Universität für Bodenkultur Wien
Department für Bautechnik und Naturgefahren

Energy efficient and ecological architecture

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Prague
06.02.2012

Introduction

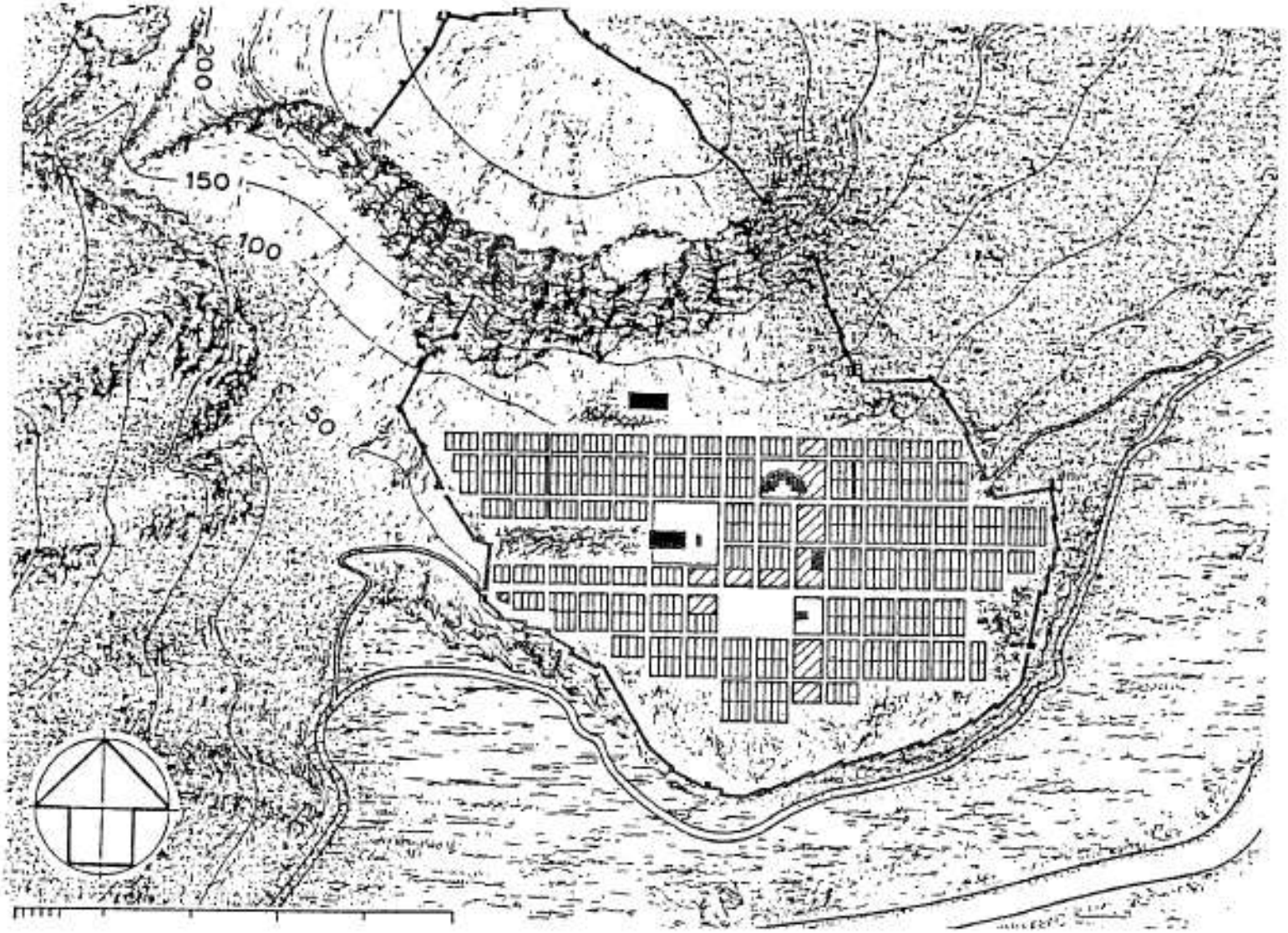
- History
- Consumption
- Passive house
- Examples

History

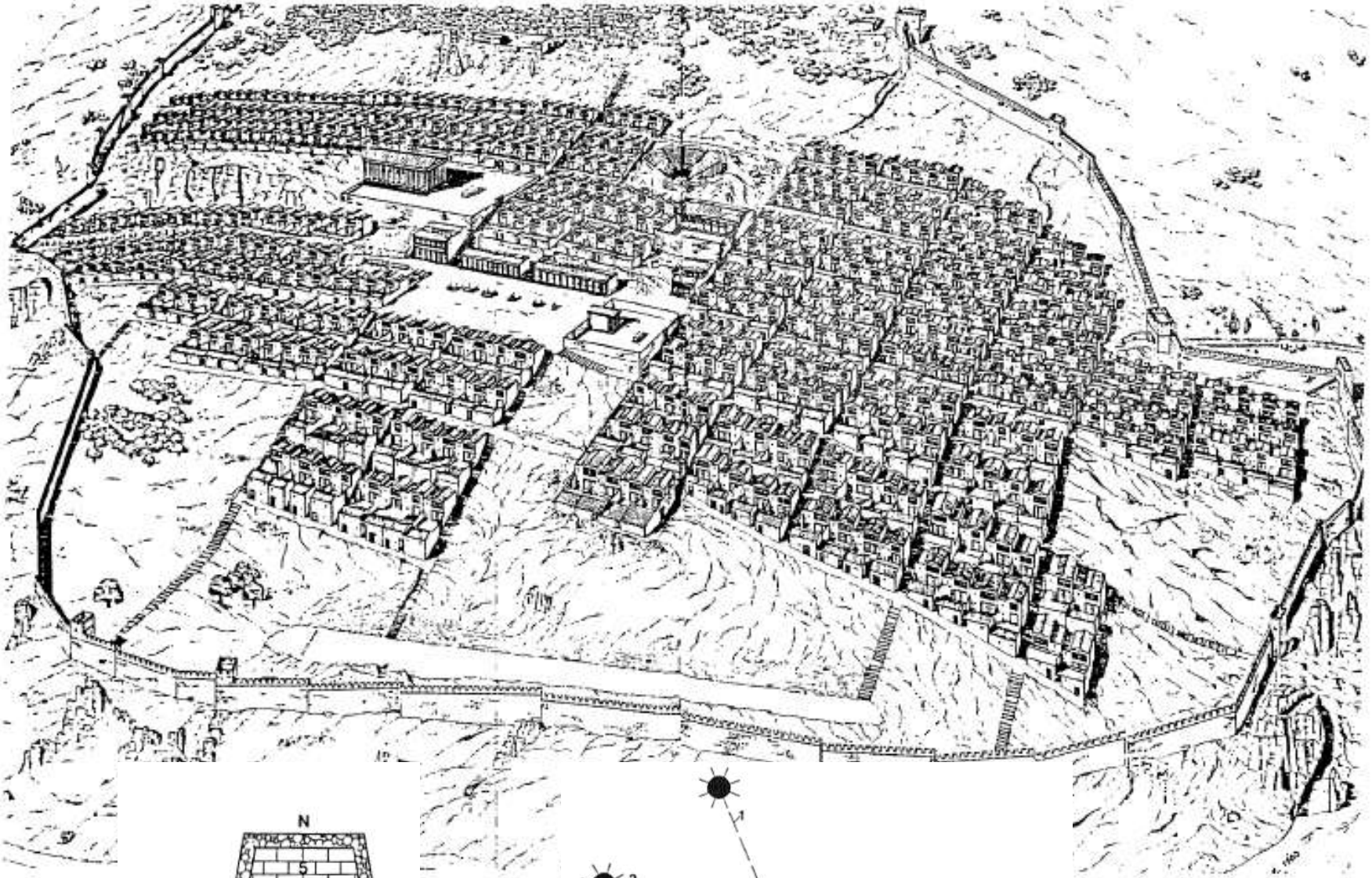
SOLAR ARCHITECTURE

Solarhouse – Low energy house – Passive house

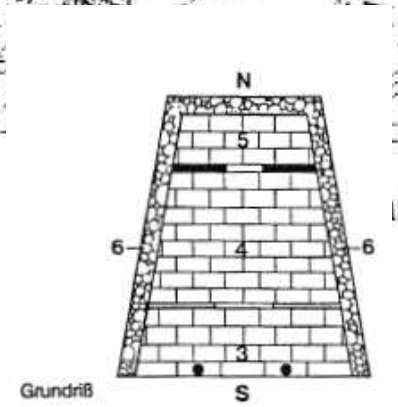
ANCIENT WORLD: Sunhouse of Socrates (469 – 397 v. Chr.)



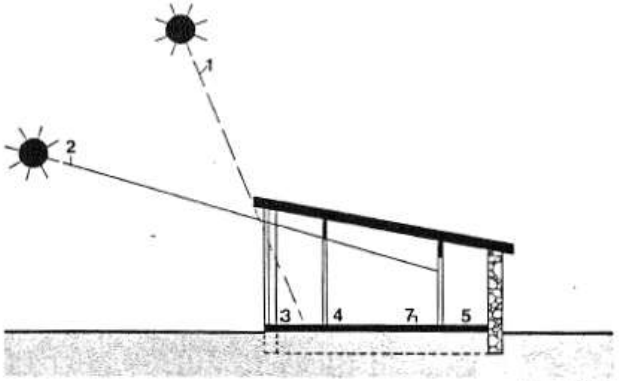
Stadtplan von Priene



sicht der S

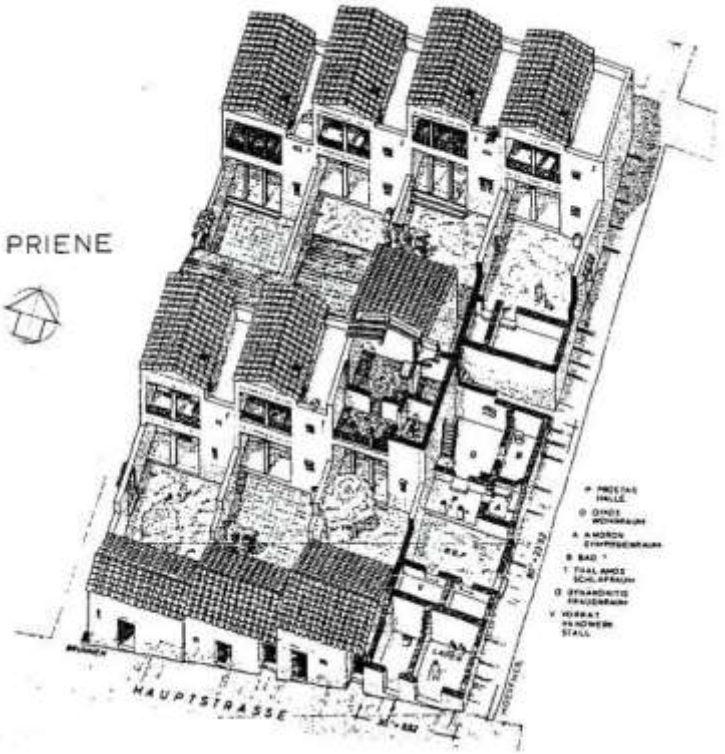


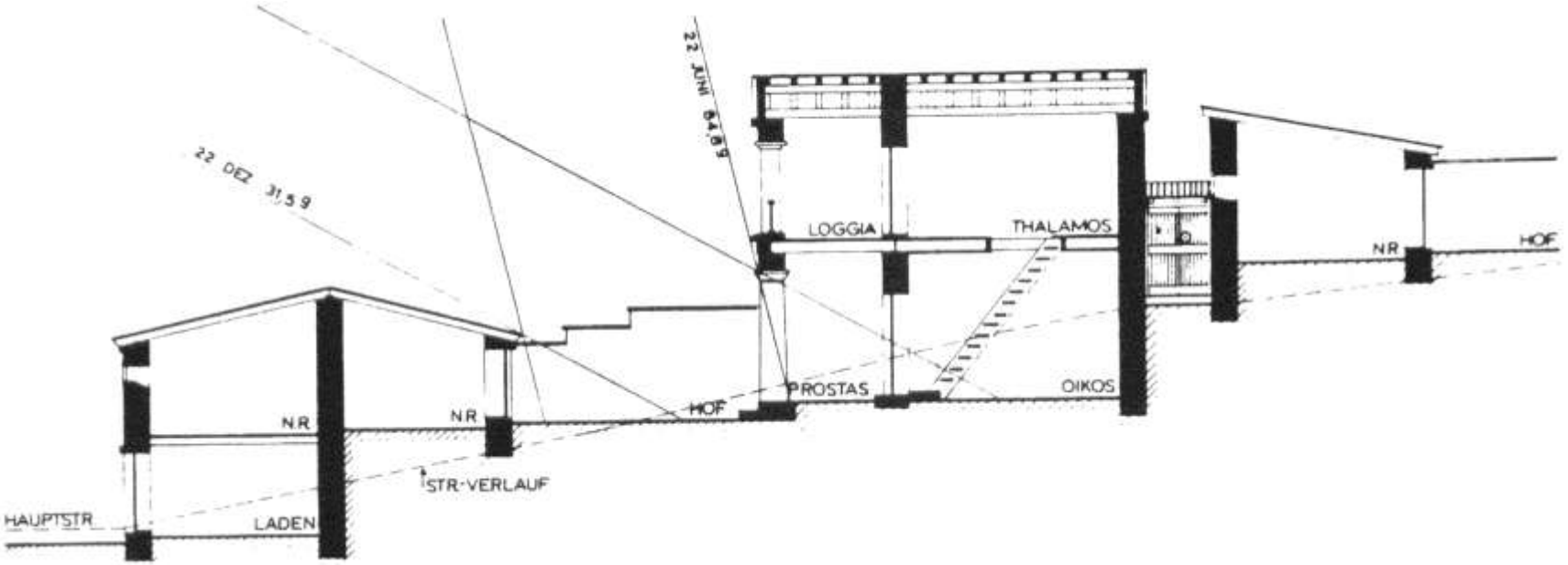
Grundriß



Längsschnitt

SOLAR ARCHITECTURE
Solarhouse – Low energy house – Passive house
ANCIENT WORLD: House in Priene





SOLAR ARCHITECTURE
Solarhouse – Low energy house – Passive house
GREENHOUSE + WINTERGARDEN

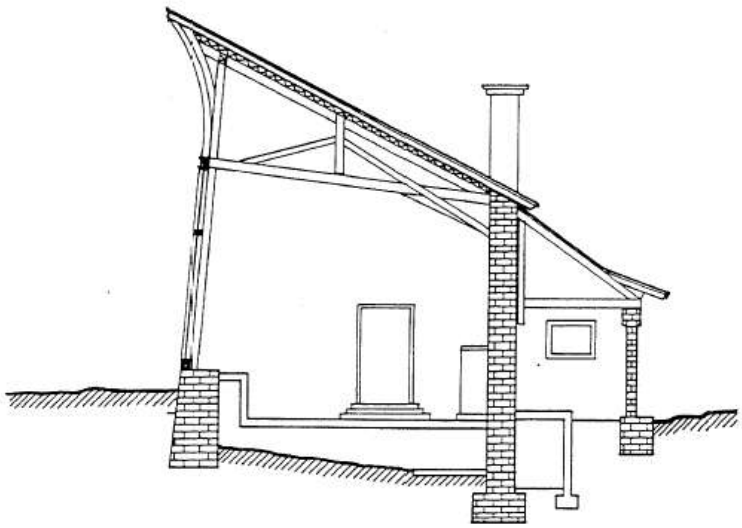


Abb. 2.14. :
Barockes Gewächshaus (Schnitt)

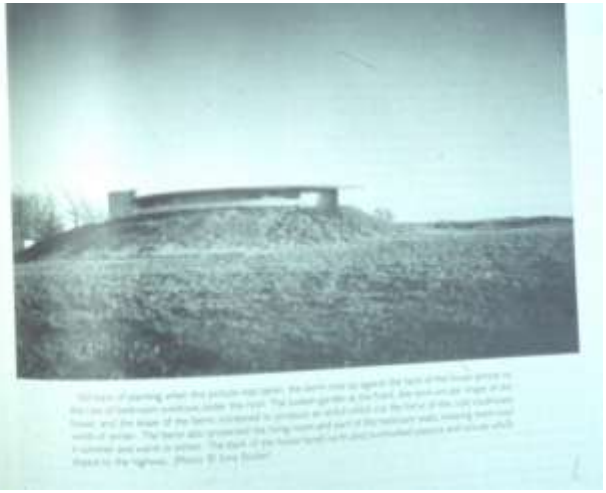
Greenhouse, Palace Garden of Telc, ca. 1800

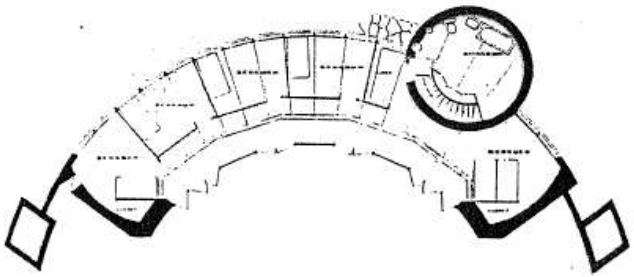
SOLAR ARCHITECTURE

Solarhouse – Low energy house – Passive house

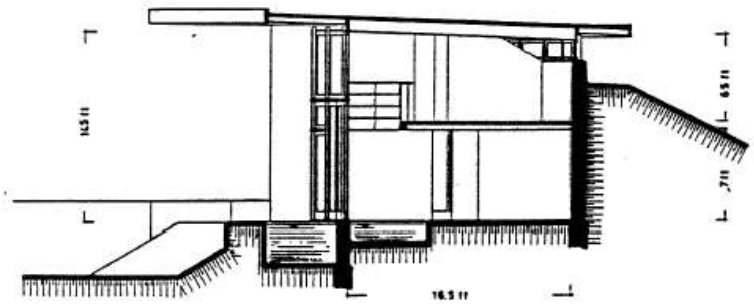
USA

Haus Jacobs II, „Solar Hemicycle“, in Middleton, Wisconsin, 1944, Frank Loyd Wright

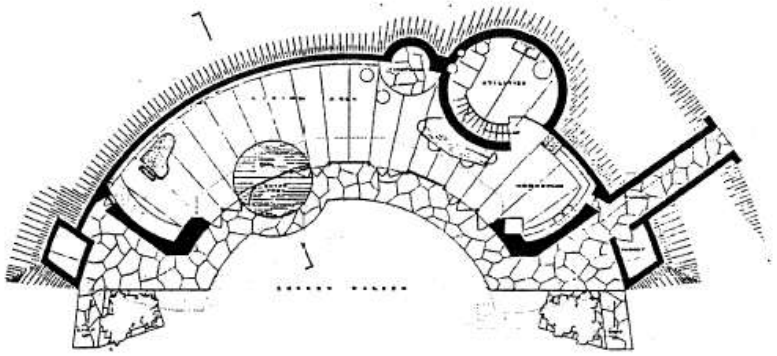




GRUNDRISS



SCHNITT



GRUNDRISS

Passive houses

- Basic Principles of the Passive House
- Projects from Austria from Treberspurg & Partner Architects ZT GmbH
- The Design of the Austria House

