



De beste prosjektene fra Tyskland – Renovation using Passive House Components

Berthold Kaufmann, Passive House Institute,
Darmstadt, Germany

building stock rehabilitation – a general task
project(s) from Germany

basic passive house conception

functional requirements (...we need that!)

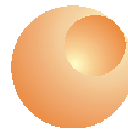
Who can help you to start first projects?



**Passivhaus
Institut
Dr. Wolfgang Feist**

www.passiv.de

- Consulting (design and construction phase)
- Thermal bridge calculations
- Thermal simulation (if necessary)
- Quality assurance
- Research and Development



**Passivhaus
Dienstleistung
GmbH**

www.passivhaus-info.de

- Consulting
- workshops and seminars (PHPP etc.)
- Quality assurance

IG PASSIVHAUS

Informations-Gemeinschaft Passivhaus Deutschland

www.ig-passivhaus.de



- Information network for architects, planers and user
- Databases about projects and 'players'
- Public relations (press, TV, internet)
- International Day of the Passive House

PassivhausPlaner.EU

www.passivhausplaner.eu

- Planer seminars soon available in english and other languages
- further education for experts in the field

englisch

14th INTERNATIONAL PASSIVE HOUSE CONFERENCE 2010

International Congress
Center Dresden
2010 May 28th / 29th
with exhibition and
guided tours to
Passive Houses in the
Dresden area.



www.passivhaustagung.de



www.passivehouseconference.org



basics: procedure to get a reasonable
ph building envelope

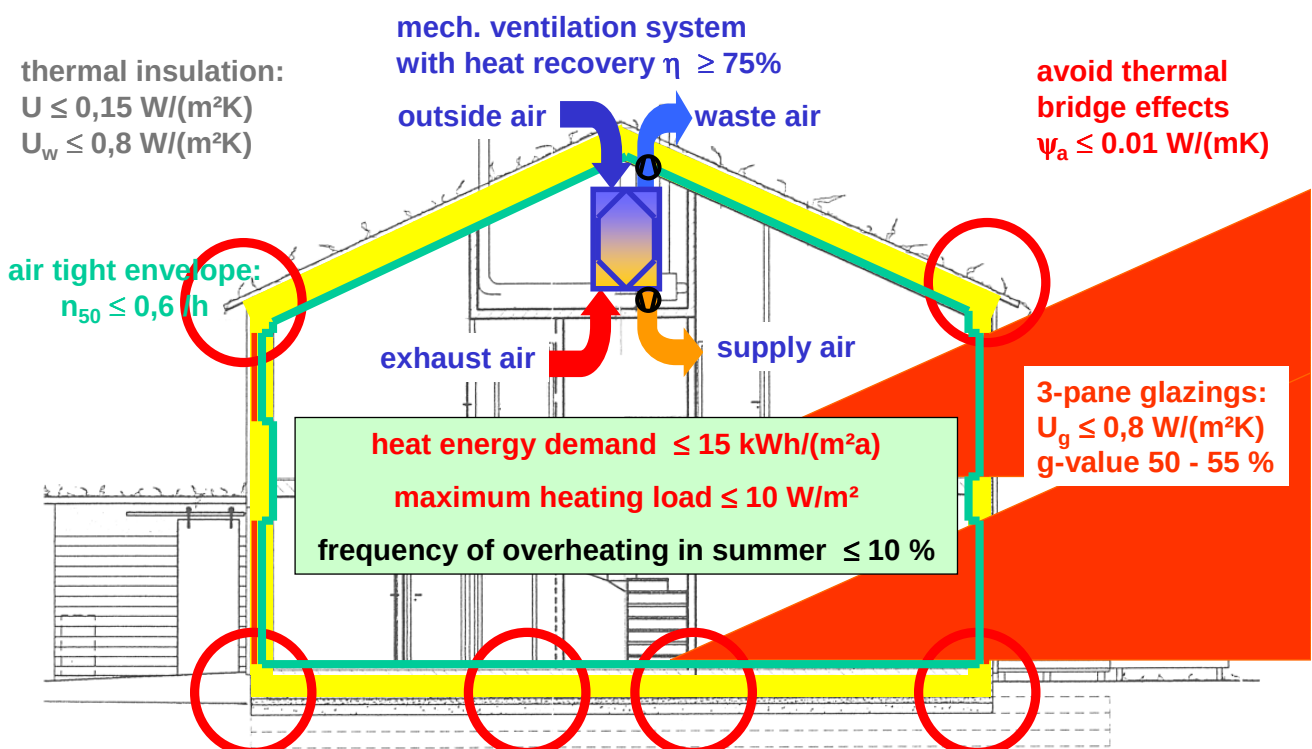
analyse climatic conditions carefully

check the energy balance in detail (PHPP)
setup a 'passive' building conception

take care on costs so that anybody
will be able to afford it

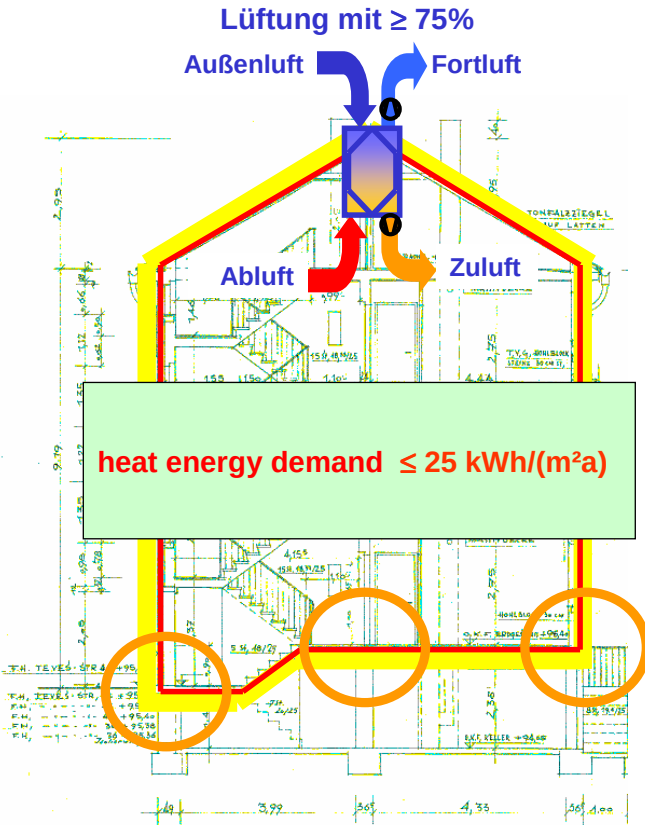


airtight – w/o thermal bridges – ventilated
required qualities for PH (new built)





airtight – w/o thermal bridges – ventilated
required qualities for PH (old house rehabilitation)



1 use thermal insulation

2 get it airtight!

3 use mech. ventilation
(with heat recovery)

4 thermal bridges ...

