people are supposed not to heat...
- very hot & humid summer conditions: July, August, September
- in spring and autumn 'neutral' outside temperatures

![Graph showing relative humidity, air temperature, and absolute humidity over time in Shanghai.](image-url)
Shanghai: heating & dehumidification dominant

- about 10…20 cm of insulation (roof!)
- energy recovery ventilation, humidity controlled
- separate cooling & dehumidification
- no night flushing (outside air too humid)
- double/triple low-e glazing
- exterior moveable shading recommended
- thermal mass is advantageous

**Shanghai**, typical demand:
- heating: $10 \text{ kWh/(m}^2\text{a)}$
- cooling: $10 \text{ kWh/(m}^2\text{a)}$
- dehumidification: $10 \text{ kWh/(m}^2\text{a)}$
CHANGXING BRUCK PASSIVE HOUSE

- Sketchup model as input for designPH
Low power cooling & dehumidification

- preconditions:
  1) well insulated building envelope helps (roof!)
  2) reduce internal heat gains (yellow)
  3) shading is absolutely needed (rose)

- pure passive operation in spring & autumn, no heating, no cooling
Low power cooling & dehumidification

- centralized preconditioning of air (MVHR) combined with dehumidification to 12 g/kg
- decentralized heating or cooling to adjust comfortable air parameters

For more information see [www.passipedia.org](http://www.passipedia.org)
Air conditioning

- cooling & dehumidification via supply air is possible
- graph shows pre-conditioned air (light blue)
Bruck concept for cooling and dehumidification

- centralized preconditioning of air (MVHR) combined with dehumidification to 12 g/kg, located on the roof
- decentralized heating or cooling to adjust comfortable air parameters with small circulation air heater/cooler in each dwelling (ach: 2/h)
- heat and cold source by water circle: cooled during summer, heated during winter
Temperatures

- hot & humid climate: summer cooling (sensible & latent) needed
- cooling & dehumidification via supply air is possible
- pure passive operation in spring and autumn, no heating, no cooling
Energy and load numbers in comparison

- shading is crucial – general hint: take $g = 0.25$ for all orientations
- numbers for one person per bedroom, minimized internal loads

**Bruck Varianten**

Low shading vs. large windows vs. optimized shading

- $g = 0.50$
- $g = 0.25$

**Graph:**
- Energy [kWh/m²a]
- power [W/m²]

- Heating energy
- Cooling energy
- Drying energy
- Heating load (daily average)
- Cooling load (daily average)
- Drying load (daily average)
- Heating load (hourly values)
- Cooling load (hourly values)
- Drying load (hourly values)
Energy and load numbers in comparison

- Internal gains are more crucial – **just avoid it!**
- Numbers for two persons per bedroom
- Higher g-values give higher cooling energy demand
Passive Hotel in Changxing (Shanghai), China

- use as a hotel: very high internal loads (that's challenging!)
- 2200 m² (TFA) hotel: 20 m² per guest
- shading by architectural design (+)
- compact design (+)
Economic Evaluation of Passive House concept for the NAMA in Mexico

basic tasks for the NAMA in Mexico
- Setup of three baseline building types for Mexican social housing
- Generation of climate data:
  temperate cold – hot & dry – hot & humid
- Energy balance for all building types in all configurations:
  Baseline – eco casa 1 – eco casa 2 – Passive House

some results, estimation of costs:
- Current costs (Mexican market + European prices)
- Future costs – when Mexican market can deliver components

for full project report see www.passivehouse.com
Witta Ebel, Susanne Theumer, Jan Steiger, Maria del Carmen Rivero Arias

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EnerPHit certificate for retrofits

Retrofit of existing buildings:

Special conditions given: Orientation, shading, compactness. Often: thermal bridges.

Consequence: Passive House Standard for new buildings can not be met

www.passivehouse.com
A certified residential EnerPHit project has:

- Either a very low space heating demand of $\leq 25 \text{ kWh/(m}^2\text{yr)}^*$ OR each component has Passive House quality.
- Airtightness: $n_{50} \leq 1$ air changes per hour.
- A very low primary energy demand of $\leq 120 \text{ kWh/m}^2\text{a} + ((Q_H - 15 \text{ kWh/(m}^2\text{yr)}) \times 1.2) \text{ kWh/(m}^2\text{yr)}^*$ including all energy used in the building.

Treated floor area calculation: See www.passipedia.org
International criteria available with PHPP 9.
Including sets of component requirements for 7 climate zones.
EuroPHit is facilitating the transition to Nearly Zero Energy Buildings.
EnerPHit: Energy efficient retrofits
EnerPHit step by step

Overall refurbishment plan with PHPP. Achieve comfort by applying first measure.
→ Would you like to get involved in EuroPHit?
→ Do you have an old building in need of retrofitting?
    ... or a completed project you would like to share?

We are interested in your experiences!
Contact us to get involved!
NEW! EU project Sinfonia just started…

District refurbishment in demo cities Innsbruck & Bolzano. Transfer to follower cities.

- Deep refurbishment of residential buildings
- Monitoring energy consumption of ~ 500 apartments
- Electrical efficiency: Concepts, monitoring, consultancy
- Integration of renewables and networks on district level
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PHPP 9 – in the making

- Simultaneous calculation of the same building with different variations
- Economic comparison of efficiency measures
- New concept of error messages and warnings to support data entry and certification process
- Enhanced entry for heating and DHW distribution
- International EnerPHit Criteria
- Implementation of the new PH classes with renewable energy supply:
New designPH patch available

www.designph.org

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- Passipedia was relaunched
- Networking:
  - iPHA affiliations
  - Component manufactures involvement in Passive House Days
- Publications:
  - Green brochure updated (2014)
  - New book on Architecture Award finalists
- Component award 2015: windows for retrofits
New: Involvement of manufacturers

Visit Passive House buildings or showcase your own project!

Doing more with less:
» Superior comfort
» Minimal heating and cooling costs
» For new builds and retrofits alike

Experience Passive House buildings first hand!
• Visits and guided tours offered across the globe
• Architects show how it’s done
• Residents share their experiences

Please see www.passivehouse-international.org for further information. Participating buildings will be listed as of September 2014 on www.passivehouse-database.org

In 2015: 13-15 November: plan your events around this weekend and inform iPHA about it!

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PH Database International: www.passivehouse-database.org

More than 3000 buildings registered
!! get involved !!

2nd Portugal Passive House conference 2014
19th INTERNATIONAL PASSIVE HOUSE CONFERENCE 2015

Leipzig | Germany
17/18 April 2015

www.passivehouseconference.org
19th INTERNATIONAL PASSIVE HOUSE CONFERENCE 2015

Leipzig | Germany

17 - 18 April 2015

Framework programme:

16 April: PHPP 9 & designPH workshop
16 April: Ventilation workshop
16 April: Windows workshop
16 April: Business case seminar

In Darmstadt:
8-15 April: Certifier course
20-21 April: TrainTheTrainer

Under the patronage of:

www.passivehouseconference.org
Thank you for listening!

The Passive House concept

- Comfortable
- Energy efficient
- Cost effective
- Sustainable
- User friendly
- Easy to apply
- NZEB-ready

success since 1991

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