Principles of the Passive House Concept

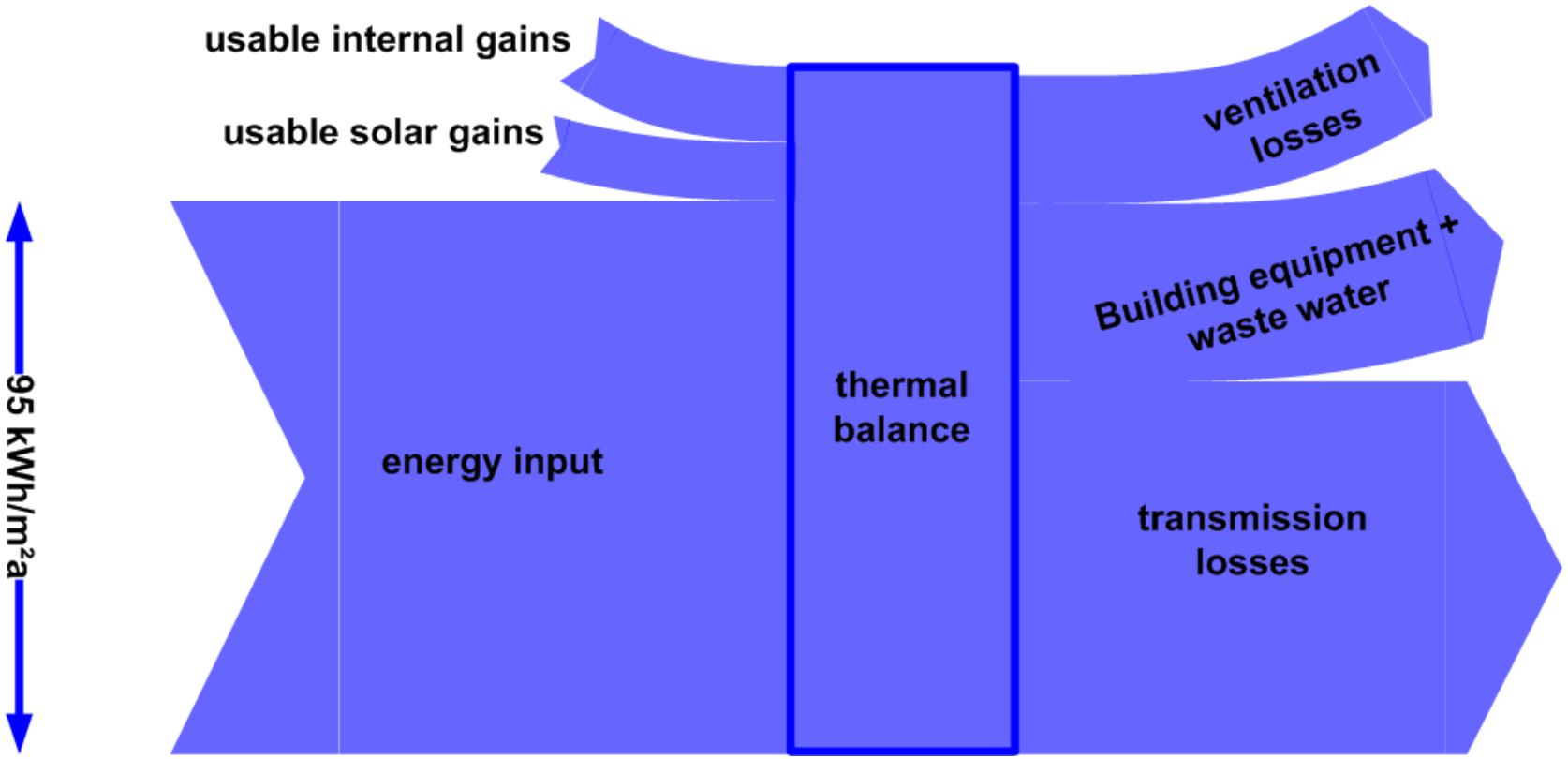
Definition (Passivhouse Institute Darmstadt - Dr. Feist):

A Passive House is a building, for which thermal comfort can be achived solely by postheating or postcooling of the fresh air mass, which is required to fullfill sufficient indoor air quality conditions - without a need for recirculated air.

- Optimizing the building shell
- Loss minimizing before Profit Maximizing

Comparison of PH with conventional buildings

Net final energy for space heating and hot water



Comparison of PH with conventional buildings

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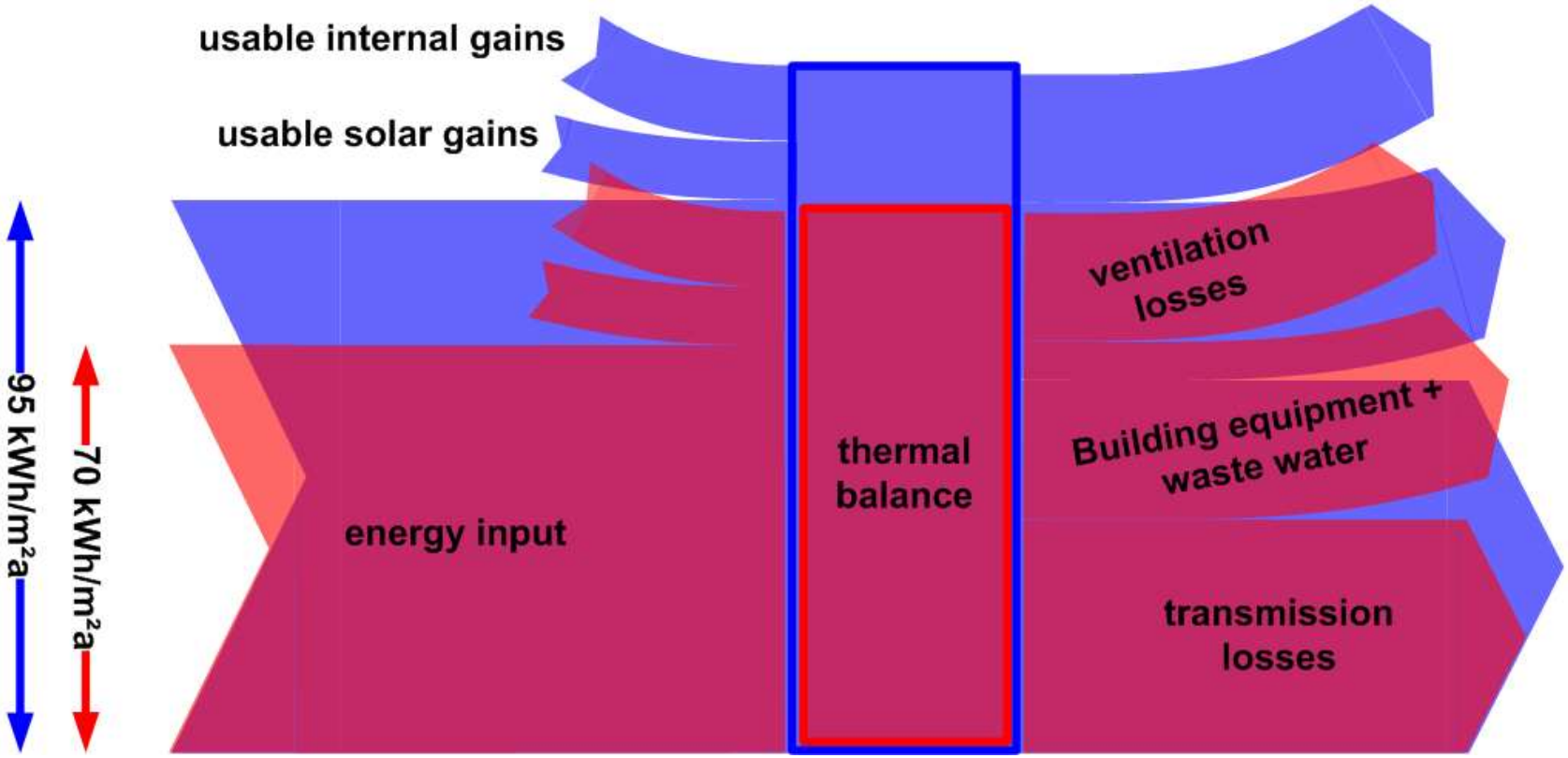

Comparison of PH with conventional buildings

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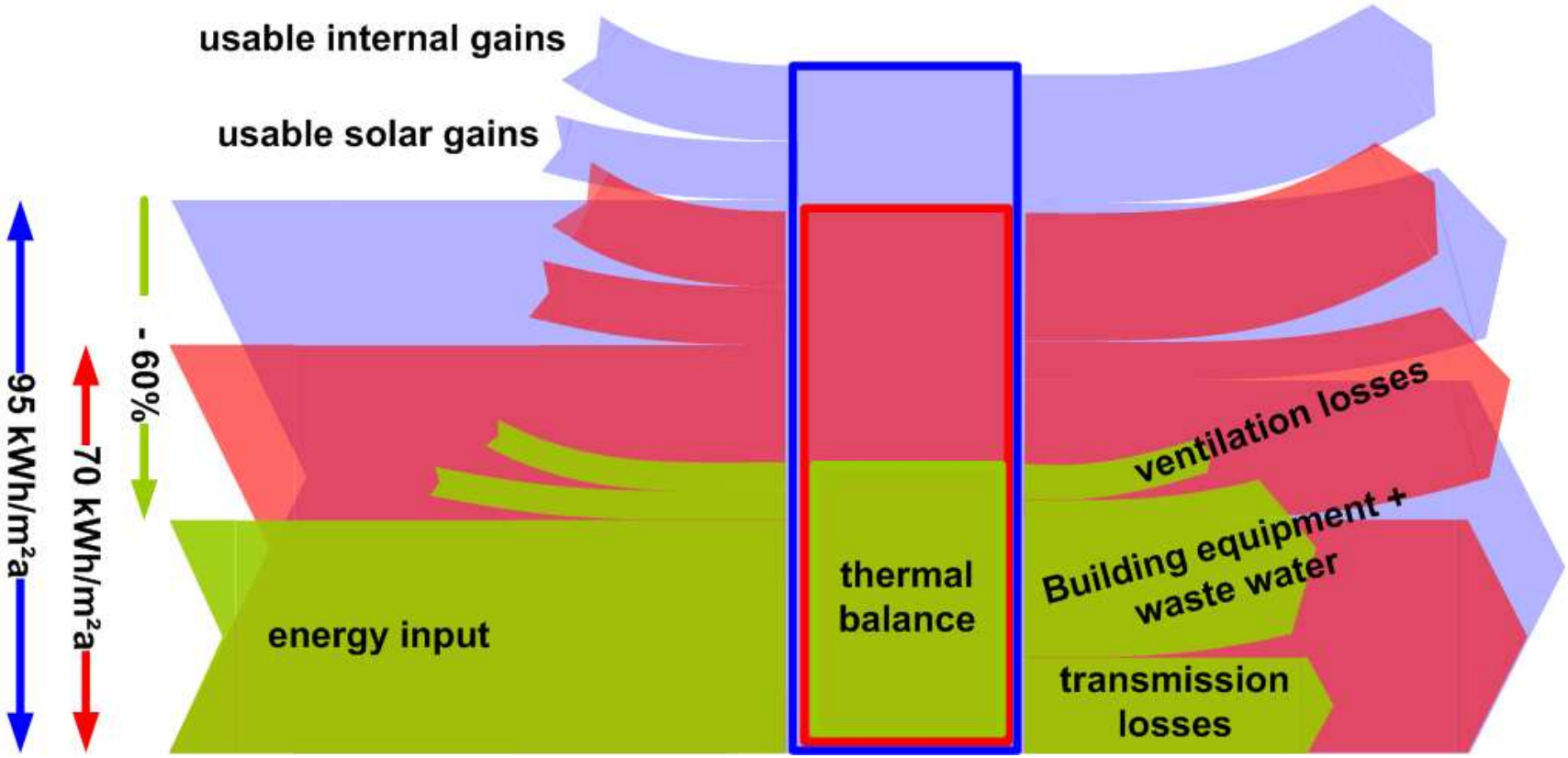
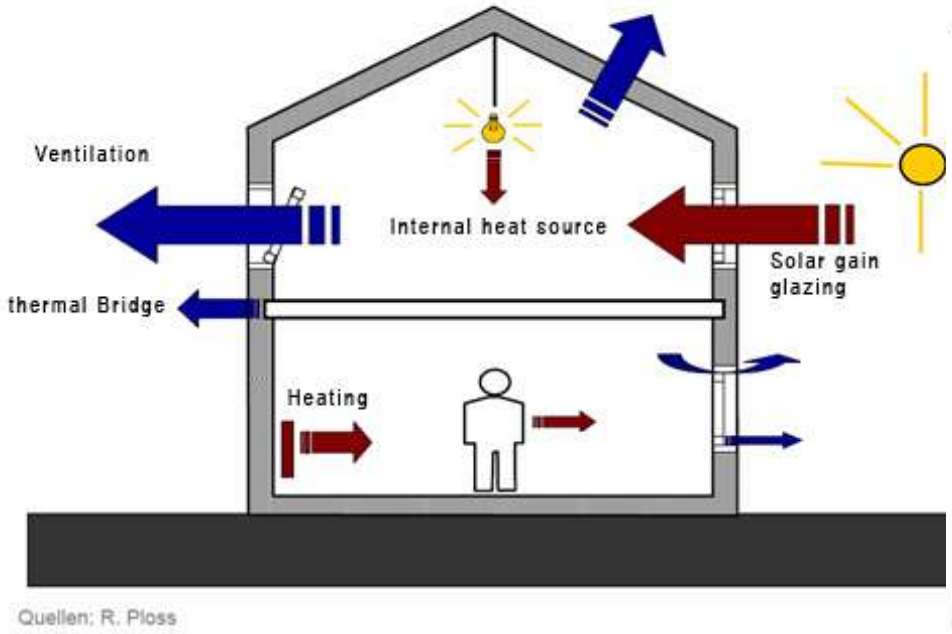


20.10.2011, SB11-Helsinki, Roman Smutny, Christoph Neururer BOKU Vienna

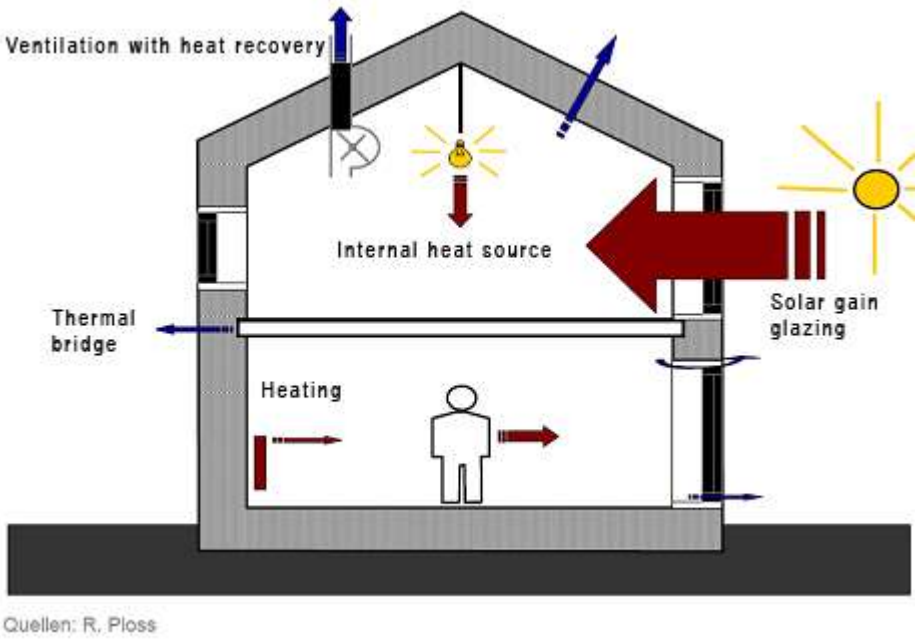
Conventional House VS Passive House

Building Standard



Quellen: R. Ploss

Passive House:

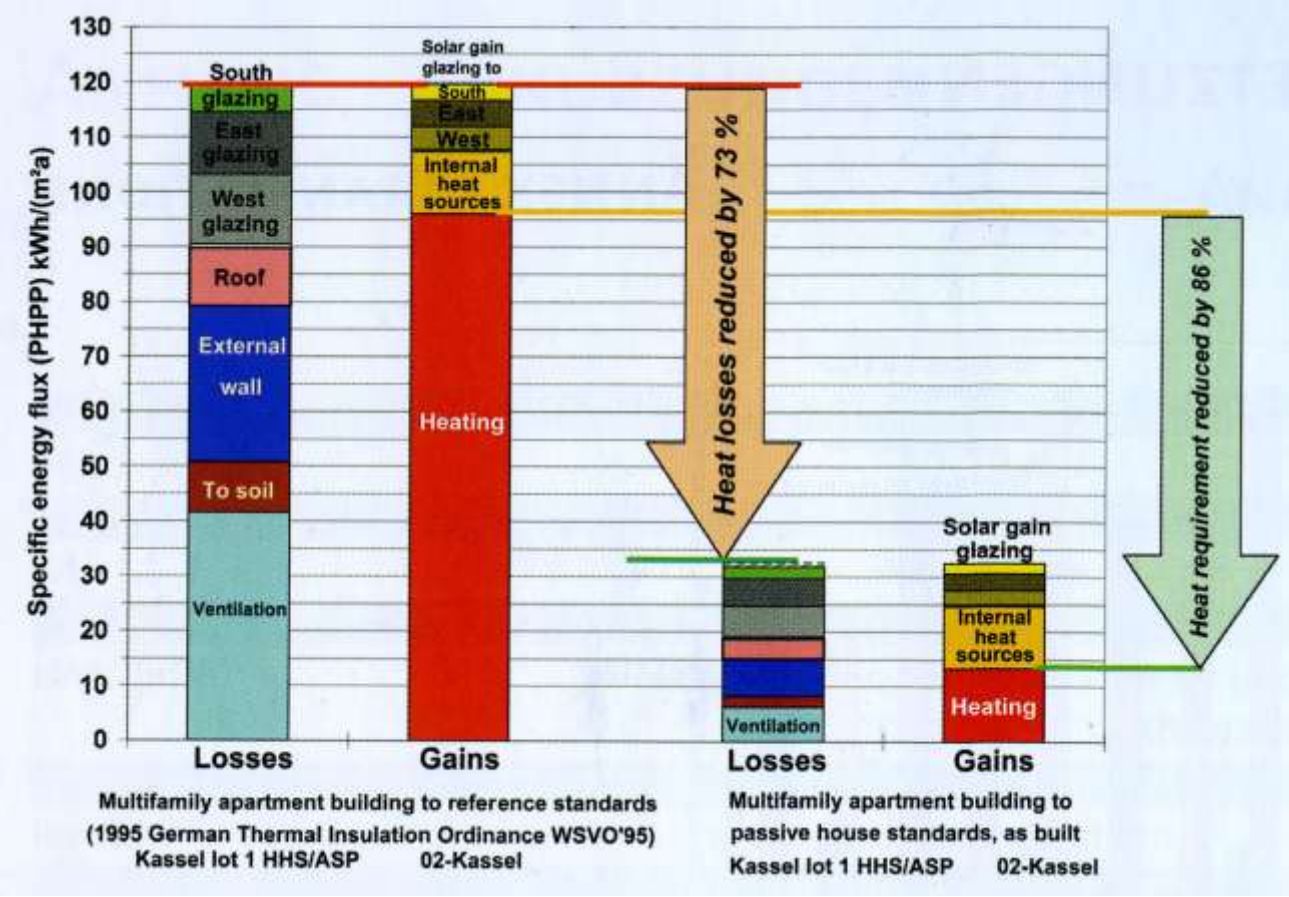


Quellen: R. Ploss

Losses – Gains
= Heating energy requirement

[source: HdZ - Passivhaus Schulungsunterlagen, 1.3 Ressourcenverbrauch im Gebäudebetrieb]

Energy Saving!