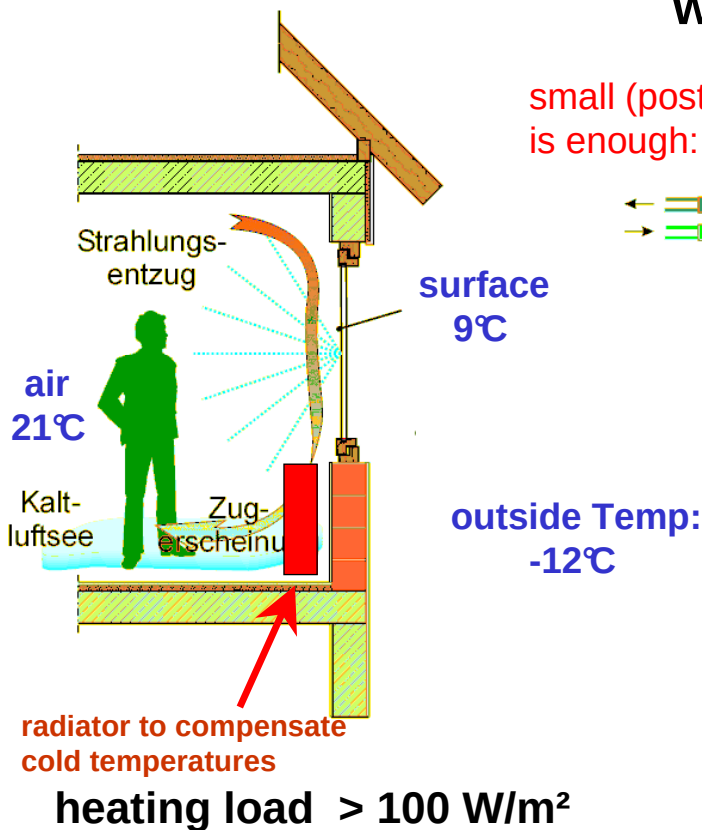
cellar

perimeter

balconies

...wrap it as good as possible

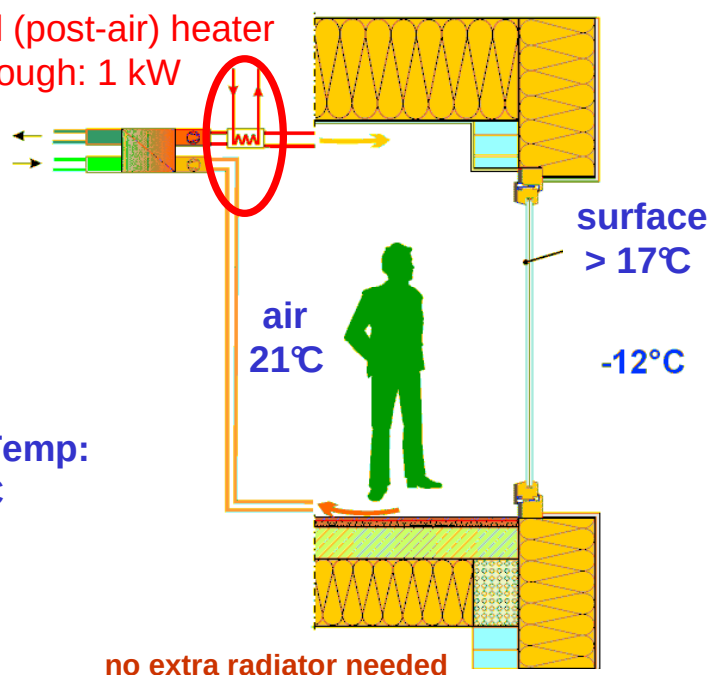
building stock



Passive House ...

with small heating system

small (post-air) heater
is enough: 1 kW



max. heat load only $10 \text{ W}/\text{m}^2$

old house renovation Tevesstraße FF/M



Architects: faktor10, Darmstadt

client: ABG Frankfurt Holding

Scientific monitoring & consultancy: Passivhaus Institut
under contract of Hessian ministry of economics traffic and development, Wiesbaden

Apartment building „Tevesstraße“ in Frankfurt am Main, DE

PROJECT SUMMARY

Renovation of two apartment buildings, built in the postwar period. Reduction of annual heat energy demand: 91 %. Almost complied with Passive House Standard

SPECIAL FEATURES

Ventilation appliance with heat recovery (efficiency >85%) in each apartment. Solar collectors

ARCHITECT

faktor 10, Gesellschaft für Siedlungs- und Hochbauplanung mbH

OWNER

ABG Frankfurt Holding, Wohnungsbau- und Beteiligungsgesellschaft mbH



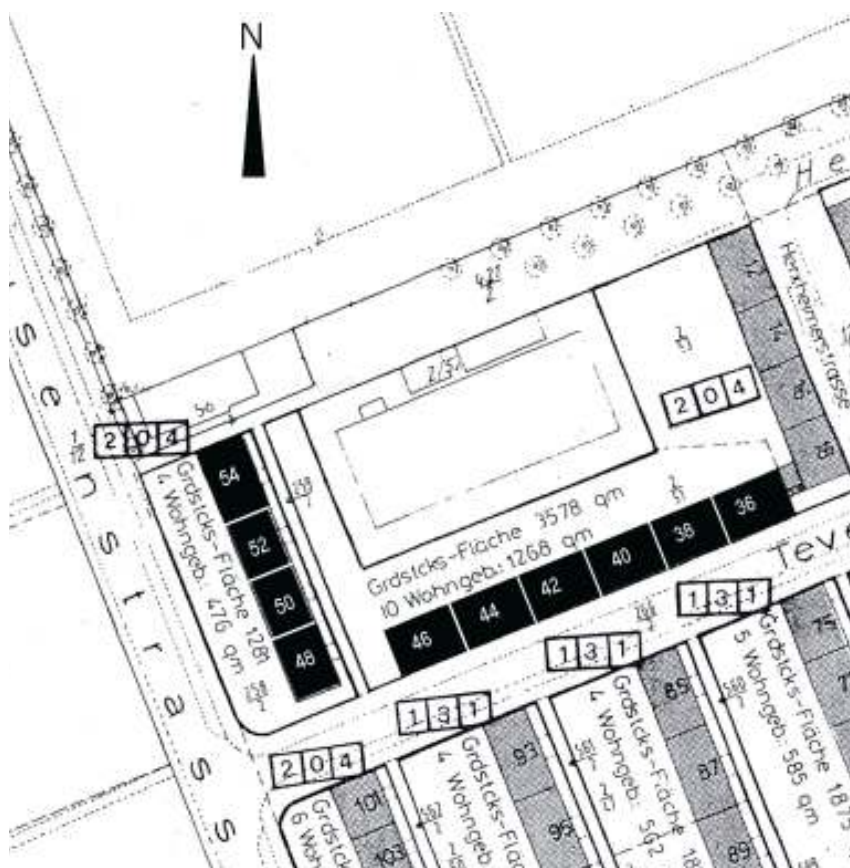
IEA – SHC Task 37

Advanced Housing Renovation with Solar & Conservation

download of brochures:

<http://www.iea-shc.org/task37/>

site map Tevesstraße: two blocks



old house renovation Tevesstrasse Frankfurt



before...



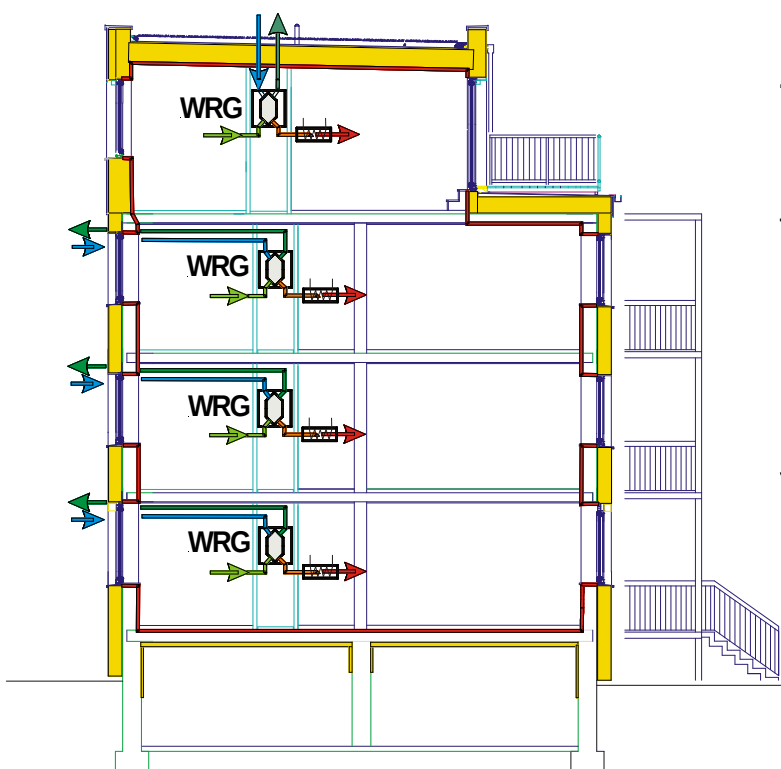


old house renovation Tevesstrasse ...afterwards

renovation using PH-components

client: ABG Frankfurt Holding
Architects : P. Grenz, F. Rasch, faktor10, Darmstadt

renovation using PH-components



thermal insulation
good windows
thermal bridges wrapped

air tight envelope

ventilation with
heat recovery

heating energy demand: 17 kWh/m²a
primary energy demand: 37 kWh/m²a
for heating, hot water and technical electricity

Sanierungsprojekt Tevesstraße FF/M
Bauherr: ABG Frankfurt Holding
Architekten: faktor10, Darmstadt

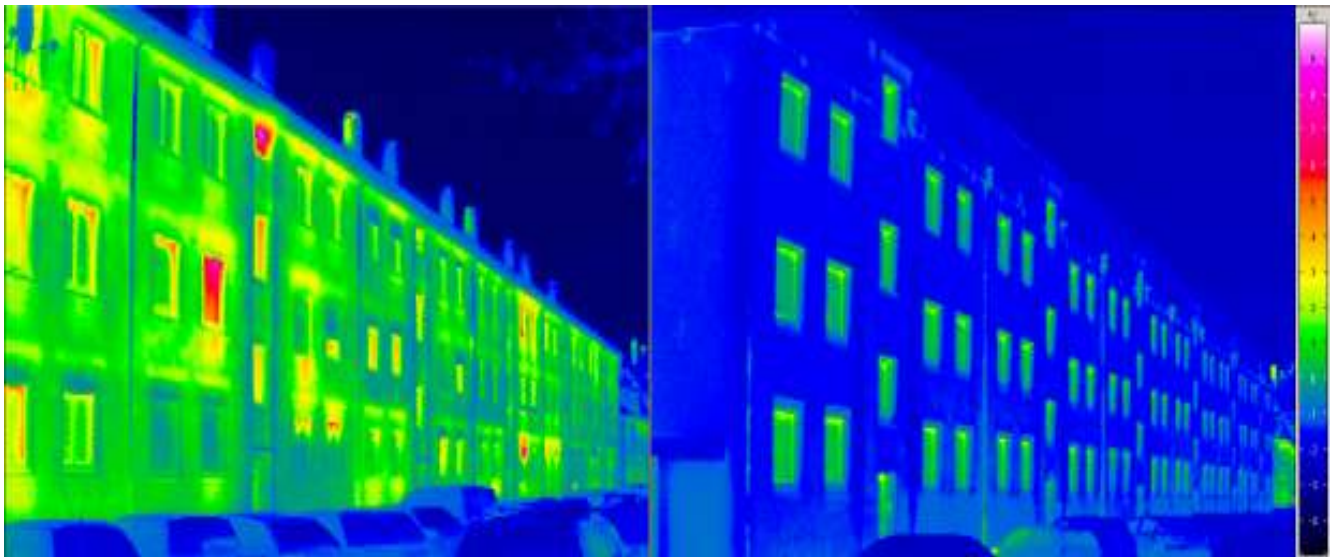
Wissenschaftliche Begleitung:
Passivhaus Institut, Darmstadt

Gefördert aus Mitteln des Hessischen
Ministeriums für Wirtschaft, Verkehr
und Landesentwicklung, Wiesbaden

... well insulated



...afterwards



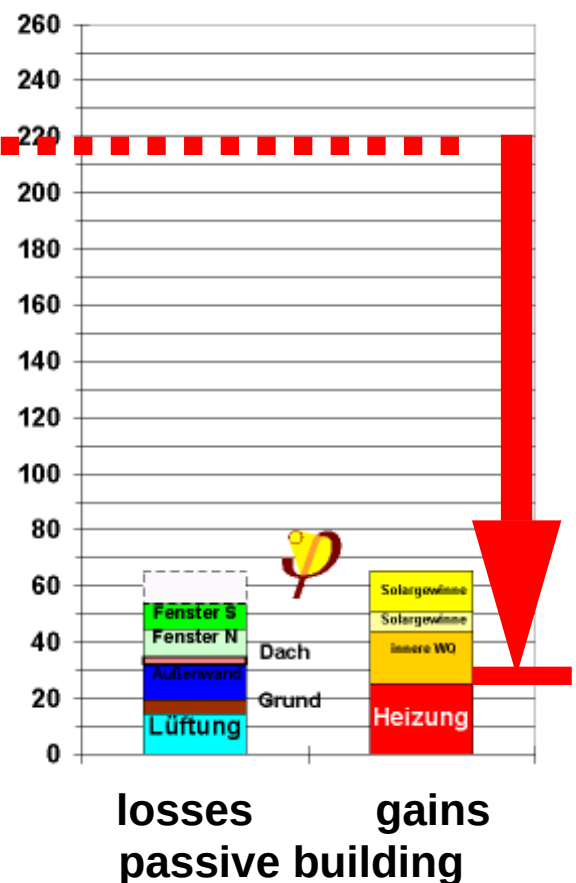
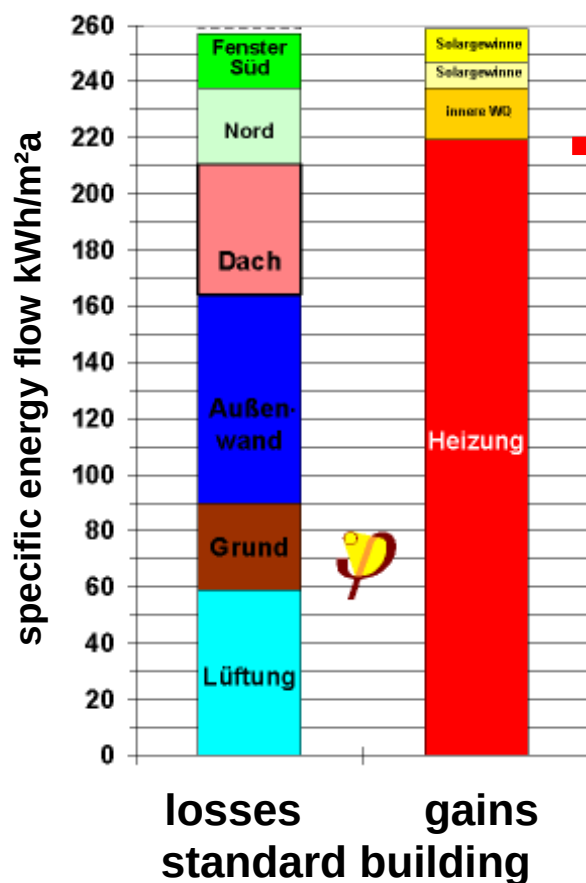
Sanierungsprojekt Tevesstraße FF/M
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before...