Energy saved on heating is 86% compared to conventional standards of new buildings.

[source: CEPHEUS]

Definition of kWh

- 1l heating oil ≈ 10 kWh
- 1l gas ≈ 7 kWh

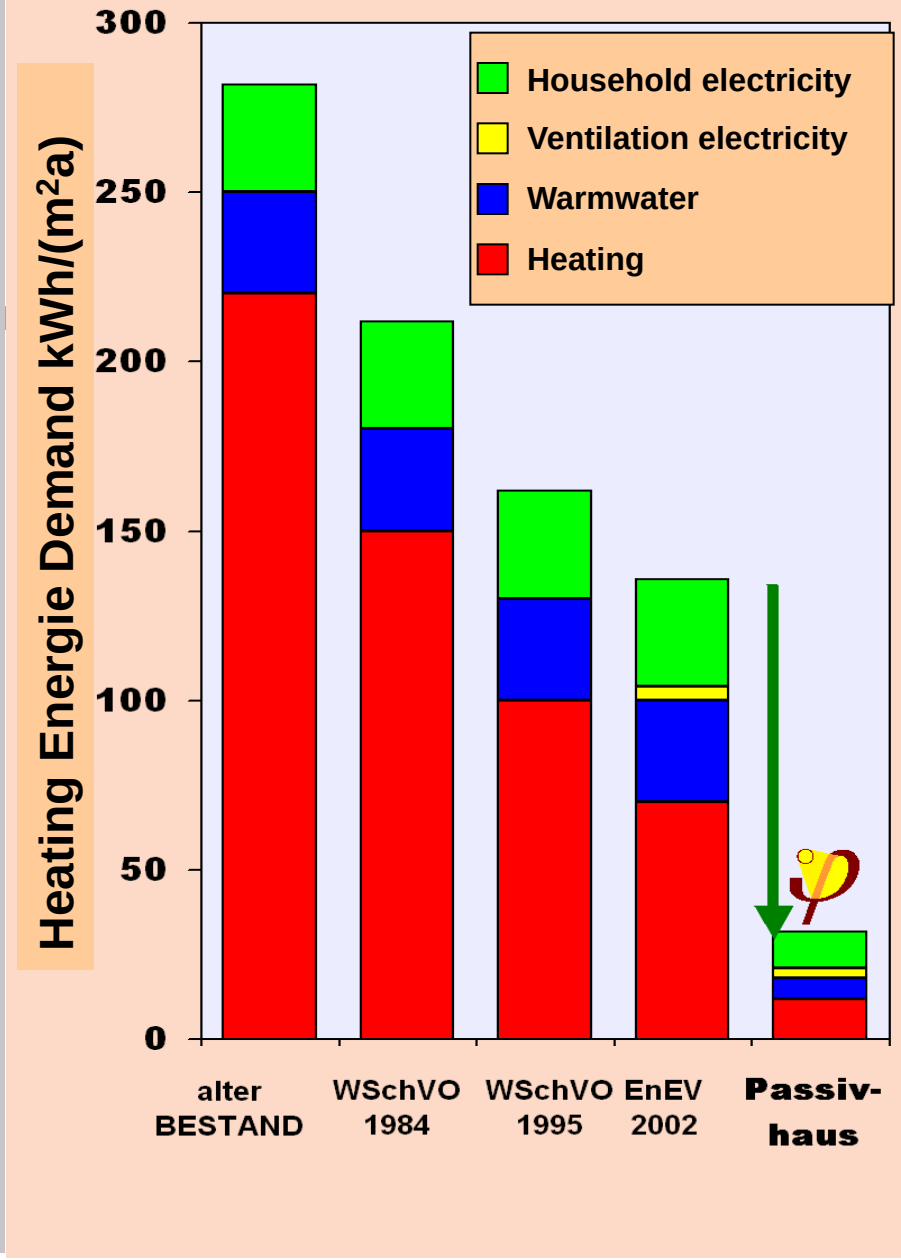
Definition of kWh

- **Conventional house** before year 1990
  -> 200 kWh / m2a
- 100 m2 -> 20 000 kWh -> 2000 liter oil

- **Passive house** -> max 15 kWh /m2a
- 100 m2 -> 1500 kWh -> 150 liter oil

	before	after
HWB (in kWh/m²WNFl./a):	175	15
Oil/l/a:	38.210	3.536
Oil savings in l:	34.674	

Factor 10 is possible



Evolution

„1-Liter Car“

Over 80% Energy savings

„1-Liter House“ = Passivhaus:

Since 1991

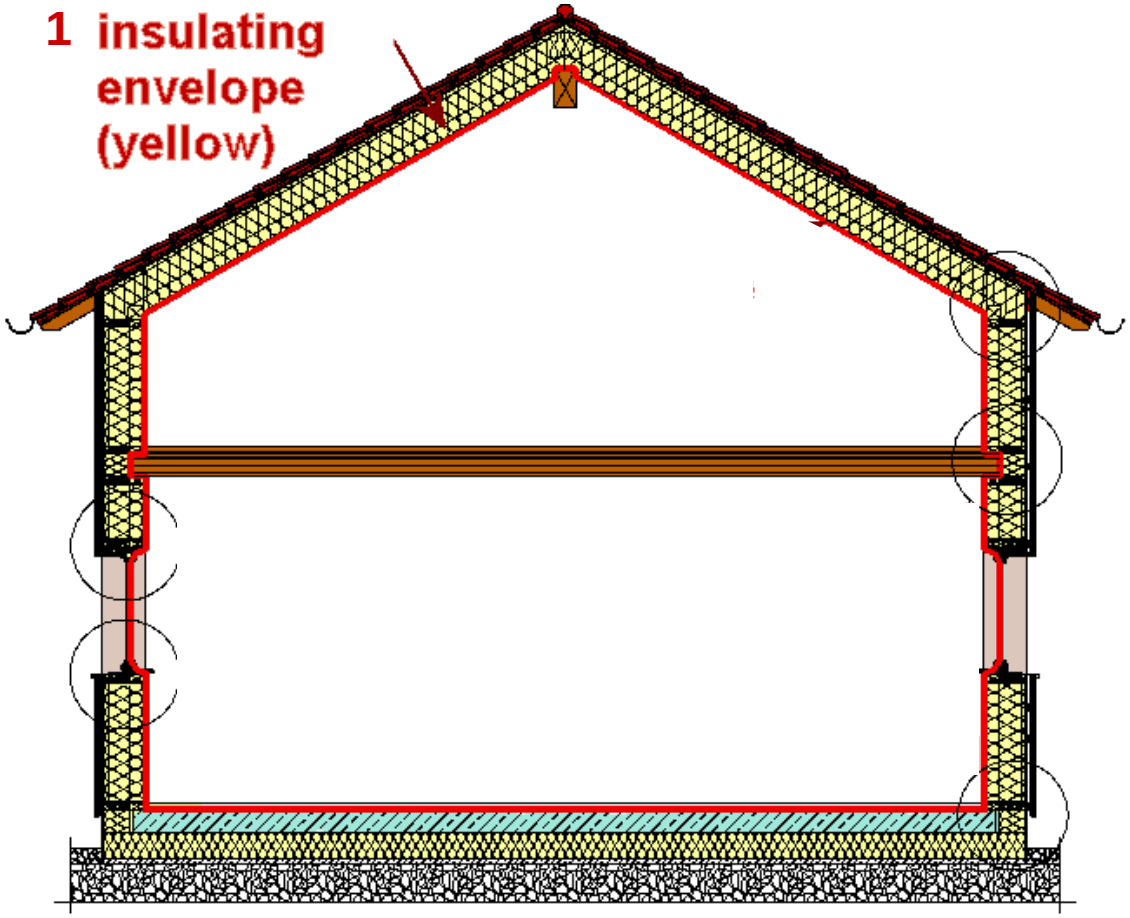
Over 90% Energy savings

Principles of the Passive House Concept

Passive Houses require superior design and components with respect to:

- Insulation
- Comfort windows
- Design without thermal bridges
- Air-thightness
- Ventilation with heat-recovery
- Innovative heating technology

Building Envelope: High Thermal Insulation

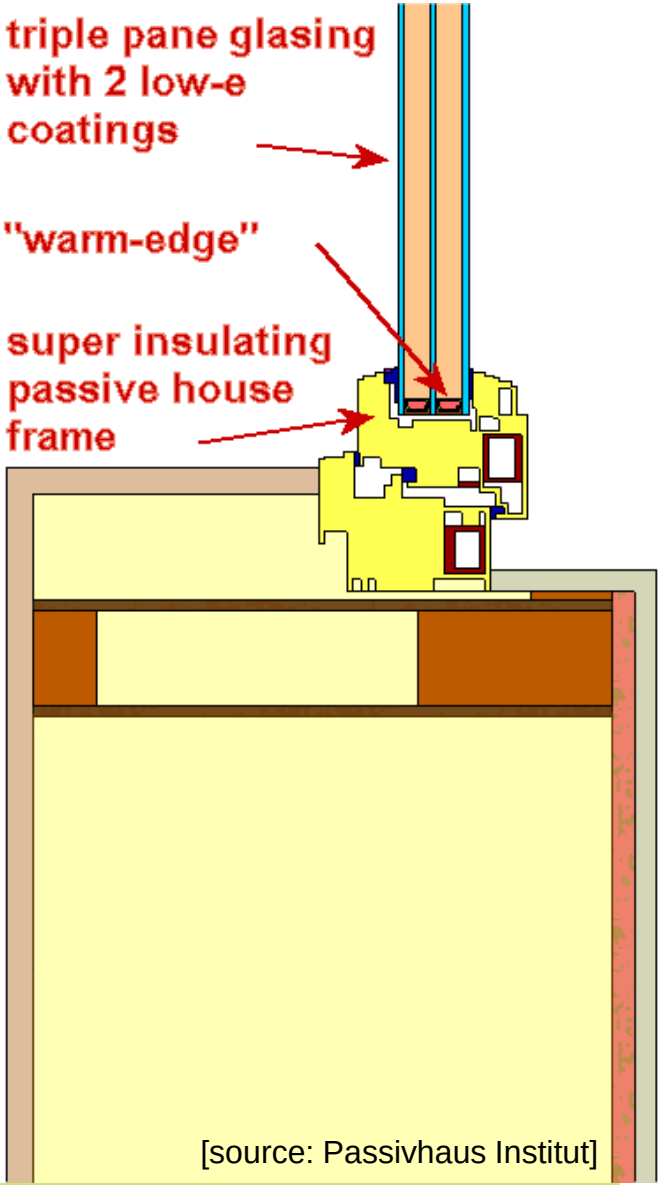


[source: Passivhaus Institut]

Building Envelope: Comfort Windows

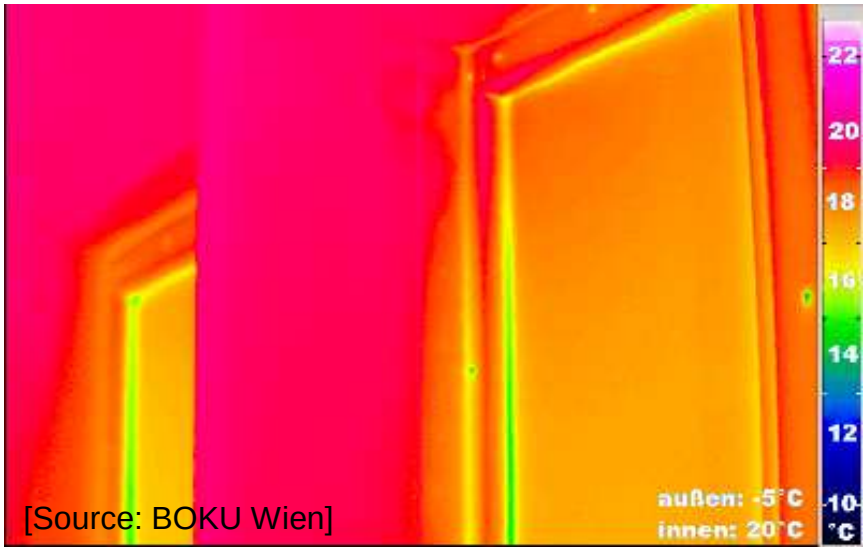
Example of triple pane glasing window

Window ≤ 0,8 W/(m²K) (R-7.1)



[source: Passivhaus Institut]

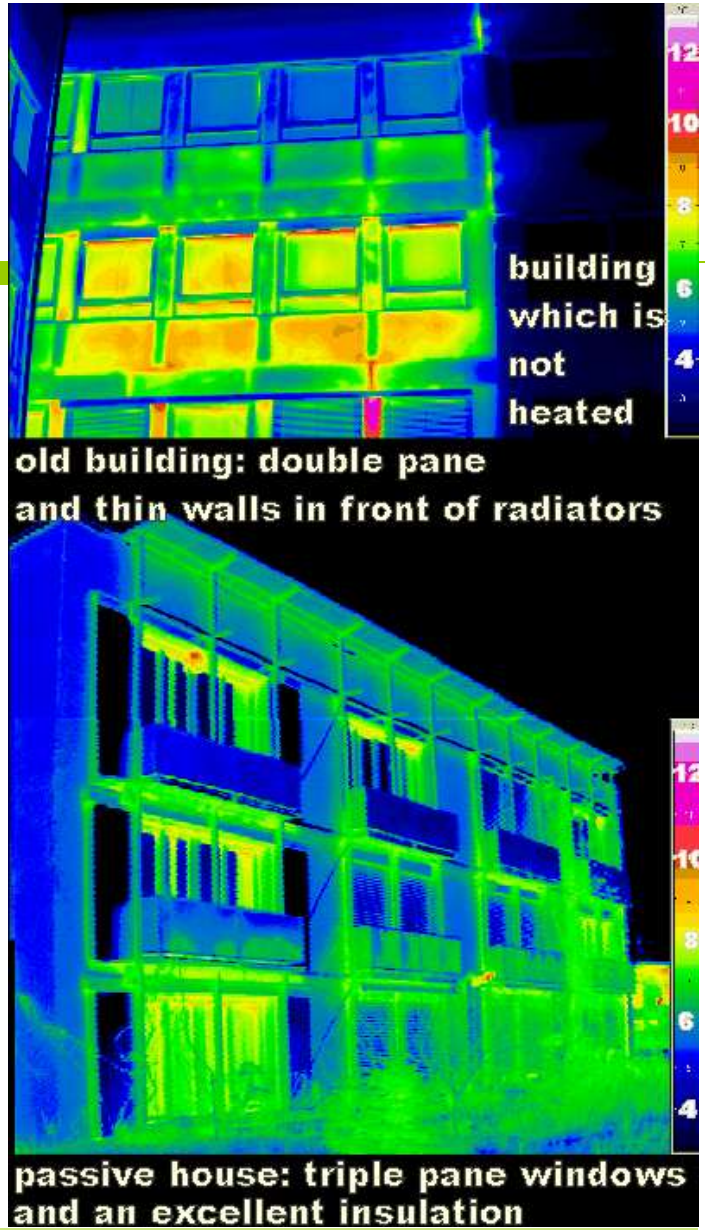
Building Envelope: Comfort Windows



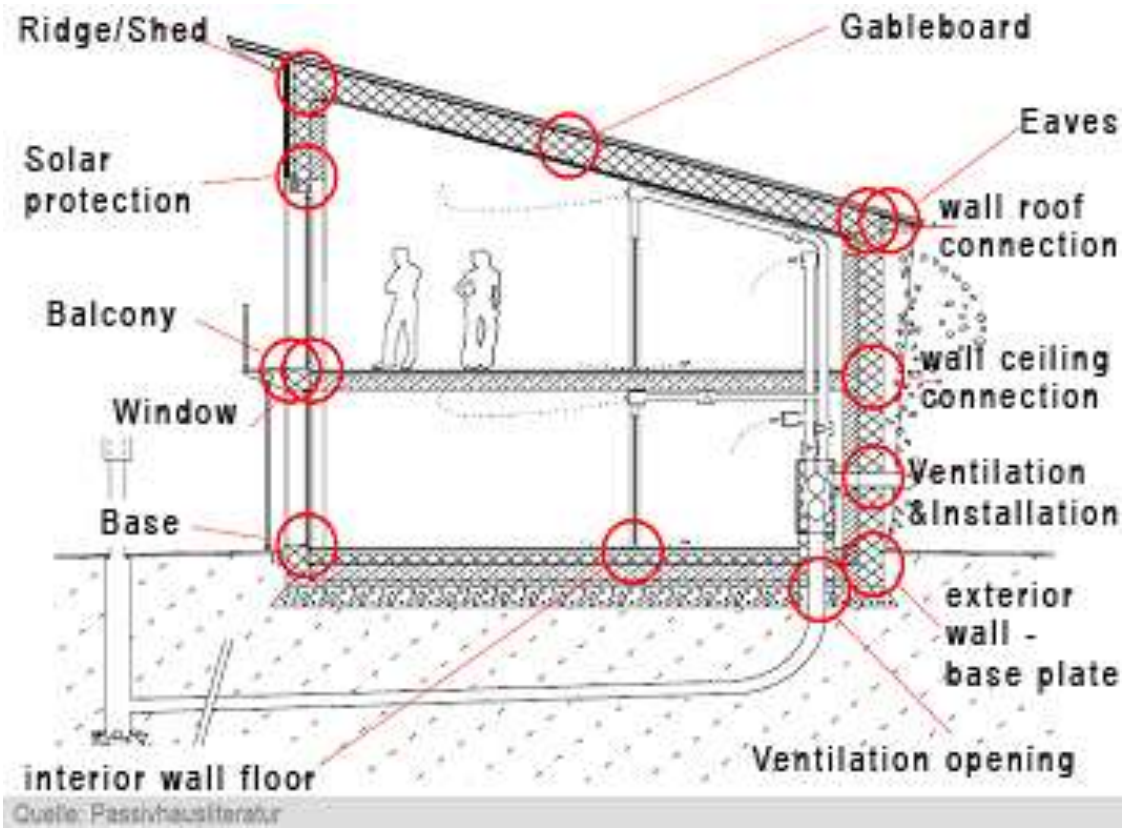
[Source: BOKU Wien]