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check the energy balance in detail (PHPP)



old cellar ceiling
NOT airtight



...first tests to fill cracks...



cellar ceiling
made airtight

low viscosity
fluid used as...

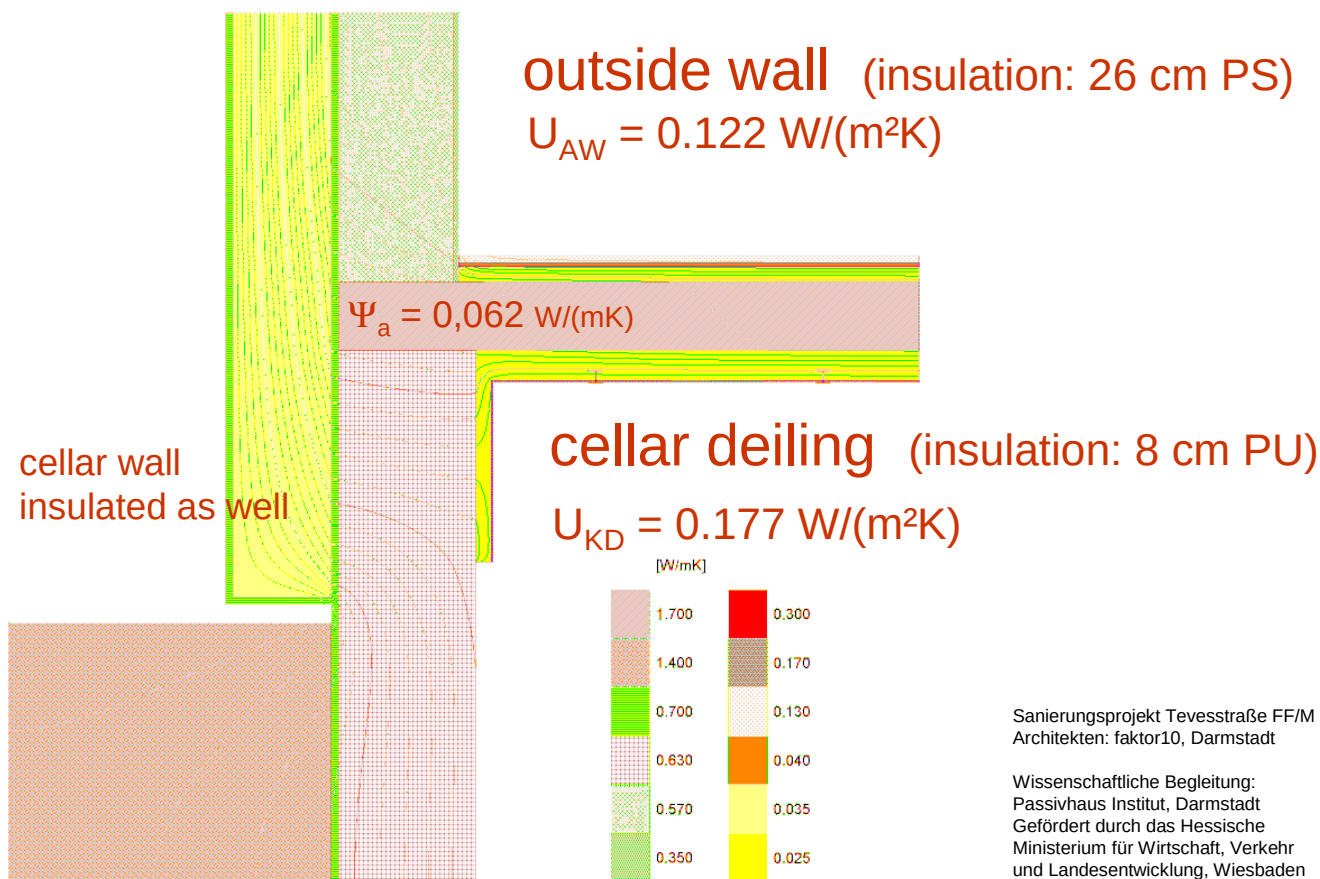


... connected
to inside plaster

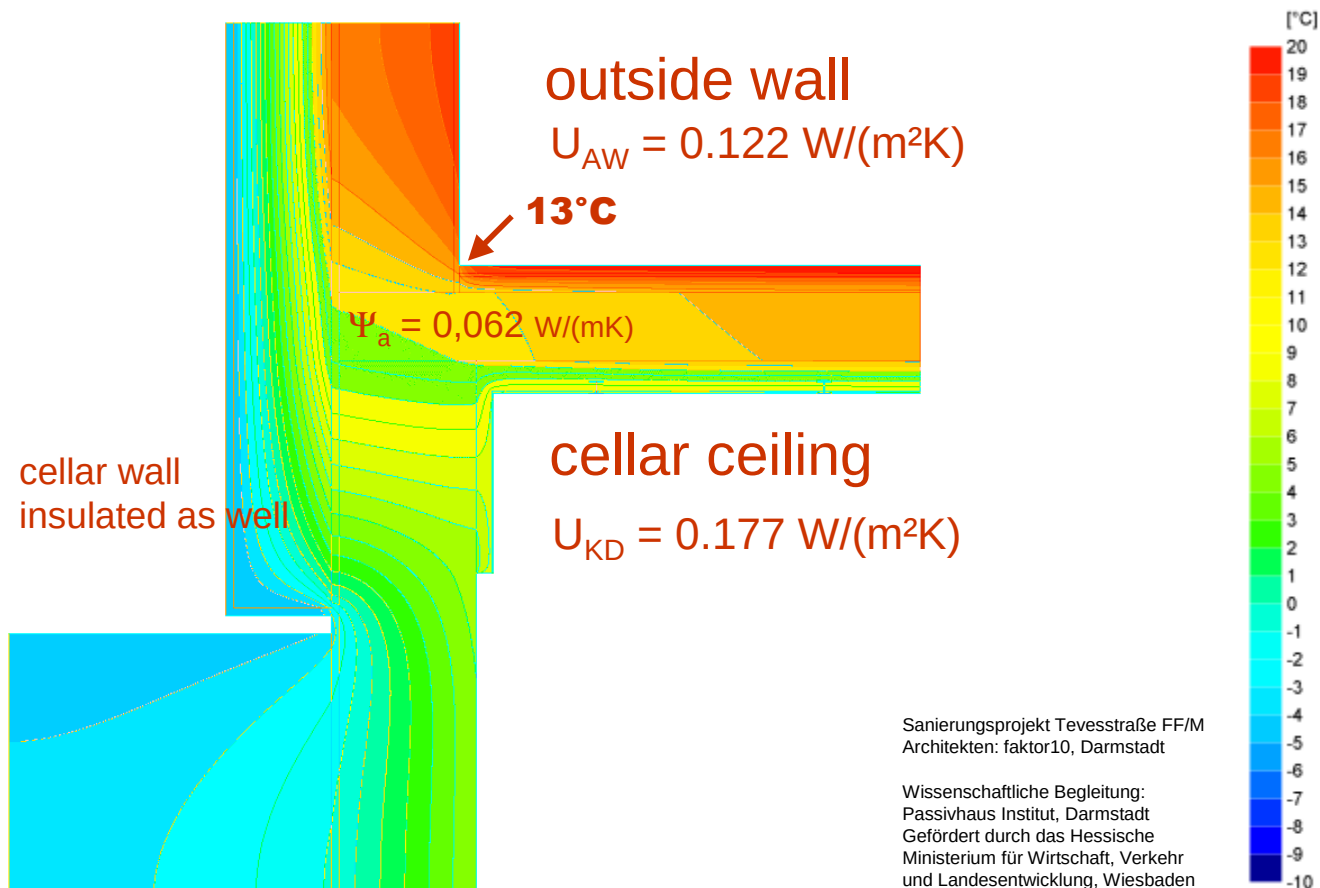
...levelling material
fills all cracks and
gaps airtight ...



Tevesstrasse renovation



Tevesstrasse renovation



pedestal of building: cellar wall insulated



view from outside



view inside

Sanierungsprojekt Tevesstraße FF/M
Architekten: faktor10, Darmstadt

Wissenschaftliche Begleitung:
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und Landesentwicklung, Wiesbaden



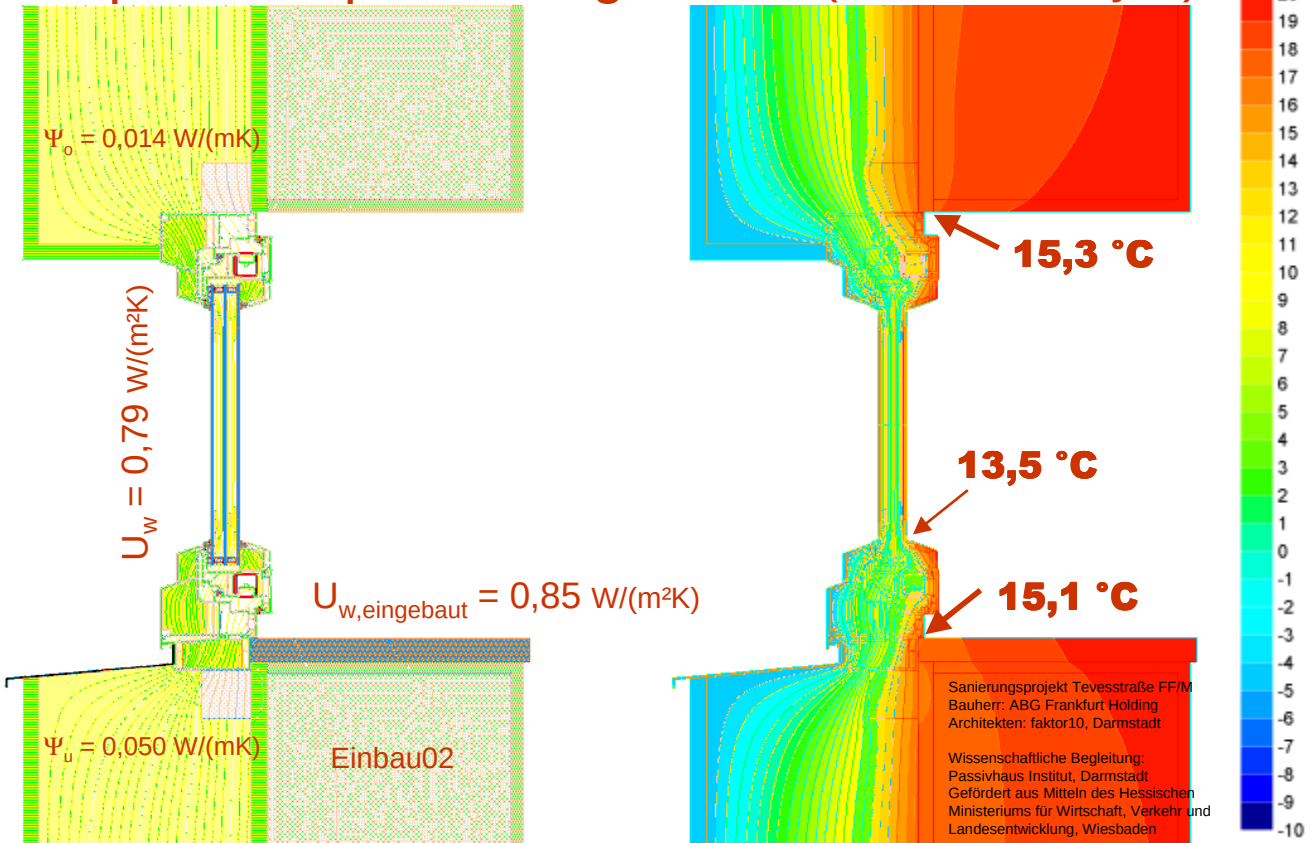
cellar ceiling and wall from inside
(staircase to cellar)

Sanierungsprojekt Tevesstraße FF/M
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thermally insulated window frame

... optimized positioning in wall (insulation layer)





new windows pushed out...
... gives additional space inside

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Landesentwicklung, Wiesbaden



new windows
pushed out...

the outside aspect ratio:
window opening / depth of reveal
remains unchanged compared
to the situation before

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renovation using PH-components



thermal bridges optimized

Heating energy demand: 17 kWh/m²a

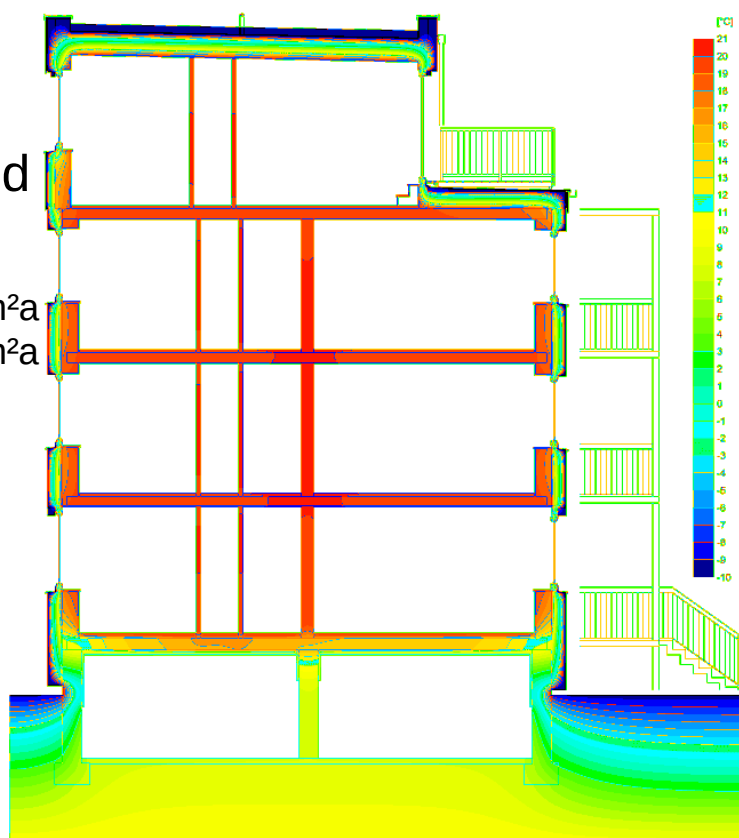
Primary energy demand: 37 kWh/m²a

heating, hot water, technical electricity

Monitoring of energy consumption
and temperatures over two years
showed very good
match to theory

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well insulated...

heating with supply-air is possible



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We need better air quality!

permanent ventilation especially in old houses!

The renovated old house with new windows will be much better air tight than before, but inhabitants are not used to cross ventilation.