Passive House Window, Interior

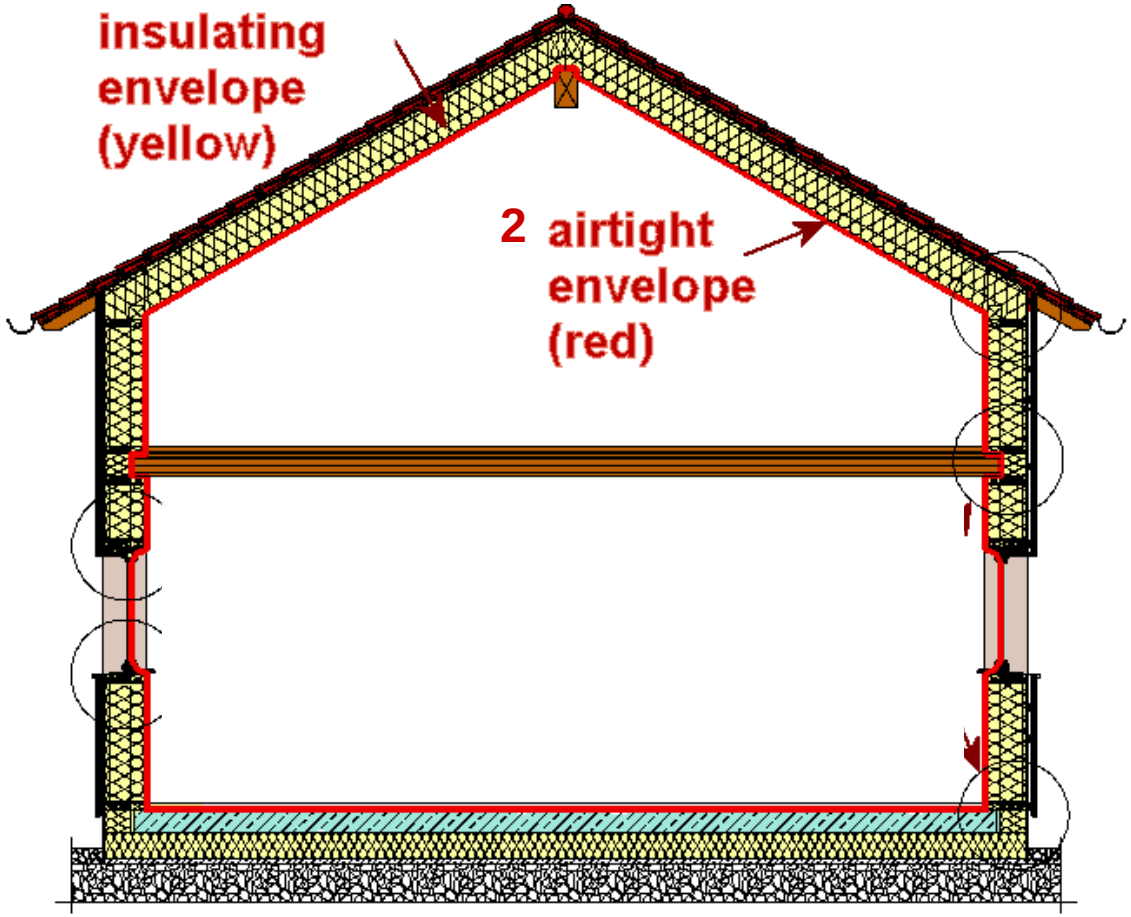
Infrared pictures of an old building and a passive house (at the bottom) for comparison (photos: PHI)



Building Envelope: Avoiding Thermal Bridges



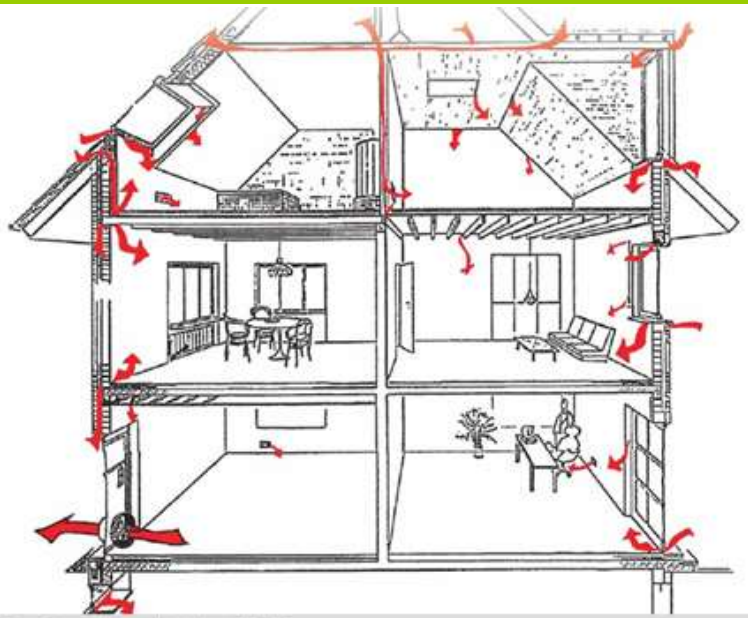
Building Envelope: Airtight Construction



An envelope can be airtight only if its consists of ONE undisturbed airtight layer enwrapping the whole volume.

[source: Passivhaus Institut]

Building Envelope: Airtight Construction

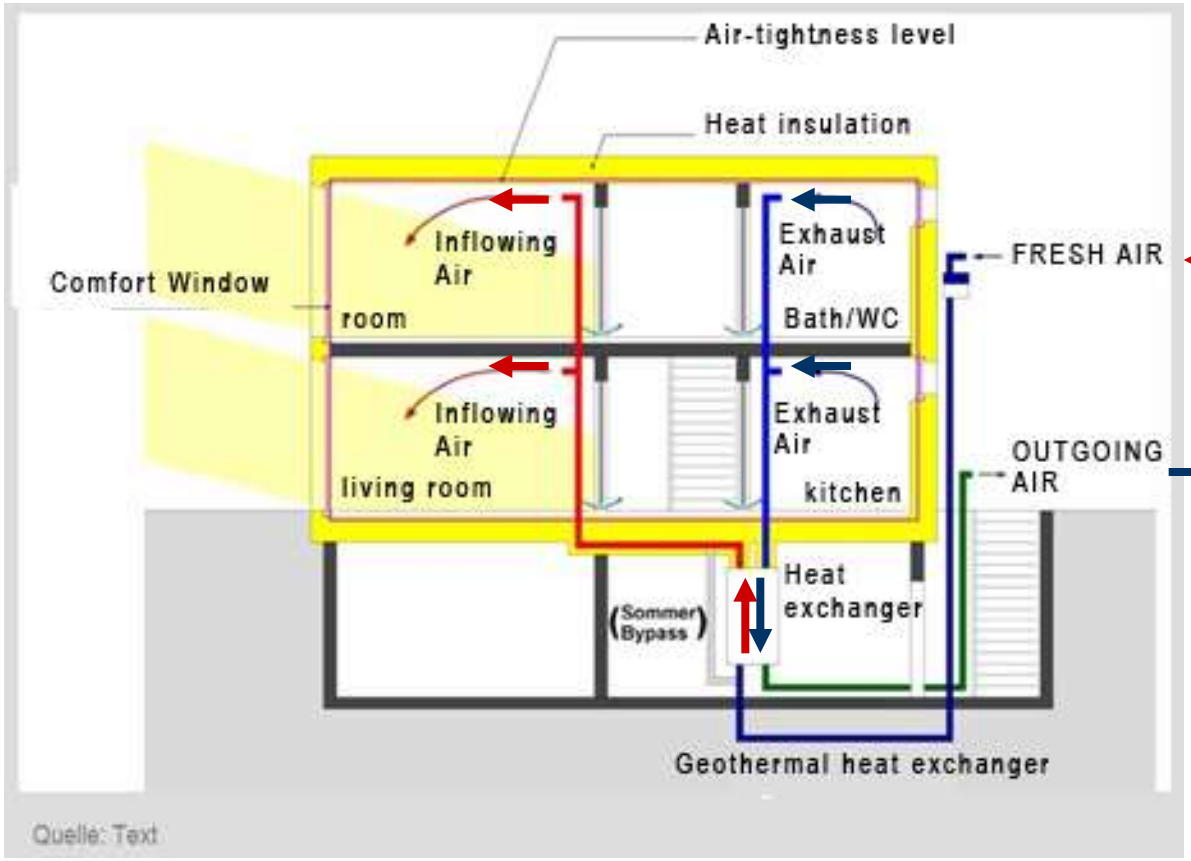


Quelle: Energie und Umweltzentrum (EUZ)

Quelle: Passivhaus Institut Darmstadt

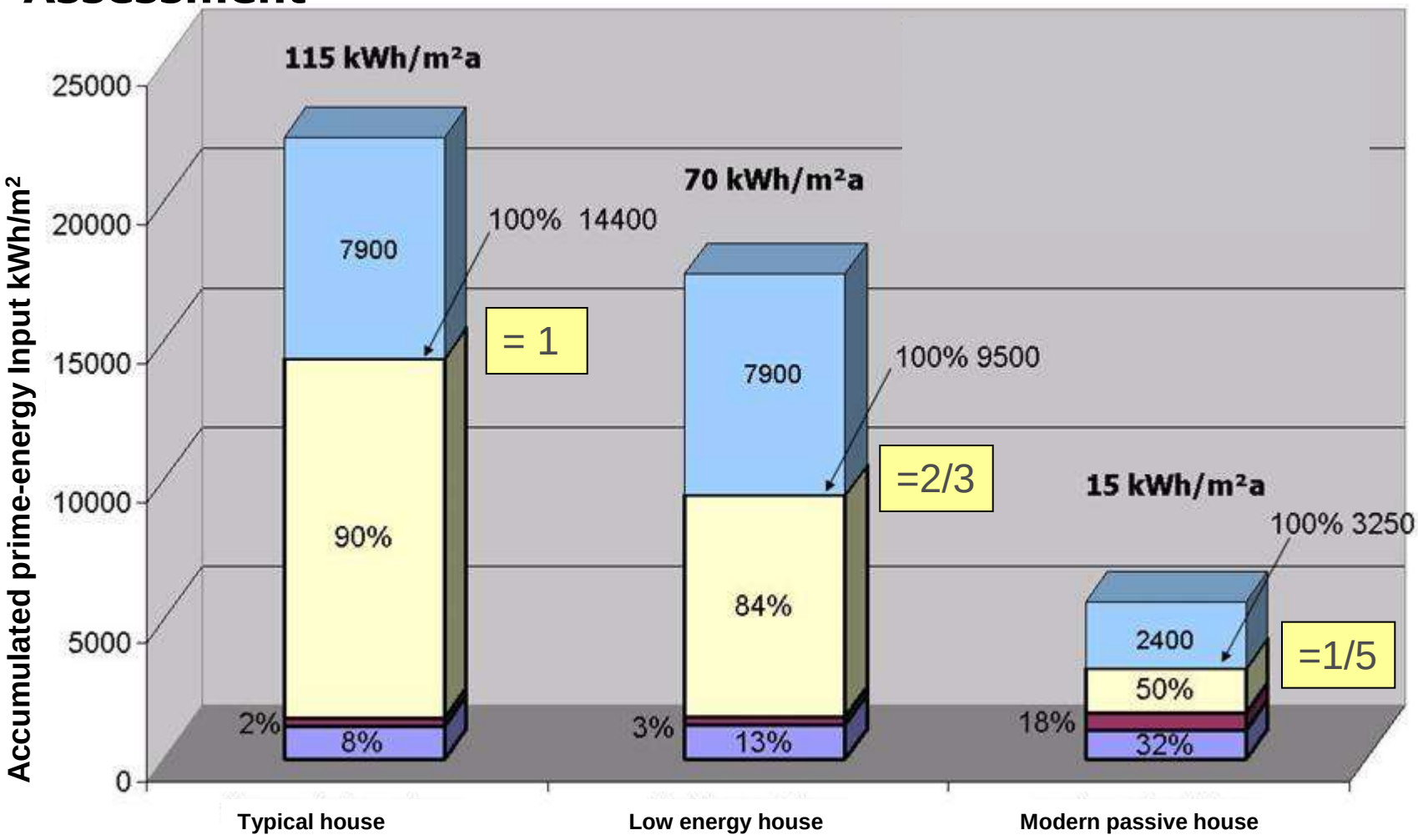
- avoid damage caused by condensation of moist, room warm air penetrating the construction
- reduce losses through building envelope and ventilation

Innovative Heating Technology: Ventilation with heat recovery



[source: CEPHEUS]

Life Cycle Assessment



W. Feist, CIB W67 Symp 1996

- Household electricity consumption 80 years accumulated
- Heating energy consumption 80 years accumulated (Gas)
- Prime-energy content demolition and disposal
- Prime-energy content new building

Certificates

- TQ-Bewertung
- TQ-Gebäudezertifikat
- IBO ÖKOPASS
- Zertifikate für nachhaltige Gebäude: Gebäudeausweis-Vorarlbg
- Energieausweis

Zertifikate für nachhaltige Gebäude: TQ-Bewertung (2-fach)

Total Quality Assessment (TQ) für Planung + Evaluation.

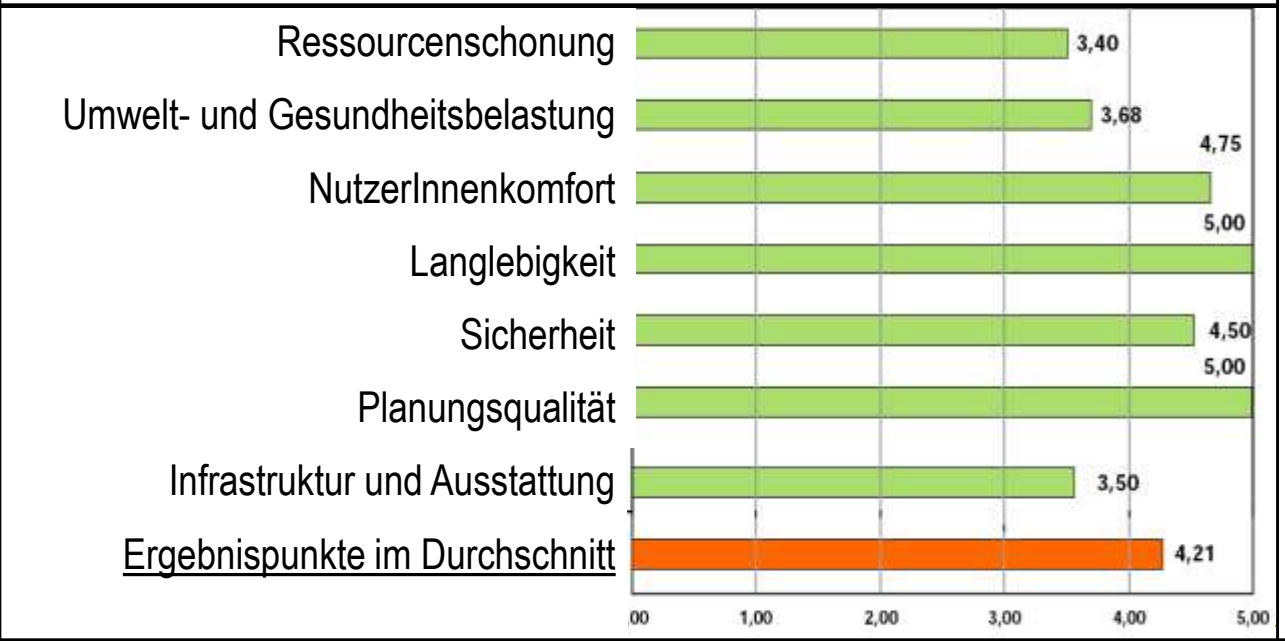
TQ-Zertifikation: Kosten ab 6.000,- €

- 1. Vorprüfung
- 2. Datenerhebung
- 3. Anwendung der Kriterien und Indikatoren (TQ Tool 2_0.xls)
- 4. Total-Aggregation mittels Punktesystem
- 5. Zertifikat

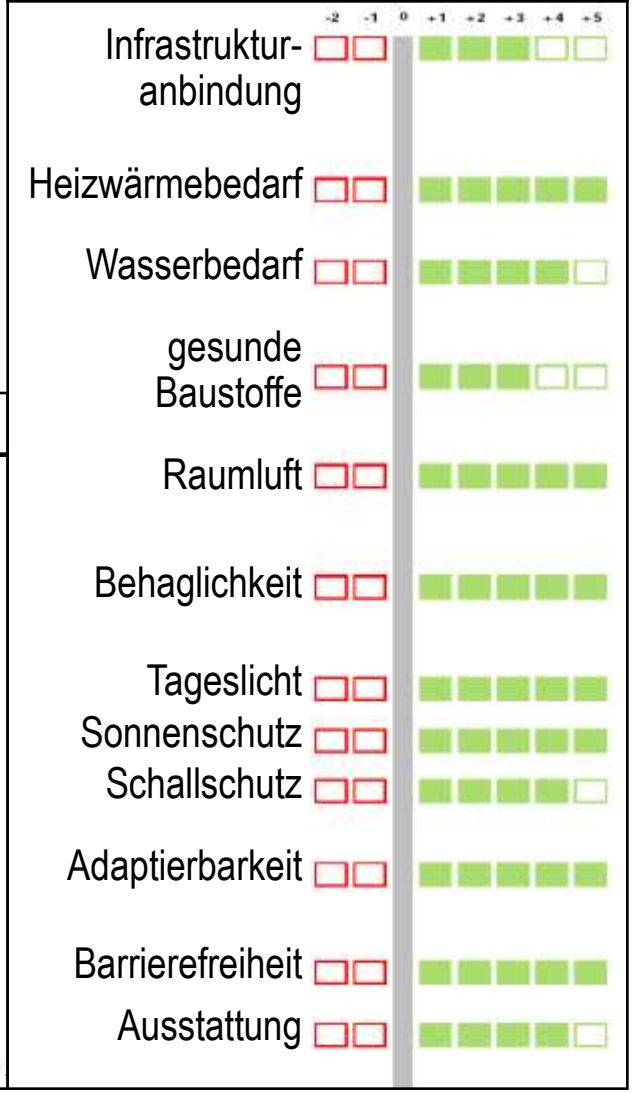
LEGENDE

-2	**Schlechteste Wertung**
0	**Durchschnitt Bestand**
+5	**Beste Wertung**

Auswertung für Planer



Auswertung für Nutzer, Eigentümer, Investor

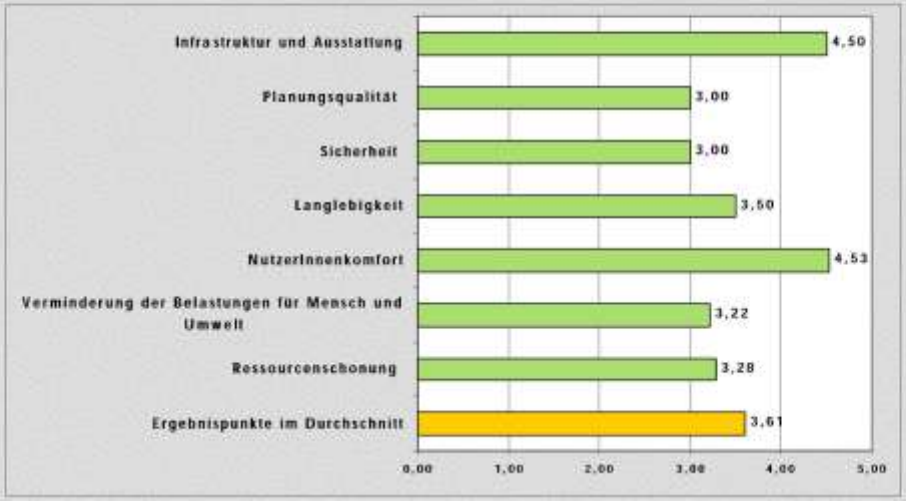


Quelle: HdZ-Projekt 08/2004; Geissler et al., 2004

Zertifikate für nachhaltige Gebäude: TQ-Gebäudezertifikat

Passivhaus Solarcity

EBS



Lechner2005

Zertifikate für nachhaltige Gebäude: IBO ÖKOPASS

Qualitätskriterien:

Nutzungsqualität

- Behaglichkeit im Sommer und Winter
- Innenraumluftqualität
- Schallschutz
- Tageslicht und Besonnung
- Elektromagnetische Qualität

Ökologische Qualität

- Ökologische Qualität der Baustoffe und Konstruktionen
- Gesamtenergiekonzept
- Wassernutzung

Zertifikate für nachhaltige Gebäude: Gebäudeausweis-Vorarlbg.