Old house renovation will have (few)more thermal bridges left

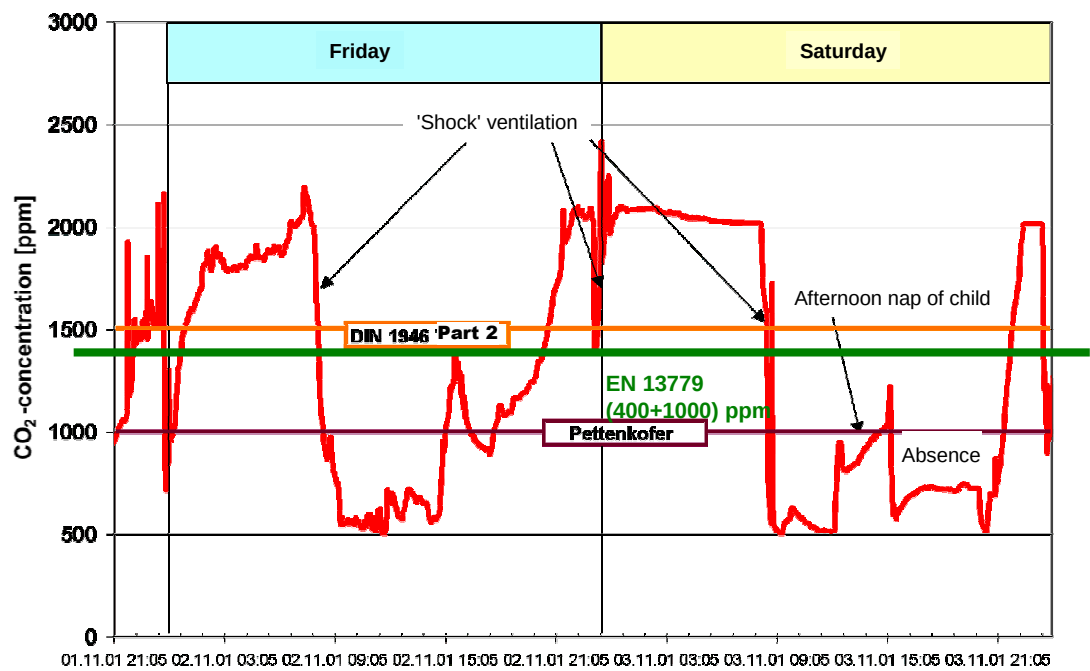
We need mechanical ventilation for dehumidification!

Recommendation: ventilation system only with heat recovery





CO₂-concentration with only ventilation by windows



Existing old building with window ventilation

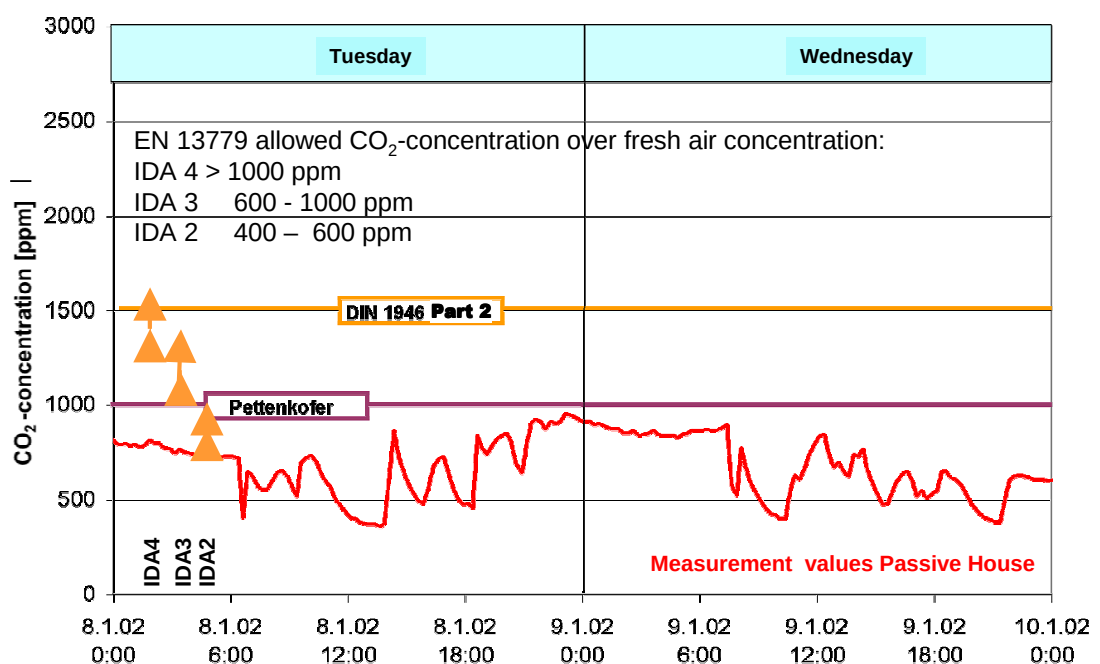
E-C.1.1 17 10/09

Source: [PHI Pfluger]