Wohnbauförderung - Ökologischer Wohnbau 2004 - Neubau / Altbau

GEBÄUDEAUSWEIS

Gebäudeart	Mehrfamilienwohnhaus	Wohnnutzfläche	1060	m^2 gesamt (WNF lt. Förderg)
Wohneinheiten	17	Bruttogeschossfläche	1276	m^2 gesamt (BGF)
Objektadresse	Errichterweg 9	Wohnungskosten	2180	€/m^2 WNF lt. Förderung
Plz., Ort	6850 Dornbirn	Grundstückkosten	150	€/m^2
Jahr der Erstellung	1972	Heizwärmebedarf spez.	42,5	kWh/(m^2 u. Jahr) BGF
Jahr der Sanierung	1990	Heizwärmebedarf	54230	kWh/Jahr
Parzelle-Nummer	Gp. 1234/12, 1234/13, 1234/14			

50 Ökologische Maßnahmen mit 300 Punkten

Planung	Behaglichkeit und Funktionalität	A	69%	9 von 13 Punkten
Standort	Flächen- und Grundbedarf	A	78%	7 von 9 Punkten
Energie	Heizwärmebedarf	B	84%	84 von 100 Punkten
Haustechnik	Energieversorgung	C	100%	25 von 25 Punkten
	Wärmeverteilung, Warmwasser	C	57%	29 von 51 Punkten
	Wasser und Elektrische Energie	C	40%	4 von 10 Punkten
Materialwahl	Ökologische Bewertung	D	69%	24 von 35 Punkten
	Ökoindex 3	D	80%	20 von 25 Punkten
	Lebensdauer und Wartung	D	50%	11 von 22 Punkten
Innenraum	Emissionsfrei	E	80%	8 von 10 Punkten
	Ökologische Gebäudequalität		75%	221 von 300 Punkten

Gmeiner2005

Energy standards

Use of energy standards:

Comparability of figures (standardised classification) through national implementation

Increase in market transperancy for renters, buyers and investors

Suggests recommended improvement measures to property owners

Assures quality to customers of newly built houses and renovation standards

Marketing-instrument for residential and real estate sector

ENERGIEAUSWEIS *Deckblatt*

Gebäudeart	Freistehendes Mehrfamilienhaus	**Erbaut im Jahr**	1999
Standort	Energiesparweg 3 4864 Attersee	**Einlagezahl**	12345
Katastralgemeinde	50001 Abtsdorf	**Grundstücksnummer**	123/1

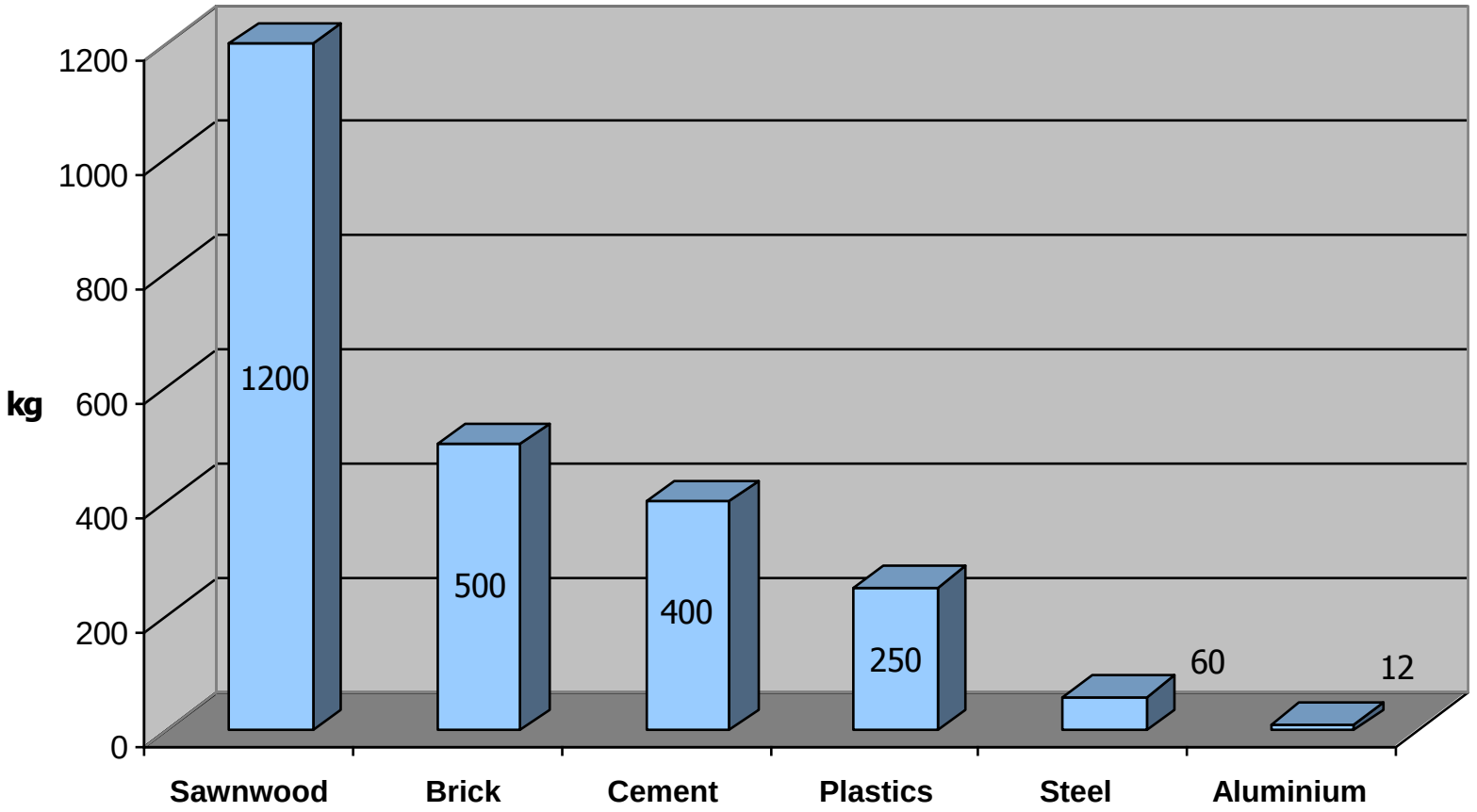
Eigentümer/Errichter (zum Zeitpunkt der Ausstellung)
Arbeitsgemeinschaft
Gemeinnütziger Wohnungsbau Ges.m.b.H.
Straße 1
3002 Purkersdorf

Wärmeschutzklassen		**Energiekennzahl**
Niedriger Heizwärmebedarf	**Skalierung**	**HWB_{BGF}**
A	$HWB_{BGF} \leq$ 30 kWh/(m²·a)	
B	$HWB_{BGF} \leq$ 50 kWh/(m²·a)	
C	$HWB_{BGF} \leq$ 70 kWh/(m²·a)	HWB_{BGF} 77 kWh/(m²·a)
D	$HWB_{BGF} \leq$ 90 kWh/(m²·a)	
E	$HWB_{BGF} \leq$ 120 kWh/(m²·a)	
F	$HWB_{BGF} \leq$ 160 kWh/(m²·a)	
G	$HWB_{BGF} >$ 160 kWh/(m²·a)	
Hoher Heizwärmebedarf		

Volumsbezogener Transmissions-Leitwert $P_{T,V}$ [1]	**0,30 W/(m³·K)** [1]	[1] *Angabe freigestellt*
LEK-Wert [1]	**37** [1]	
Flächenbezogene Heizlast P_1 [1]	**40,4 W/m²** [1]	
Flächenbezogener Heizwärmebedarf HWB_{BGF}	**77 kWh/(m²·a)**	
Gesetzliche Anforderung an den flächenbezogenen Heizwärmebedarf HWB_{BGF}	**81 kWh/(m²·a)**	

Abbildung: Beispiel eines Energieausweises (OIB Muster für einen Energieausweis; Stand 15.03.1999)

Producible building materials from 1000 kWh thermic Energy

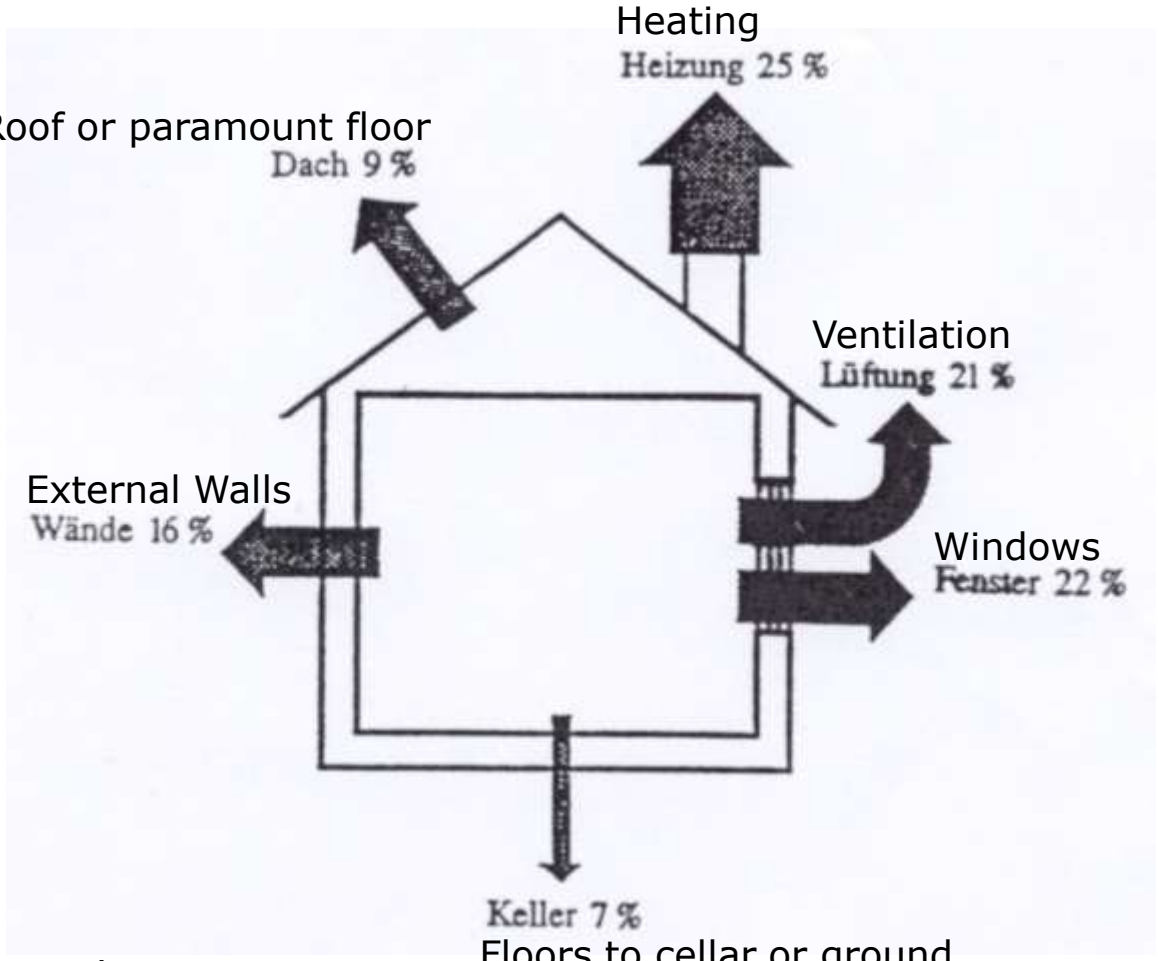


1200 kg Sawnwood - 1000 kWh - 12 kg Aluminium

Nach P. Sabady, Biologischer Sonnenhausbau 1989

THERMAL REFURBISHMENT

Where is the heat lost?



Heat losses of building components in contact with outer air

[Source: WUPPERTAL INTSITUT FÜR KLIMA, UMWELT, energy (1996) energygerechtes Bauen und Modernisieren. Basel: Verlag für Architectur]

THERMAL REFURBISHMENT

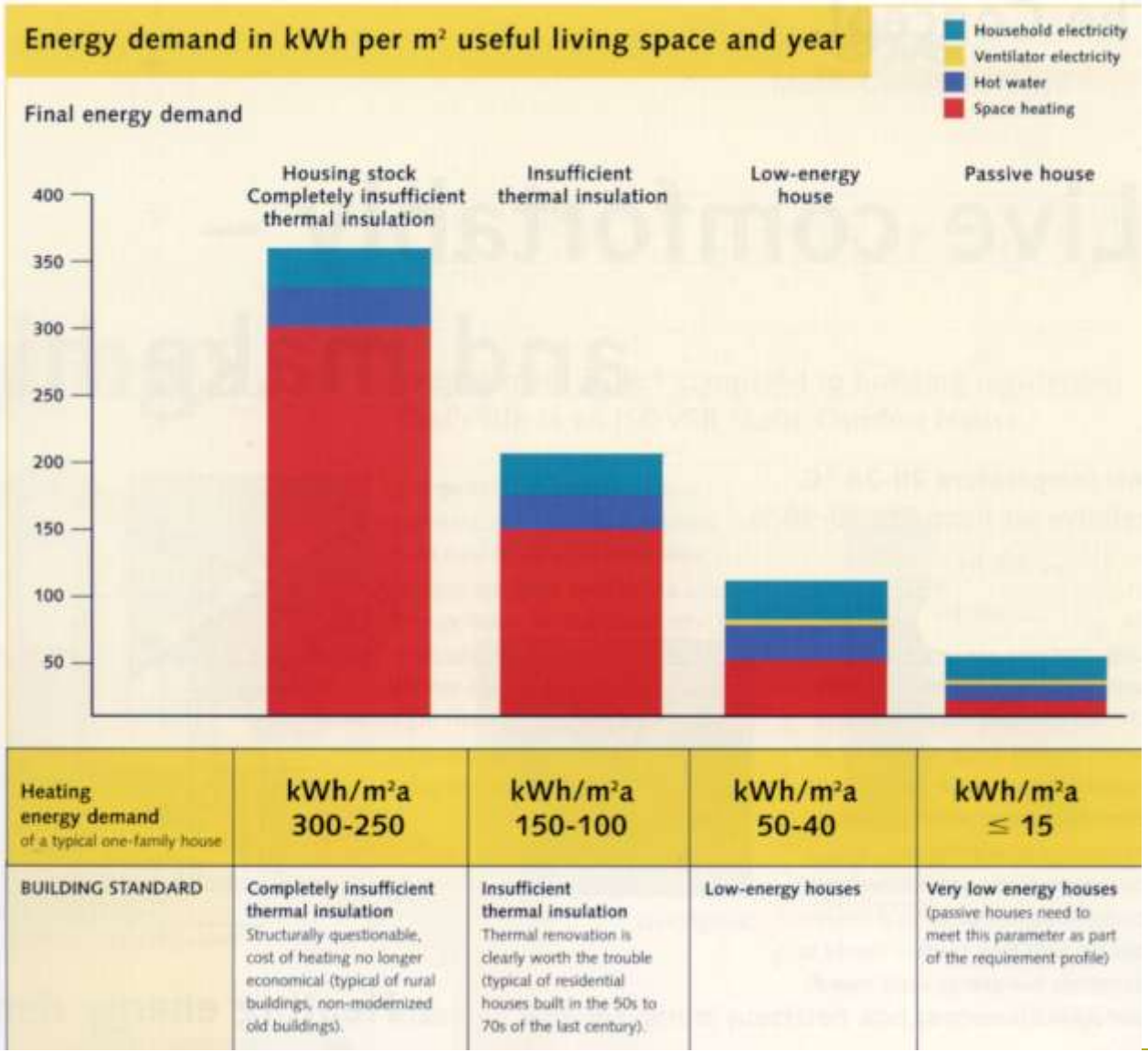
Year of construction | One-family house | Town house | Multifamily residence

Baualtersklasse	Freistehendes Haus, EFH / ZFH	Reihenhaus	Mehrfamilienhaus
Baujahr bis 1918			
Spez. Energieverbrauch ø	Seite 42 351 kWh/m²·a		244 kWh/m²·a
Baujahr 1918 bis 1948			
Spez. Energieverbrauch ø	325 kWh/m²·a	Seite 43 270 kWh/m²·a	248 kWh/m²·a
Baujahr 1940 bis 1968			
Spez. Energieverbrauch ø	Seite 44 275 kWh/m²·a	221 kWh/m²·a	270 kWh/m²·a
Baujahr 1969 bis 1977			
Spez. Energieverbrauch ø	190 kWh/m²·a	Seite 45 177 kWh/m²·a	127 kWh/m²·a

Heating energy demand [kWh/m²a]

[Source: GABRIEL, I., LADENER, H. (Ed.) (2004) Vom Altbau zum Niedrigenergyhaus. 4. Edition. Staufen: Ökobuch]

THERMAL REFURBISHMENT



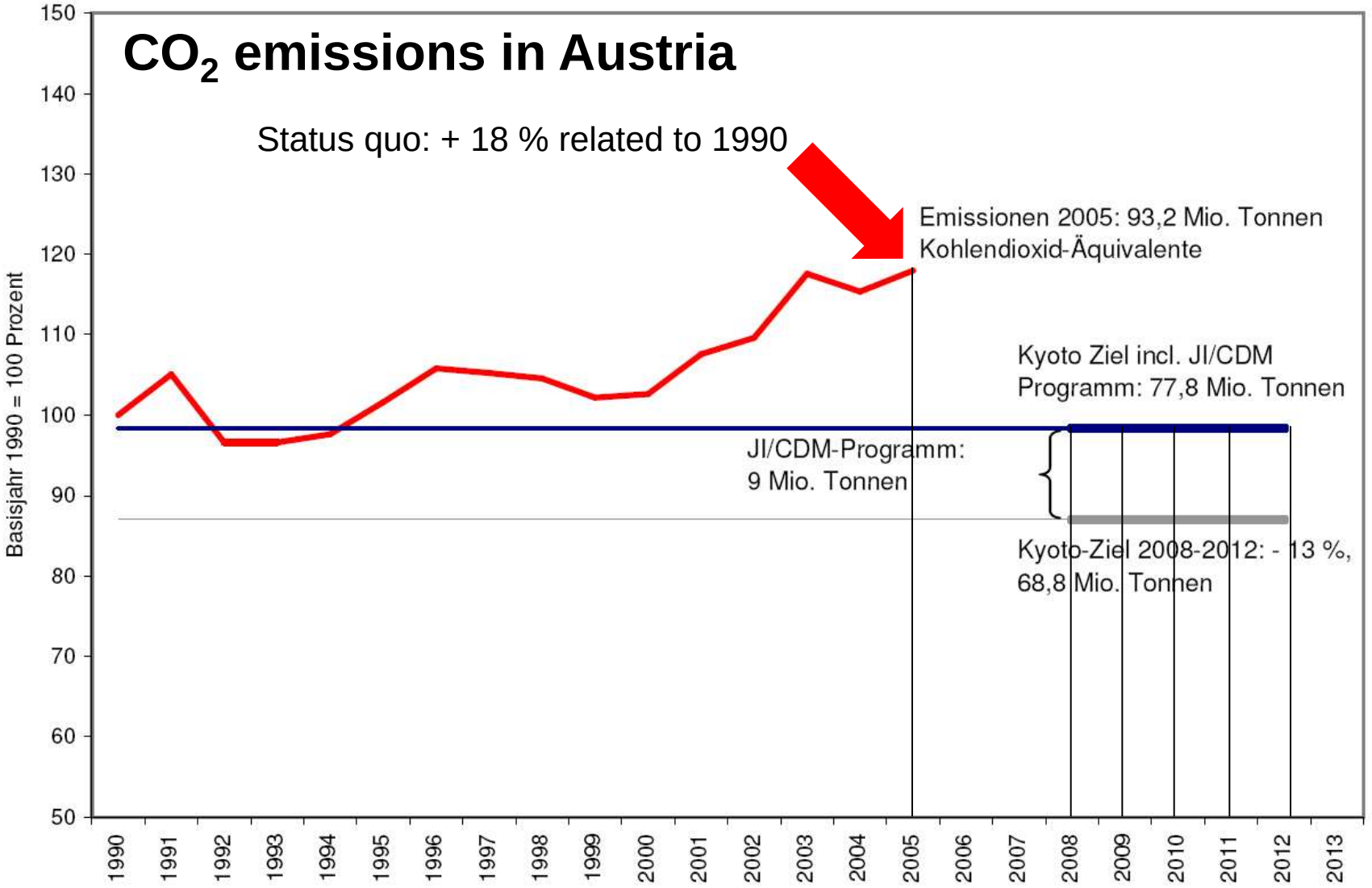
[Source: ISOVER (2007) Built for the future: The ISOVER Multi-Comfort House.]