Author: HK / PHI / PHD

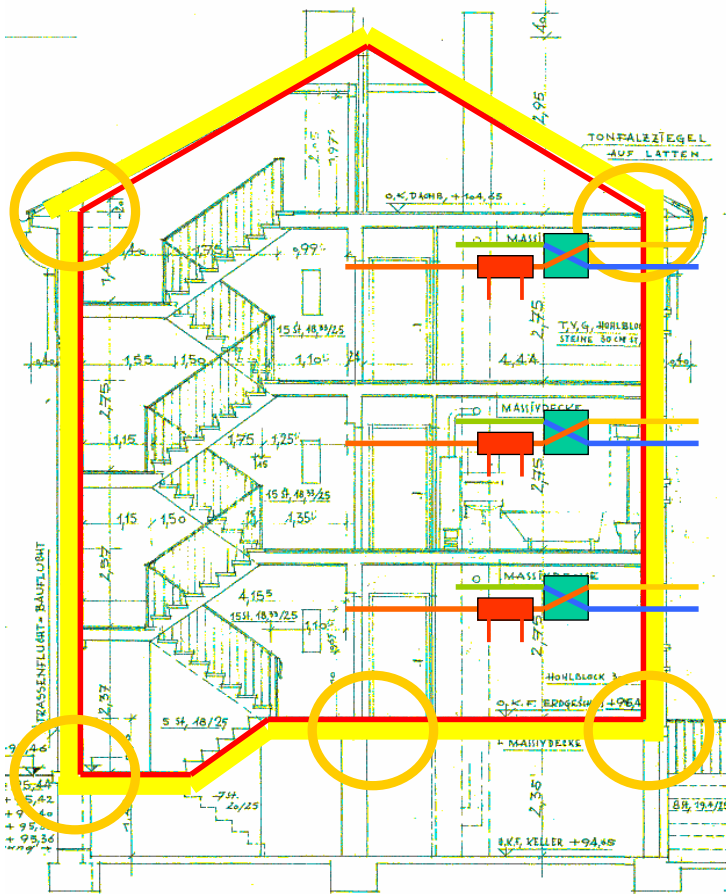


CO₂-concentration with mechanical ventilation



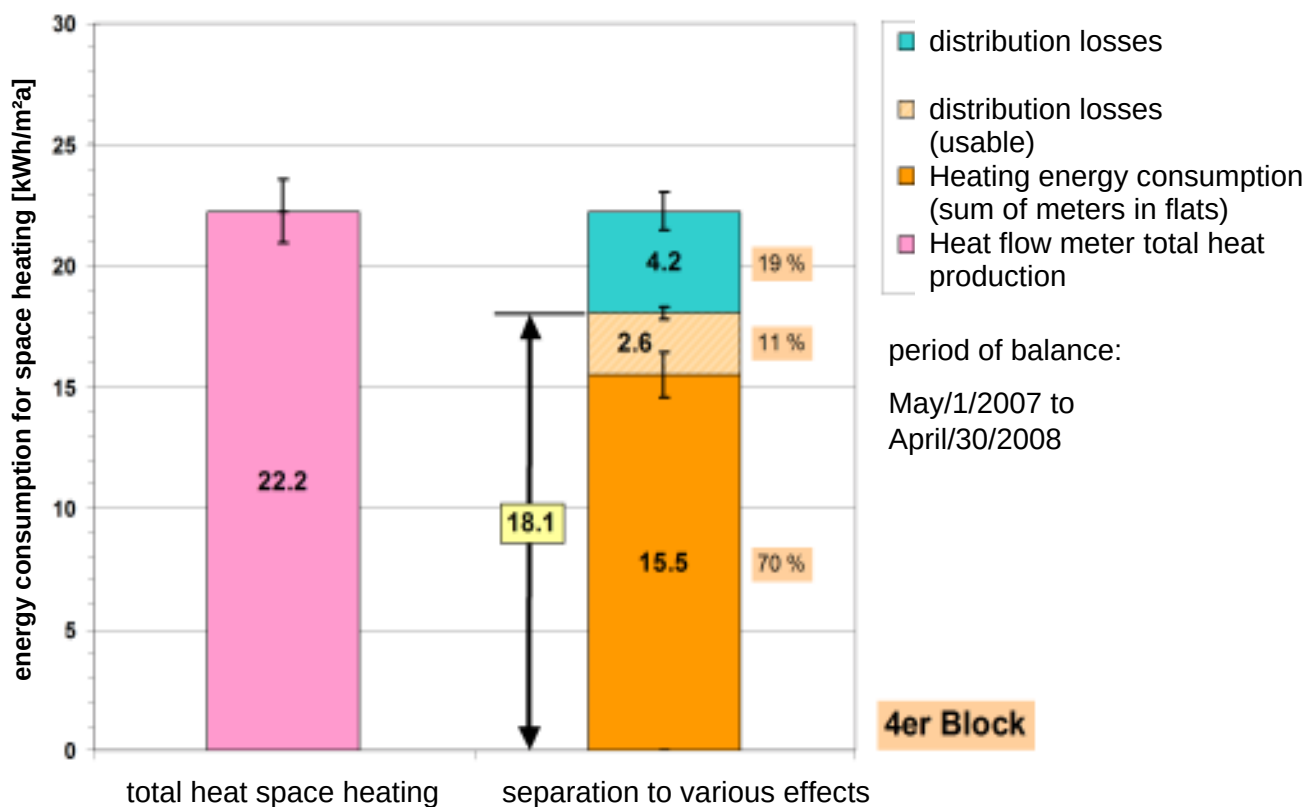
CO₂ - concentration in a Passive House
(Bedroom, measurement Kassel Marbachshöhe winter 2001/2002)

Monitoring of building performance by PHI



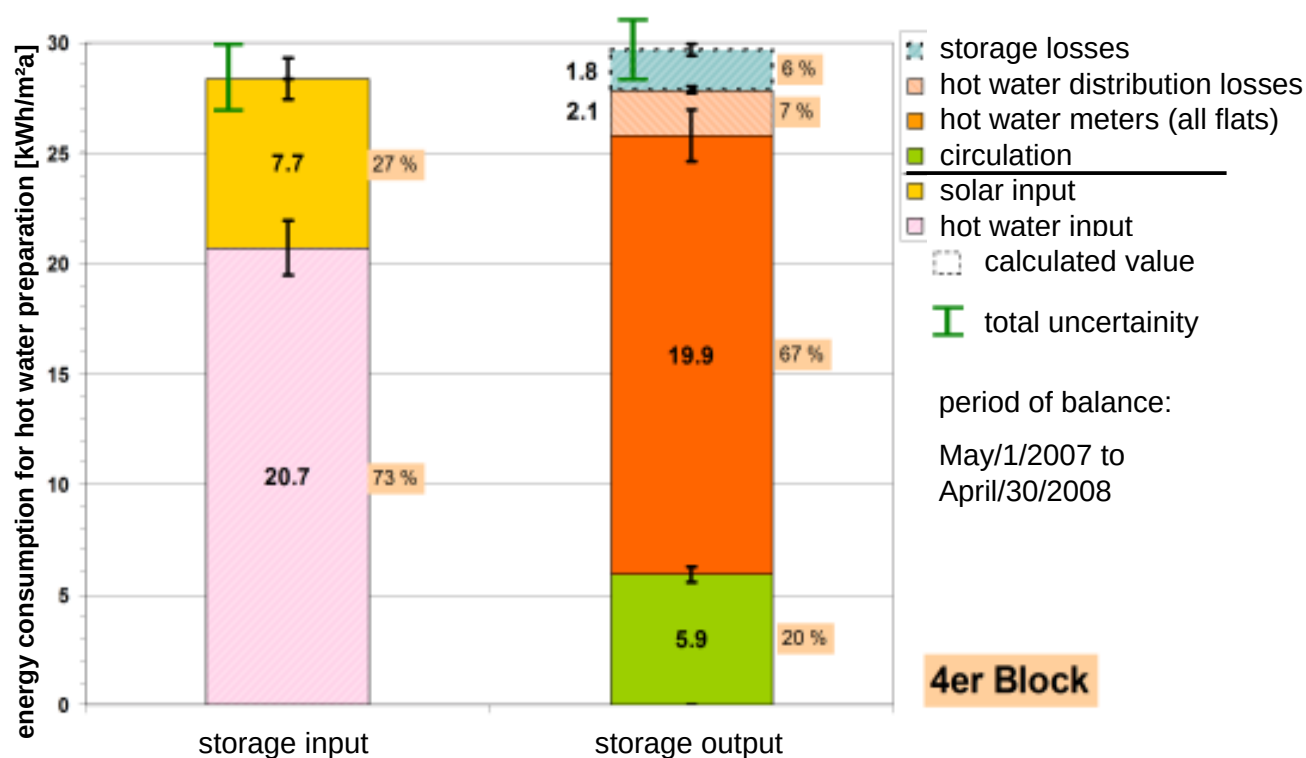
monitoring for 2 years:
temperatures
air quality
air exchange rates
energy consumption
space heating
hot water

Monitoring Tevesstrasse: balance heating



download of detailed project documentation (german language) at www.passiv.de

Monitoring Tevesstrasse: balance hot water



download of detailed project documentation (german language) at www.passiv.de

Apartment building „Hoheloostraße“ in Ludwigshafen, DE

PROJECT SUMMARY

Renovation of an apartment building, built in 1960. Reduction of annual heat energy demand: 94 %. Almost complied with Passive House Standard

SPECIAL FEATURES

decentral ventilation appliances with heat recovery, PV

ARCHITECT

GAG Ludwigshafen am Rhein

OWNER

GAG Ludwigshafen am Rhein



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and what about costs?

passive house & sustainable design
will give long term return



why emphasize on building envelope?