THERMAL REFURBISHMENT

Heating energy demand of a typical one-family house	kWh/m²a 300-250	kWh/m²a 150-100	kWh/m²a 50-40	kWh/m²a ≤ 15
BUILDING STANDARD	**Completely insufficient thermal insulation** Structurally questionable, cost of heating no longer economical (typical of rural buildings, non-modernized old buildings).	**Insufficient thermal insulation** Thermal renovation is clearly worth the trouble (typical of residential houses built in the 50s to 70s of the last century).	**Low-energy houses**	**Very low energy houses** (passive houses need to meet this parameter as part of the requirement profile)
BUILDING ELEMENT	Typical U-values and insulation thicknesses			
External walls (massive wall of 25 cm) Insulation thickness	1.30 W/(m²K) 0 cm	0.40 W/(m²K) 6 cm	0.20 W/(m²K) 16 cm	0.13 W/(m²K) approx. 30 cm
Roof Insulation thickness	0.90 W/(m²K) 4 cm	0.22 W/(m²K) 22 cm	0.15 W/(m²K) 30 cm	0.10 W/(m²K) 40 cm
Floors to ground Insulation thickness	1.0 W/(m²K) 0 cm	0.40 W/(m²K) 6 cm	0.25 W/(m²K) 10 cm	0.15 W/(m²K) 26 cm
Windows	5.10 W/(m²K) Single glazing	2.80 W/(m²K) Double glazing, insulation glass (air-filled)	1.10 W/(m²K) Double glazing, thermal insulation glazing	0.80 W/(m²K) Triple glazing, thermal insulation glass, special frame
Ventilation	Leaky joints	Open the windows	Exhaust air unit	Comfort ventilation with heat recovery
CO_2 emission	60 kg/m²a	30 kg/m²a	10 kg/m²a	2 kg/m²a
Energy consumption in liters heating oil per m² living space and year	30-25 liters	15-10 liters	4-5 liters	1.5 liters

[Source: ISOVER (2007) Built for the future: The ISOVER Multi-Comfort House.]

THERMAL REFURBISHMENT



[Source: Kyoto-Fortschrittsbericht, Umweltbundesamt 2007]

THE DESIGN OF THE AUSTRIA HOUSE IN WHISTLER, CANADA

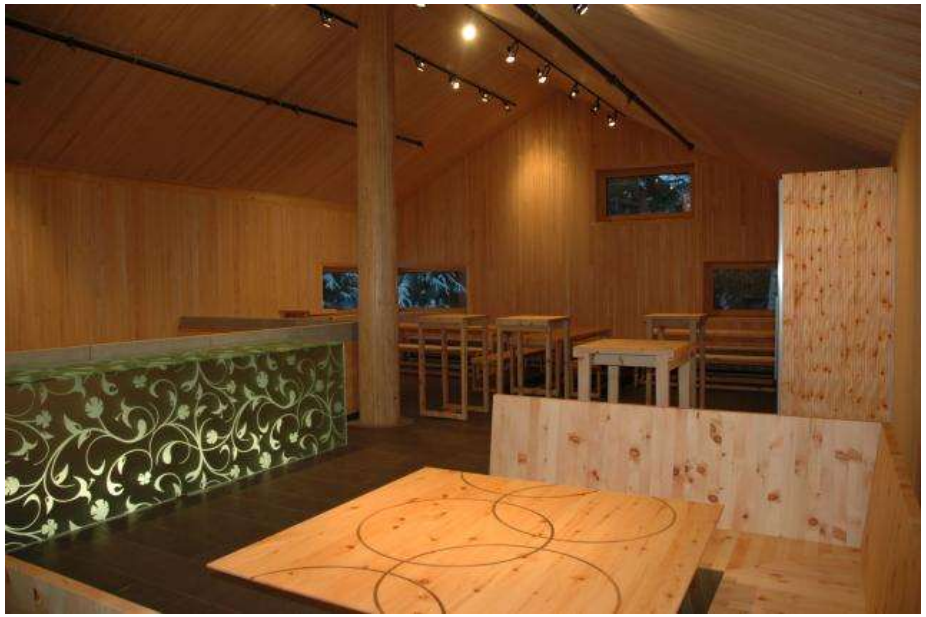
What´s the overvalue of the Olympic Austria House?

Symbol for Canada and the world, how the energy issue could be solved and how sustainable development could be realized

- Most energy efficient building in the Olympic history
- Ecological building materials
- Salubrious indoor climate: fresh air quality, natural light and other contributions to raise workplace productivity
- High quality of planning (coordinator Erich Reiner) and workmanship: Sohm Holzbau, Optiwin, drexel&weiss and others


WHISTLER
CANADA
SUSTAINABLE
EXPORT
AUSTRIA

THE DESIGN OF THE AUSTRIA HOUSE WHISTLER



(credit:Ira Nicolai)

THE DESIGN OF THE AUSTRIA HOUSE WHISTLER

THE DESIGN OF THE AUSTRIA HOUSE WHISTLER

From Austria …

… to Canada

THE DESIGN OF THE AUSTRIA HOUSE WHISTLER

Day 3

Day 5

THE DESIGN OF THE AUSTRIA HOUSE WHISTLER

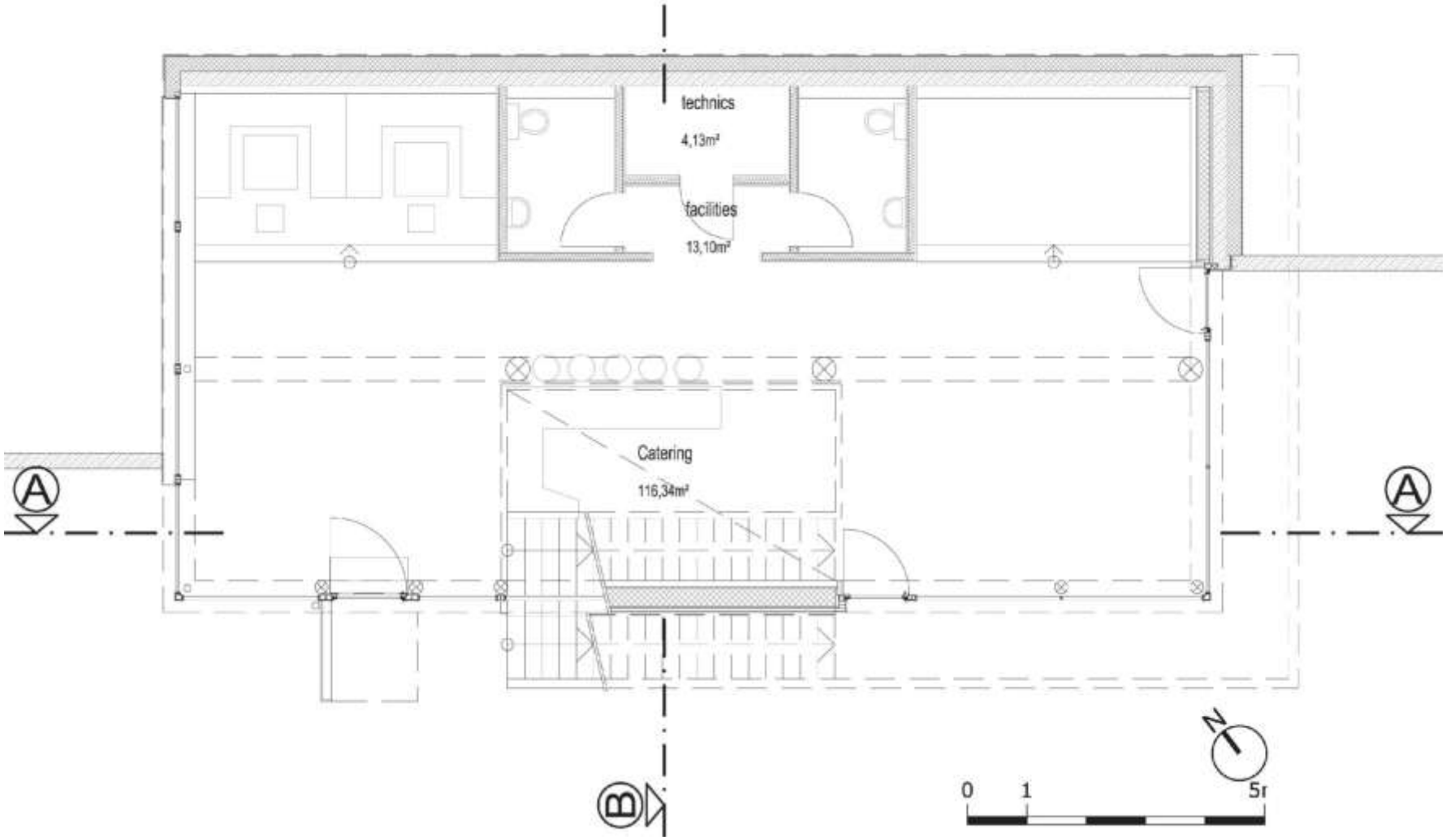
Installing windows

Topping out ceremony

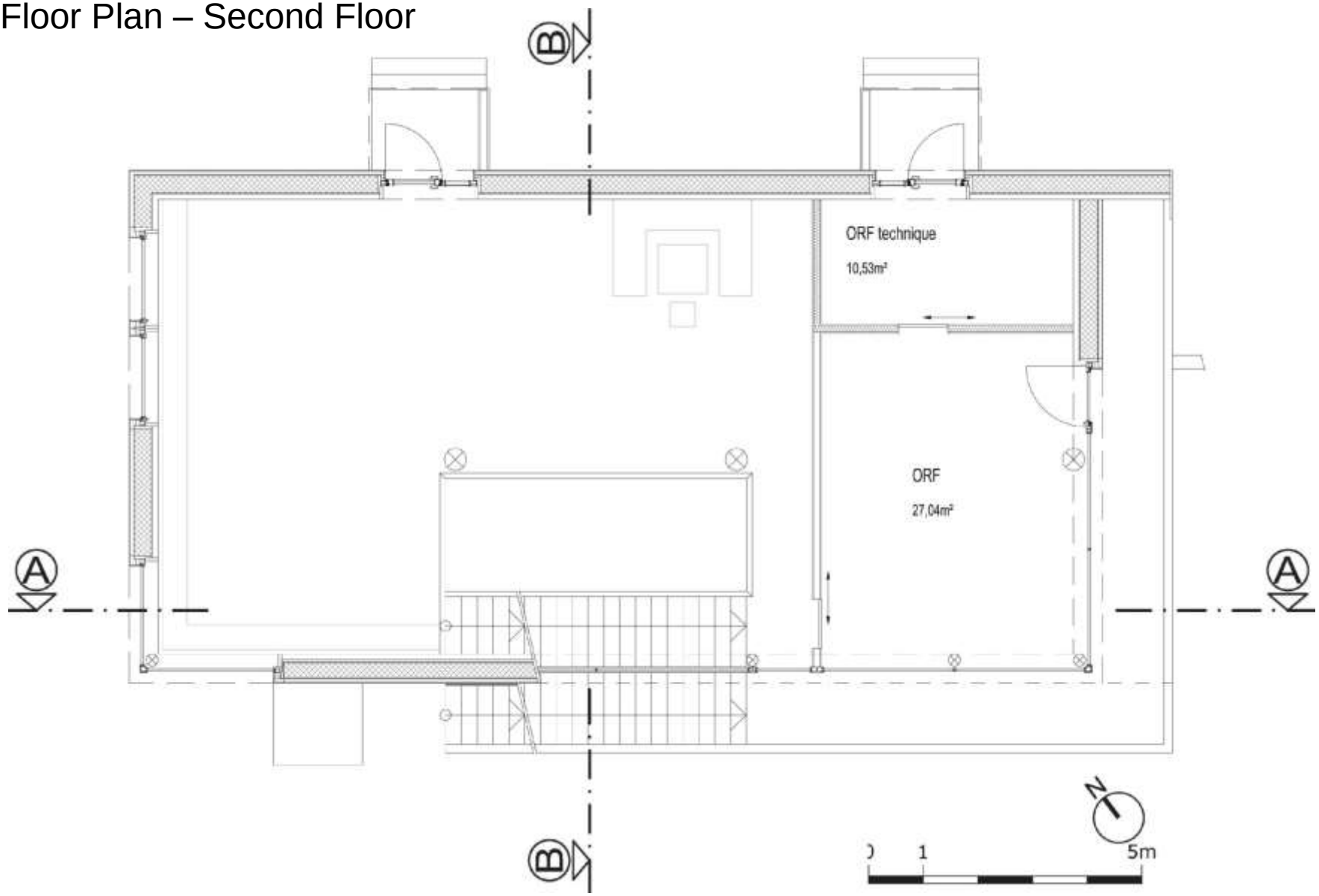
THE DESIGN OF THE AUSTRIA HOUSE WHISTLER

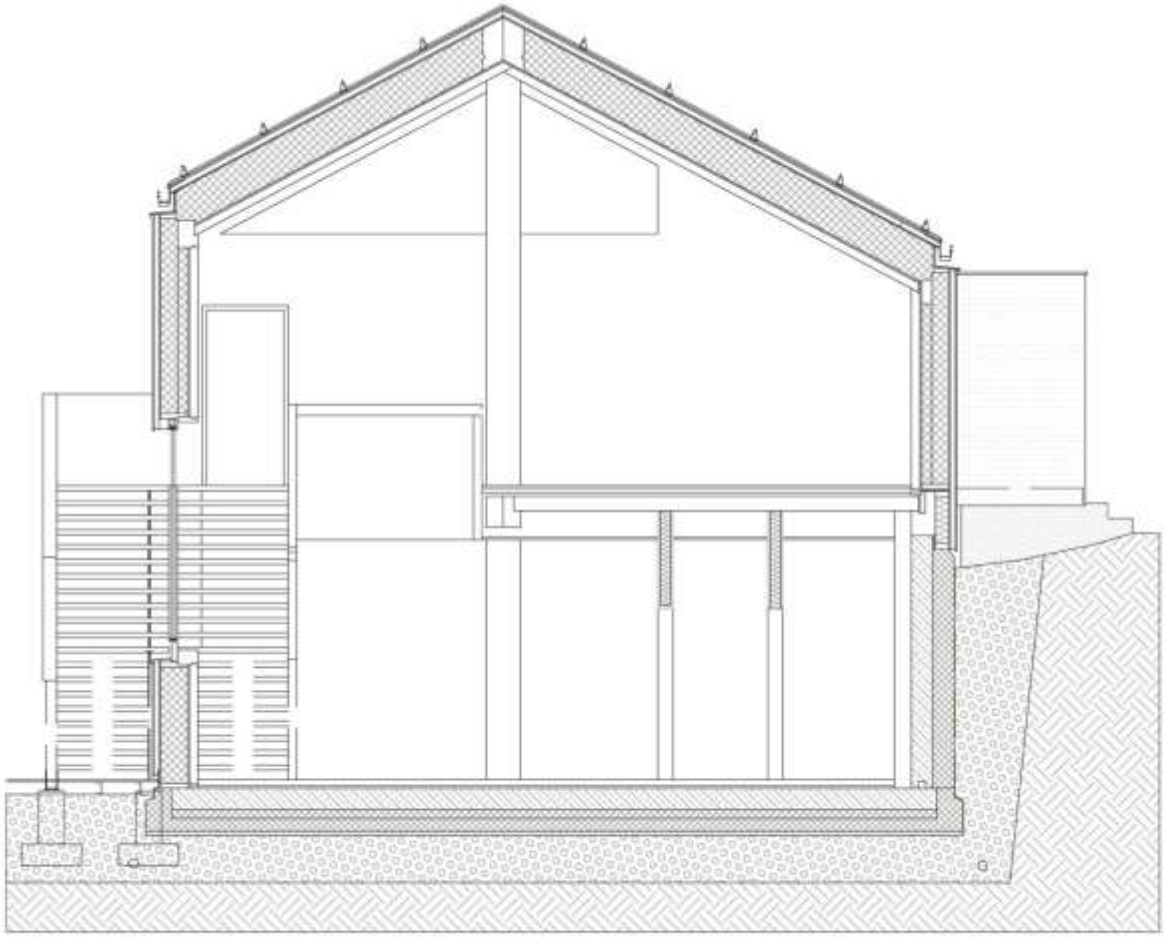
(credit: Ira Nicolai)

Floor Plan – First Floor



Floor Plan – Second Floor





Cross section B M 1:100

0 1 5m

AWARDS, PRIZES, QUALITY CERTIFICATES

The quality of the Austria House was awarded several times

ENERGY PERFORMANCE: Passive House Planning Package (PHPP). Passive House Institute Darmstadt

KLIMA:AKTIV Awarded by the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Manegement for Passive House Quality

DGNB – Pre-Certificate. International seal of quality for sustainable buildings. First building awarded by ÖGNI (World Green Building Council Austria)

Team & Partners:

Architect
Treberspurg & Partner Architects ZT GmbH, 1140 Vienna

Austrian Passive House Group APG:
Ingenieurbüro Reiner, Bezau (Coordination)
drexel und weiss – innovative compact comfort ventilation system, Wolfurt
Optiwin Fenster+Türen, - PH-Windows, Ebbs
Sohm Holzbautechnik, Timber Construction, Alberschwende
Zweiraum Werbeagentur, Imst (Marketing)

(credit:Ira Nicolai)

Partner in Canada
Sea to Sky Consulting, Vancouver
Dürfeld Log Construction, Whistler (Construction)

Projectpartner
Resort Municipality of Whistler, Whistler Blackcomb Foundation,
Österreichisches Olympisches Comitee (ÖOC),
BOKU-Wien, Uni Innsbruck, ORF, klima:aktiv, WKO, SOS Kinderdorf,
www.oesterreichhaus.at

MOUNTAIN REFUGE USING PASSIVE HOUSE TECHNOLOGY „SCHIESTL-HOUSE“

Hochschwab Mountain, Styria 2154 m

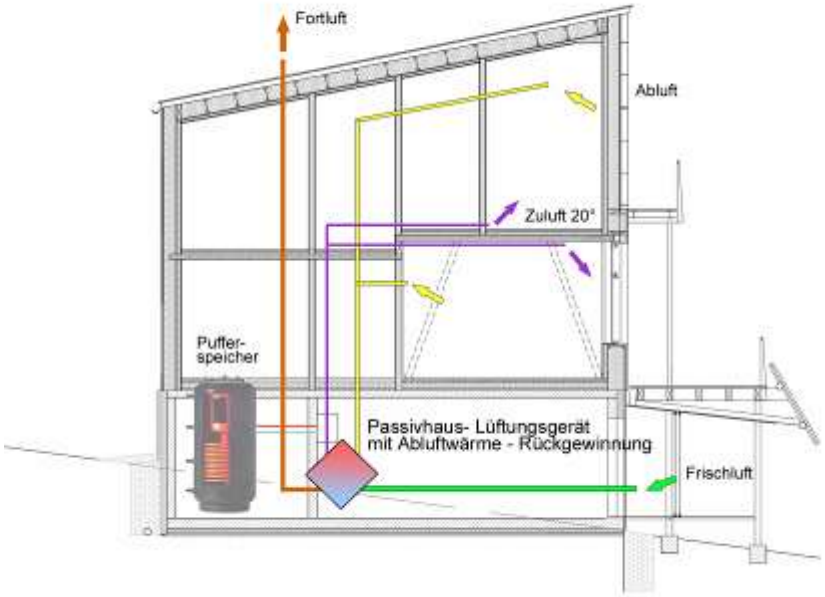
Developer: Austrian Tourist Club, Vienna
Architect: GP-ARGE pos architekten and Treberspurg & Partner Architekten ZT GmbH, Vienna

[Treberspurg & Partner Architekten ZT GmbH, Vienna]

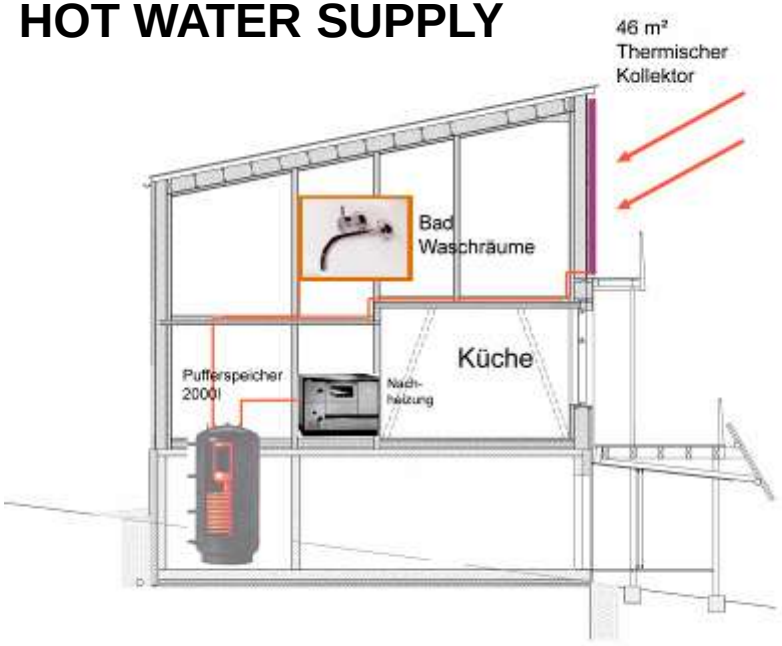
MOUNTAIN REFUGE USING PASSIVE HOUSE TECHNOLOGY „SCHIESTL-HOUSE“

Hochschwab Mountain, Styria 2154 m

HEATING AND VENTILATION



HOT WATER SUPPLY

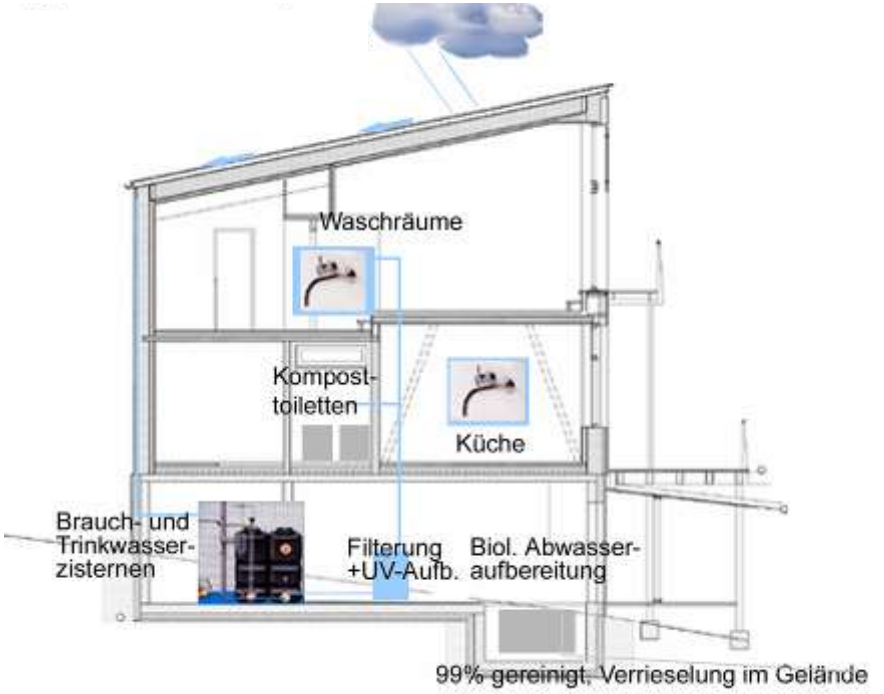


[Treberspurg & Partner Architekten ZT GmbH, Vienna]

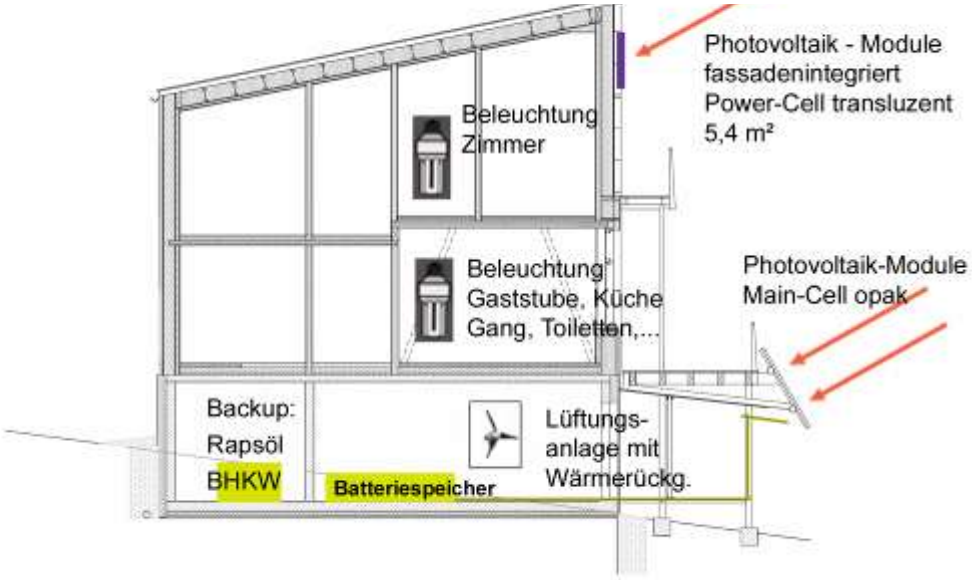
MOUNTAIN REFUGE USING PASSIVE HOUSE TECHNOLOGY „SCHIESTL-HOUSE“

Hochschwab Mountain, Styria 2154 m

WATER SUPPLY (RAIN WATER) AND BIOLOGICAL WASTE WATER SYSTEM



ELECTRIC POWER SUPPLY WITH PHOTOVOLTAIC SYSTEM



[Treberspurg & Partner Architekten ZT GmbH, Vienna]

75 m² of photovoltaic cells

MOUNTAIN REFUGE USING PASSIVE HOUSE TECHNOLOGY „SCHIESTL-HOUSE“

Hochschwab Mountain, Styria 2154 m

[Treberspurg & Partner Architekten ZT GmbH, Vienna]

May 2004: Transportation of building site equipment

blasting of excavation
03th of june 2004

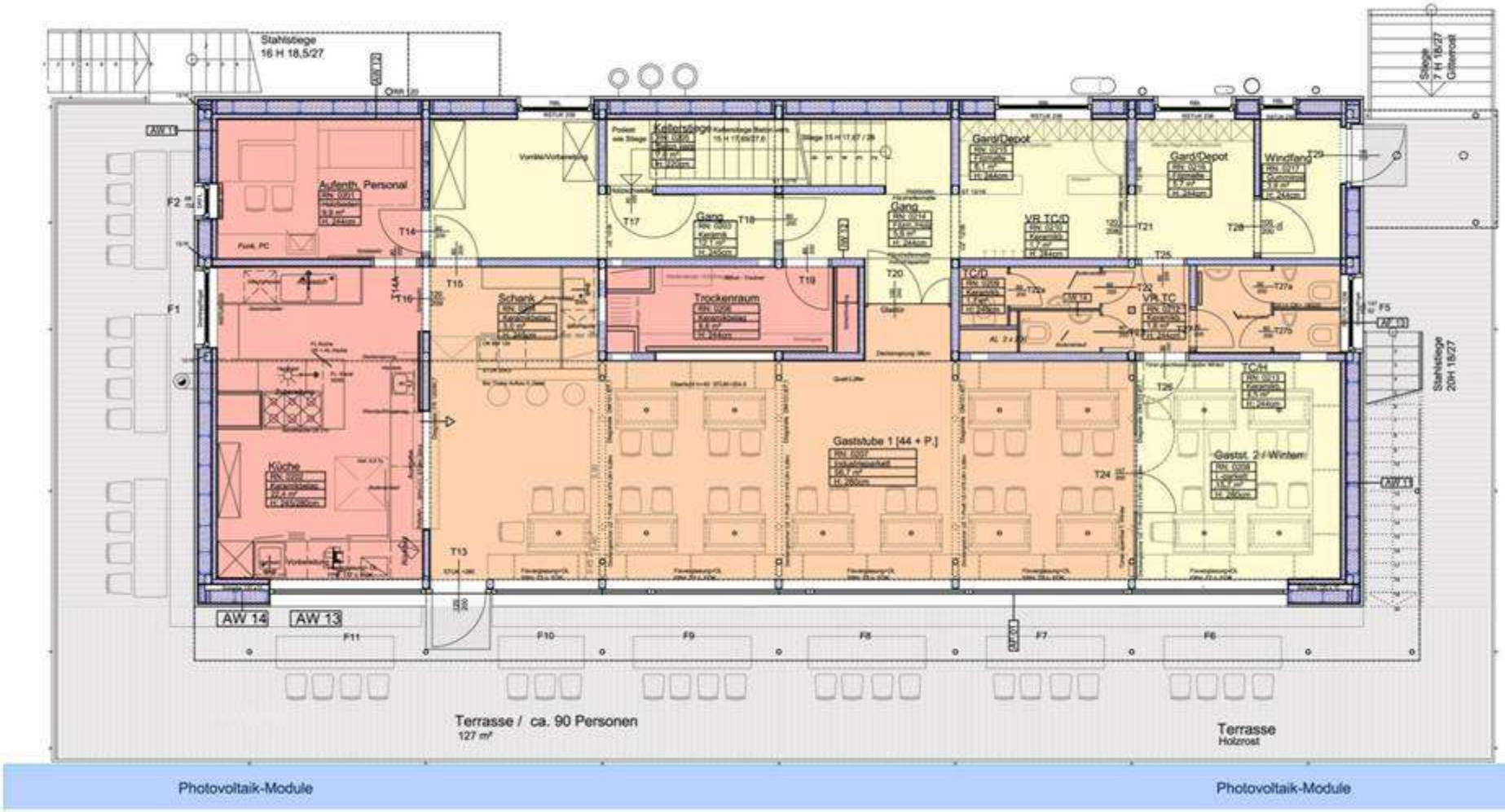
MOUNTAIN REFUGE USING PASSIVE HOUSE TECHNOLOGY „SCHIESTL-HOUSE“

Hochschwab Mountain, Styria 2154 m

January 2006

[Treberspurg & Partner Architekten ZT GmbH, Vienna]

[Treberspurg & Partner Architekten ZT GmbH, Vienna]



BUILDING DESIGN – ORGANISATION OF FLOOR PLAN

The old Schiestlhaus - 120 years old and in a very bad condition.

…AGAIN AND AGAIN….
BAD WEATHER!!

Details of the wall-elements:

Joints of elements with pre-mounted air sealing and vapor barrier foils

Roof assembling September 2004

Mounting of all 15 roof elements within only a few minutes: requires maximum concentration of carpenters and helicopter pilot

Maximum weight of roof elements: 900kg (including thermal insulation)


YTONG
YTONG
YTONG
YTONG


winter 2004 / 2005

view from the north east

snow and ice covering as additional thermal insulation

Exhaust ventilator of the kitchen and radiation measurement units on the roof

FAMILY HOUSE PENKA

3911 Rappottenstein 34, NÖ

OBJECT DATA

Type:	New building of Passive House
Constructor:	Fam. Penka
Planung:	Treberspurg & Partner ZT GmbH
Completed:	2000/2001
Size:	203 m²
Heating energy demand :	14 kWh/(m²a)
Netto Building Costs:	ca. 24.000 EURO

Ventilation system mit earth collector, heat recovery and fresh air preheating unit

Development

PH-RESIDENTIAL HOUSING ROSCHEGASSE

Pantucekgasse Roschegasse 20, 1110 Vienna

Type:	social residential building
Developer:	a:h, gemeinn. Siedlungsgenoss. Altmannsdorf - Hetzendorf
Design&Planning:	Treberspurg & Partner Architekten ZT GmbH
Completion:	2006
Size:	9.900 m² living space, 114 apartments, common areas, underground car park
Heating Energy:	7,3 kWh/(m²a) (PHPP)
Netto building costs:	1.212 EURO/m² living space

Dec. 2006 biggest social residential Passive House!

PH-RESIDENTIAL HOUSING ROSCHEGASSE

Pantucekgasse Roschegasse 20, 1110 Vienna

PH-RESIDENTIAL HOUSING ROSCHEGASSE

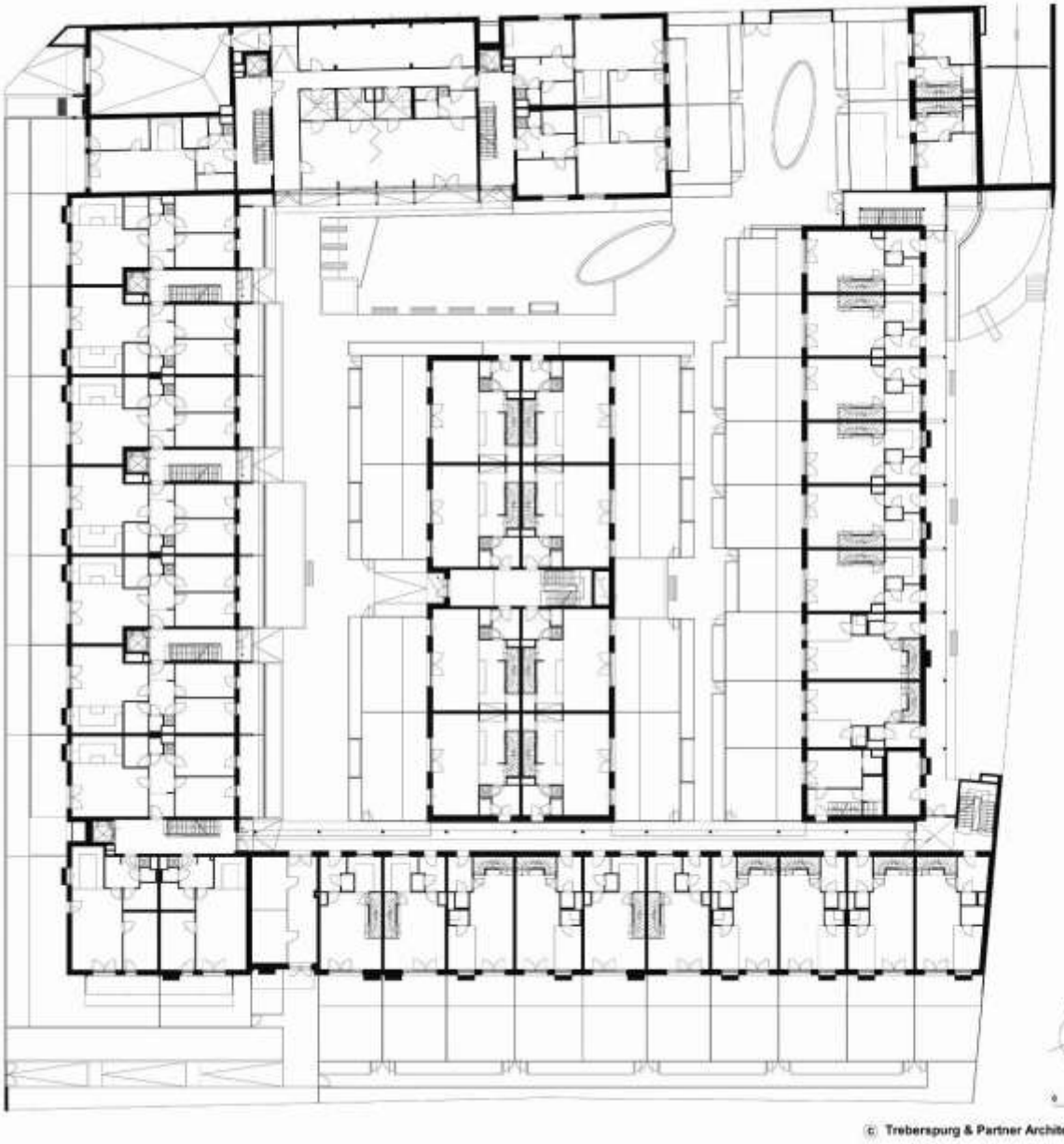
Pantucekgasse Roschegasse 20, 1110 Vienna

[Treberspurg & Partner Architekten ZT GmbH, Vienna]

PH-RESIDENTIAL HOUSING ROSCHEGASSE

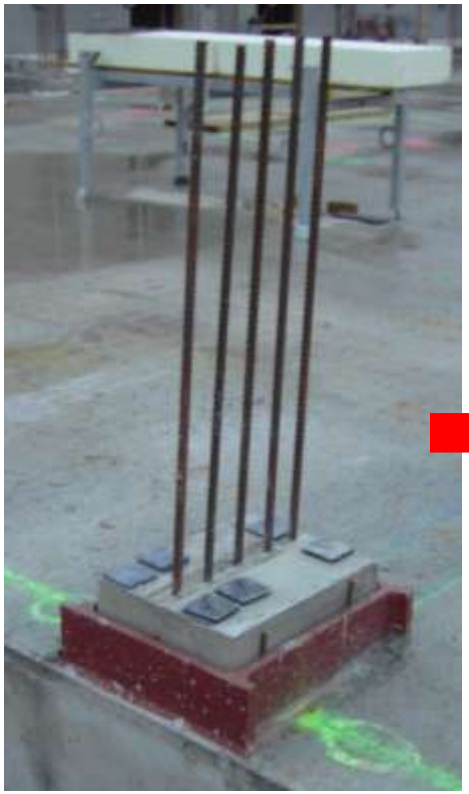
Pantucekgasse Roschegasse 20, 1110 Vienna

[Treberspurg & Partner Architekten ZT GmbH, Vienna]