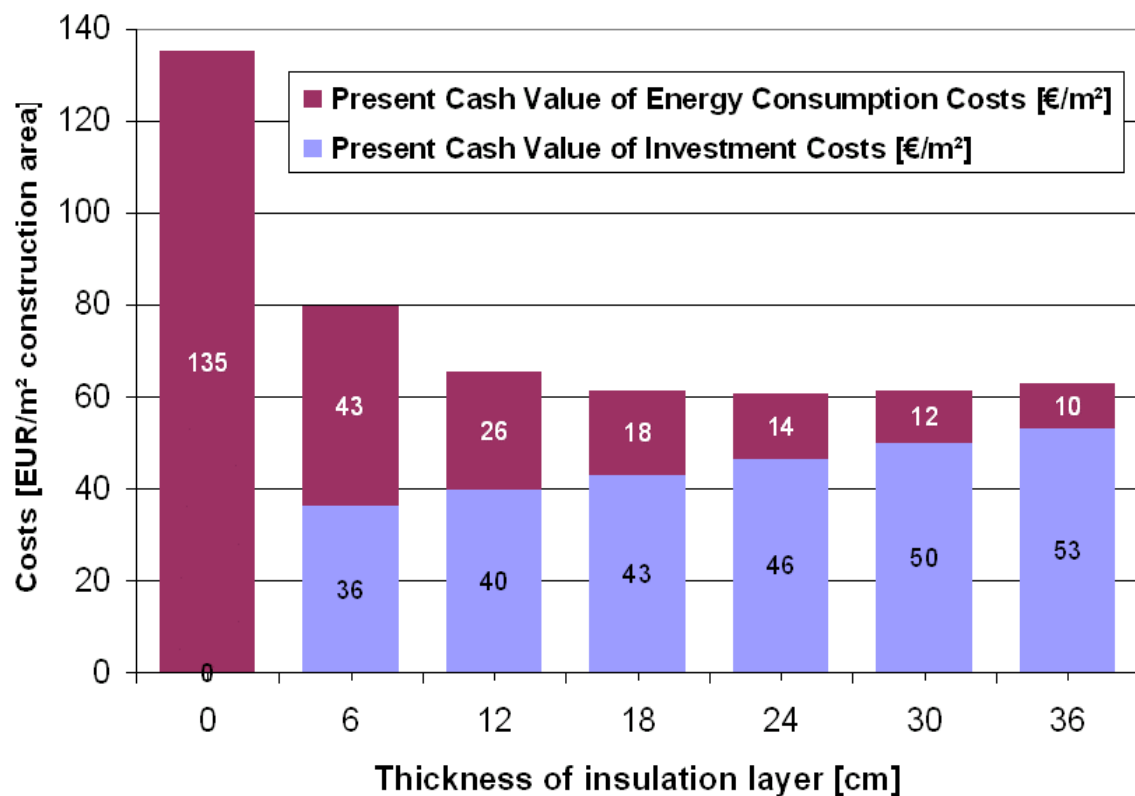
the economic approach:

**lifetime of envelope components is high
30 ... 50 ... 100 years
renovation intervalls are therefore long
and so innovation cycles are long**

conclusion: the investor will be fixed to any
decision made now for many years

do the best you can afford now

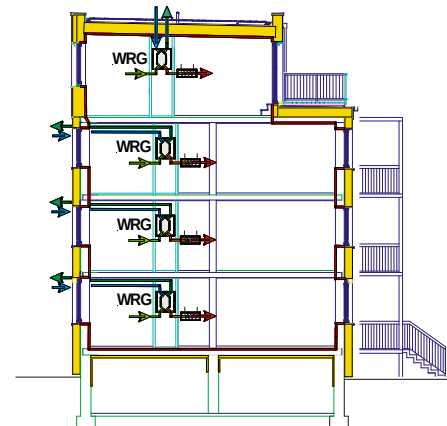
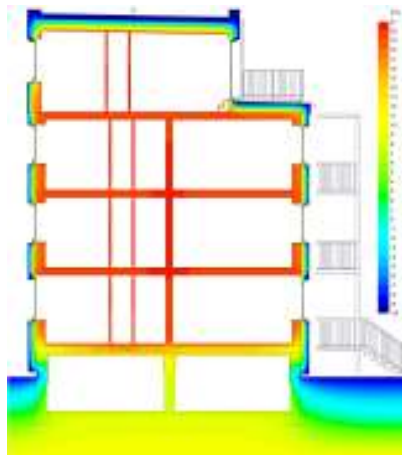
total costs of thermal insulation (wall)



extra effort for building envelope renovation ...



- ... gives noticable extra benefit for the customer
- ... provides locally added value (no fuel importation)
- ... makes renewables a realistic possibility



... is not 'easy' to realize – but reasonable

Passive Houses – building today for a sustainable future

remember Fridtjof Nansens FRAM (1893)



In Nacht und Eis.

Die Norwegische Polarexpedition
1893—1896.

Von
Fridtjof Nansen.

Mit einem Beitrag von Kapitän Sverdrup,
211 Abbildungen, 8 Chromotafeln und 4 Karten.

Neue revidierte Ausgabe.

Erster Band.



Leipzig:
F. A. Brockhaus.
1898.



the challenge: very cold climate, small ship

Fritjof Nansen: "In Nacht und Eis. Die norwegische Polarexpedition", Leipzig 1898

Fridtjof Nansens FRAM



Del 1 side 41:

Tak, gulv og vegger bestod av mange lag, så det ble tykke og varmeisolerende. Innerst inne mot det varme rommer ble det overalt lagt linoleum, som skulle hindre den fuktige kahyttluften fra å komme ut i siden og der avsette vann, som i tilfelle snart ville fryse til is. Skipssidene ble dekket med tjæret filt, deretter korkfyll, granpanel, et tykket filtag, lufttett linoleum og tilslutt enda et panel. Taket (under dekk over salong og kahytter) hadde følgende lag: luft, filt, granpanel, linoleum, (renhårsfyll, granpanel, linoleum, luft, granpanel. Når vi regner med dekksp plankene,) var tykkelsen alt i alt omtrent 40 cm. (På gulvet i salongen ble det ovenpå dekksp plankene lagt et tykt lag med korkfyll, der over et tykt tregulv og så øverst linoleum.) for å motvirke kulden ble også skylightet bl.a. beskyttet ved tre ruter innenfor hverandre.

Del 1 side 129

Det er et varmt hus, "Fram", riktig et koselig hus. Enten det er 30 grader kulde eller 6 grader, har vi ikke noe i ovnen. Og ventilasjonen er førsterangs; (især siden vi rigget opp luftseilet står en hel vinter inn gjennom ventilhullet. Men like fullt sitter vi lunt og godt her med en lampe brennende.) Jeg tenker på å ha ut hele ovnen; den står bare i veien.

(Hva beskyttelse mot vinterkulden angår, har da iallfall mine beregninger slått godt til. Vi plages heller ikke stort av fuktighet.)

thanks for the norwegian text and some explanations
to Trond Haavik, Segel AS, Nordfjordeid (www.segel.no)

a passive house described in 1893



„... besides this, ceilings, floors and walls were made [air] tight and thermal insulating by numerous layers.

[nearest to the warm room] on all surfaces there was placed air tight linoleum to prevent from condensation of warm humid air: the humidity would freeze otherwise very soon. The walls are covered with tared felt, followed by cork, then a layer of wood, a layer of felt, then linoleum and again wood. The ceilings [...] have an overall thickness of about 40 cm. The window where the cold could come in very easily was protected by triple panes and other means.

This is a warm and comfortable location. Whether the temperature outside is 5°C or 30°C below zero, we don't have any fire in the stove. The ventilation is excellent, for it drives fresh winter air through the fan downwards.

I conceive to bring the stove outside, it just stands in the way. "

the solution: good insulation & triple pane glazings
airtightness & ventilation

a passive house described in 1893



thank you very much for your attention
berthold.kaufmann@passiv.de

for more information see:
www.passiv.de
www.ig-passivhaus.de
www.passivhaustagung.de