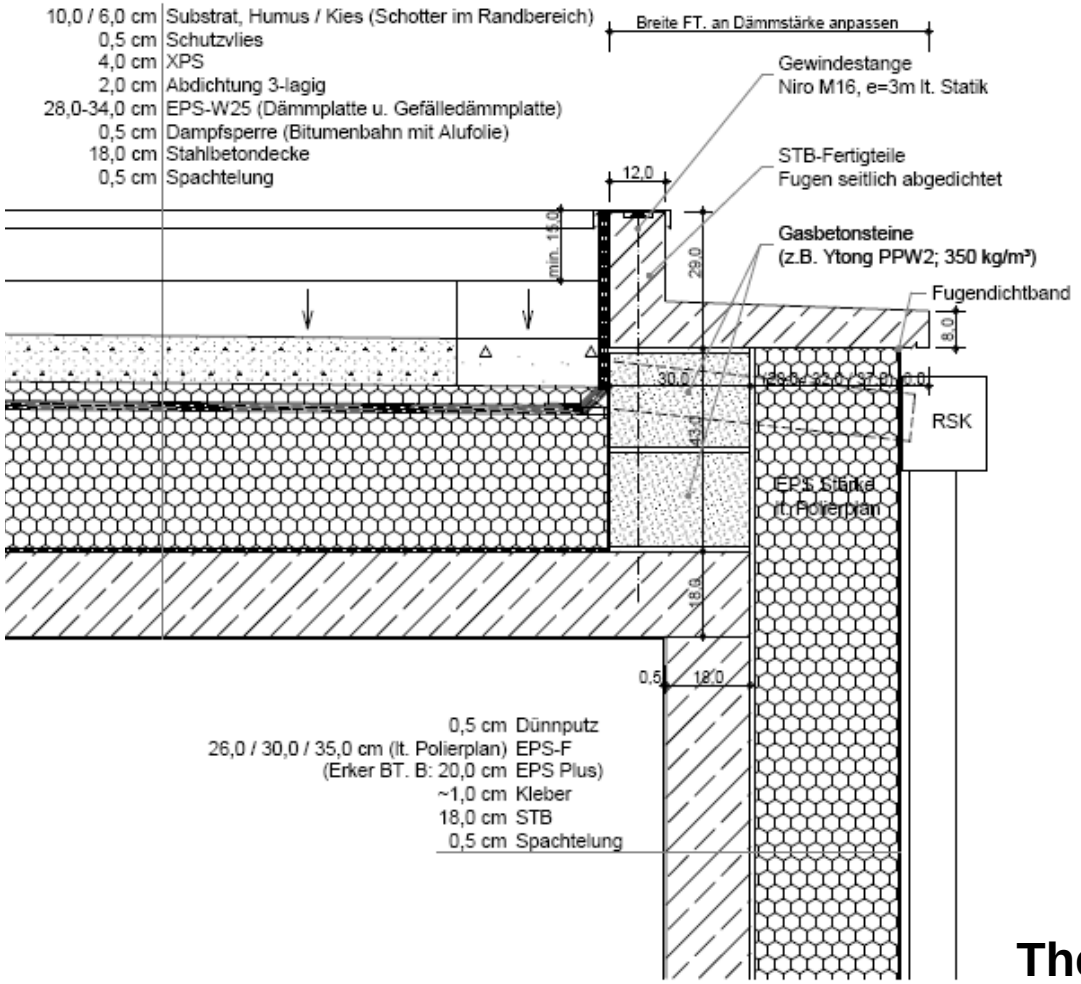
Ground plan

Construction Details
Foundation



Thermic detached base-points above celler

Construction Details
Attic

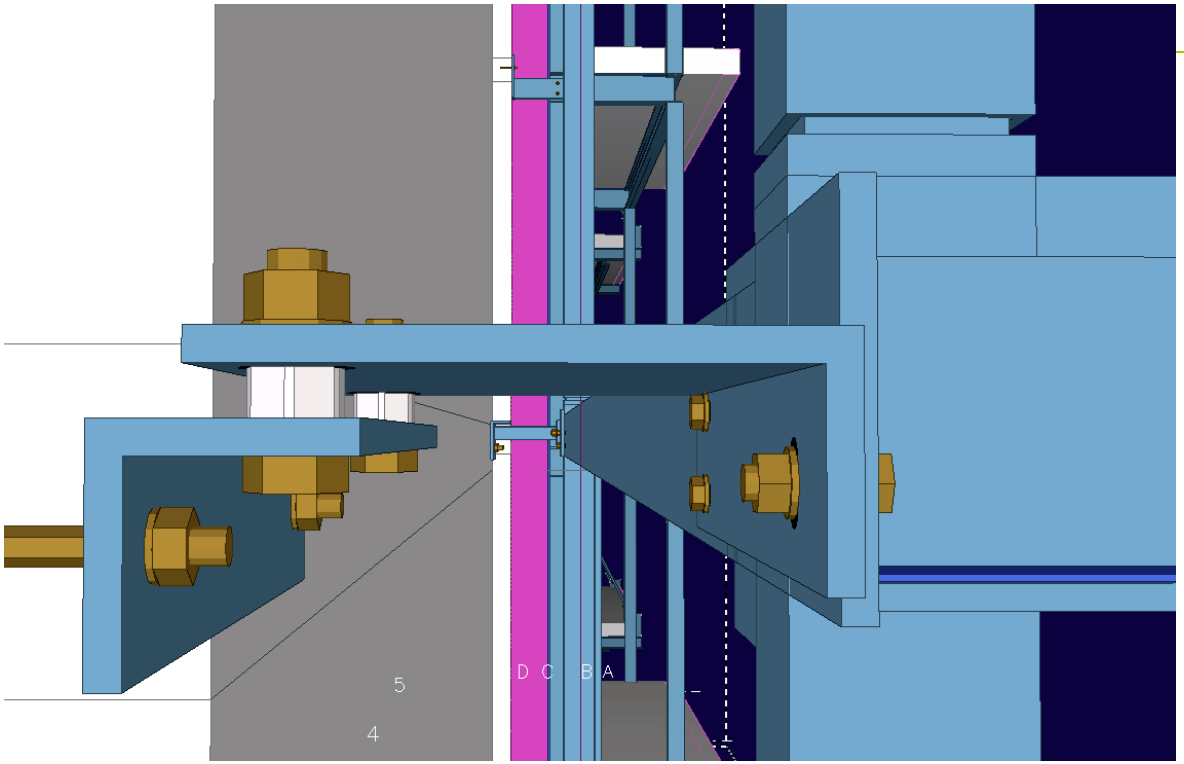


Thermic detached attic connection

Construction Details
Attic

Thermic detached attic connection

Construction Details
Loggia scaffold – access balcony - anchoring



Detail Anchoring

Construction Details

Thermic scaffold

BUILDING SERVICES CONCEPT

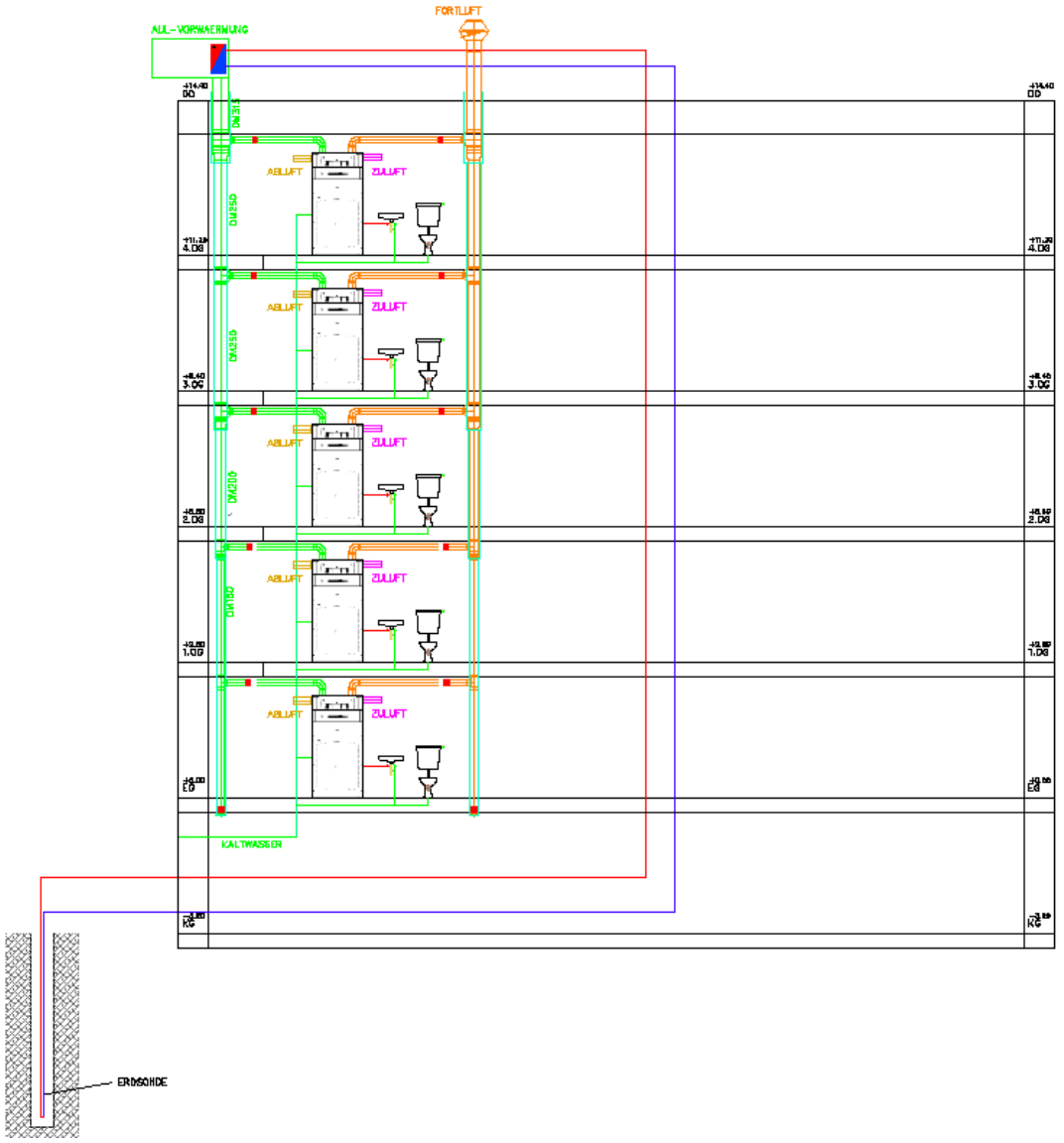
- decentralised ventilation compact system with PH- Compactinstruments Aeorsmart S of Drexel & Weiss in every apartment.
- air preheating through 11 geothermal sensors in 100 m depth, Solezwischenkreis and heat exchanger on the roof as fresh air-exhausts.
- A small electrical radiant heater in the bathroom, an electrical radiator, controlled by the compact instrument for peak demand
- Photovoltaic cells on the southern façade

BUILDING SERVICES CONCEPT

Ventilation facilities at the Roof

BUILDING SERVICES CONCEPT
Function ventilation

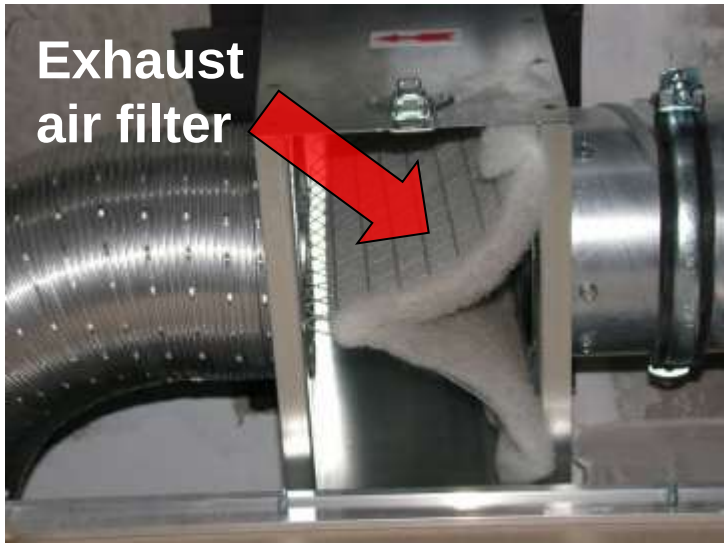
- Passivhouse ventilation through decentralised ventilation instrume every apartment
- Air preheating through heat excha and geothermal energy sensors
- Warm water preparation decentra due to hydro-extractors



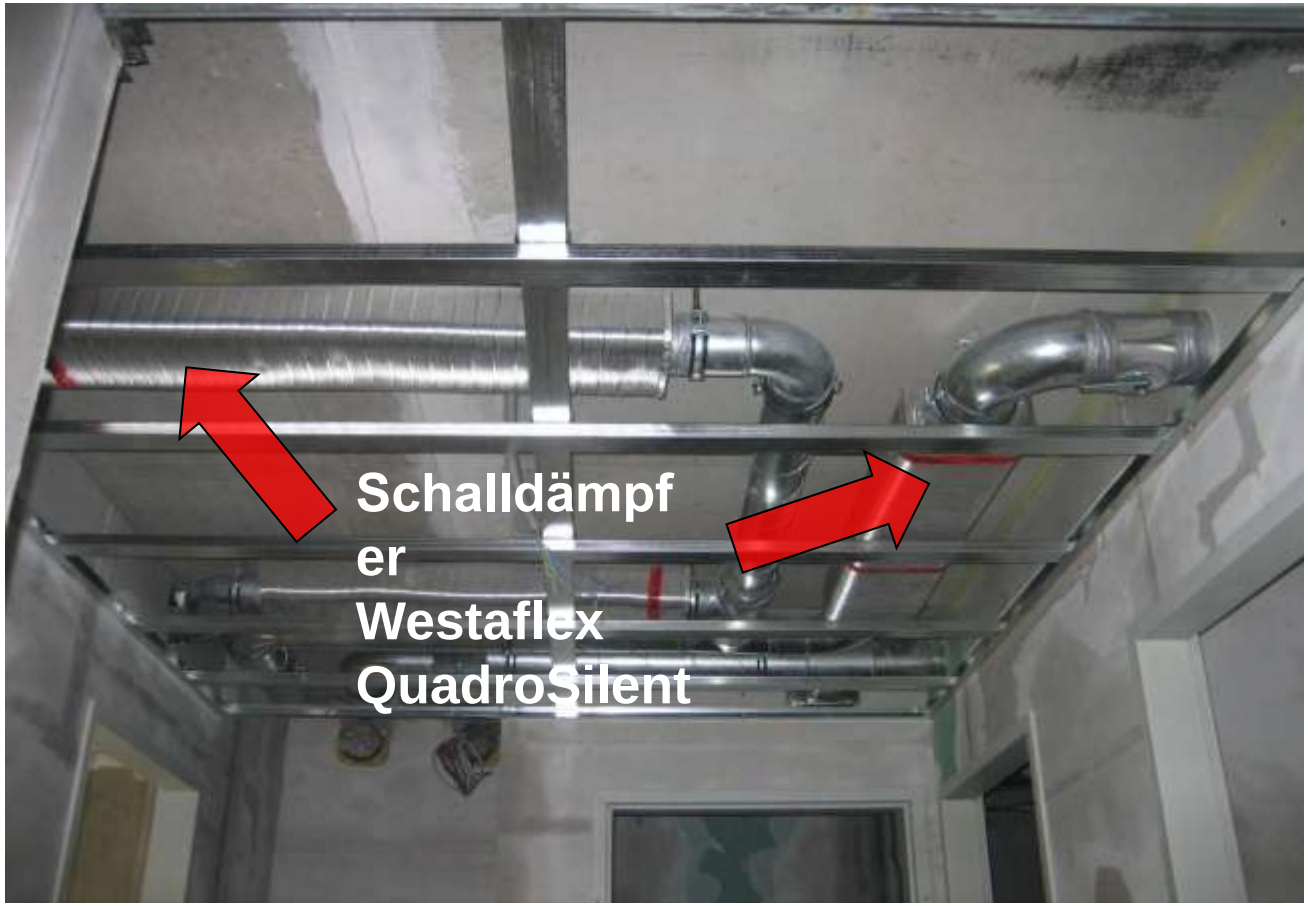
BUILDING SERVICES CONCEPT

Kompaktlüftungsgerät

Cover for the filter change in the ceiling



BUILDING SERVICES CONCEPT



Luftverteilung in abgehängten Decken

HIGH SCHOOL HAIZINGERGASSE

Hainzingergasse 37, 1180 Vienna
OLD BUILDING MODERNISATION – SCHOOL RECONSTRUCTION

1.808 m² before
4.986 m² after

OBJECT DATA

Type:	School Building Reconstruction and Rebuilding
Constructor:	BIG GmbH
General Planning:	Treberspurg & Partner ZT GmbH
Completed:	2000
Dimension:	ca. 5.000 m²
Netto Building Costs:	ca. 7,27 Mio. EURO

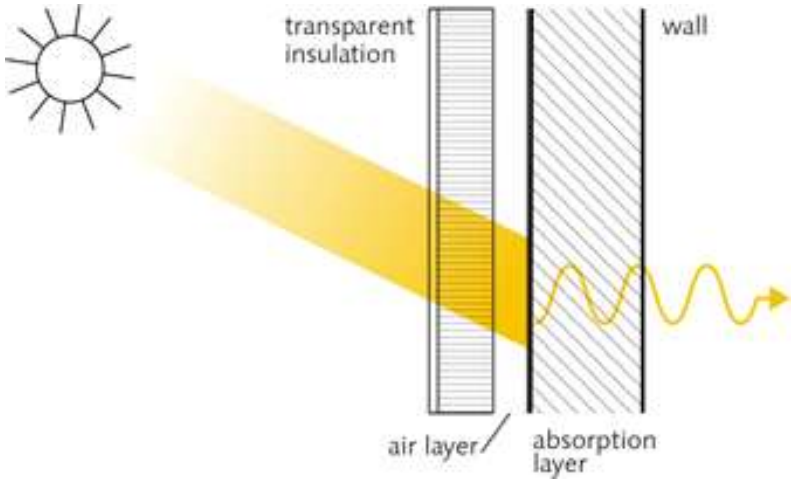
TERRACED HOUSE - NATURE NEARBY LIVING

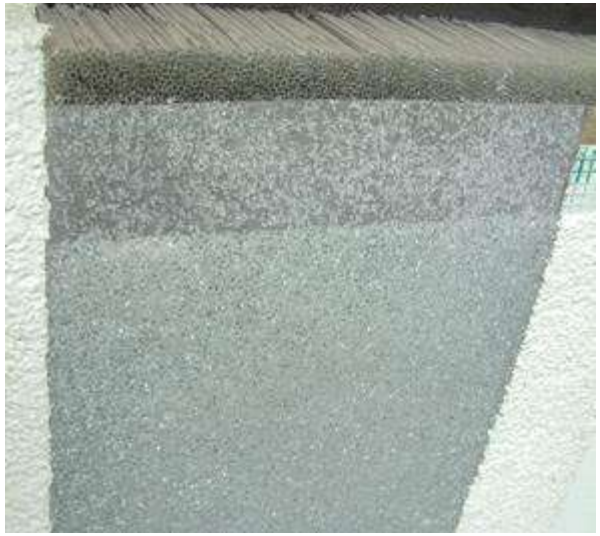
Fred Raymondgasse 19, 1220 Vienna

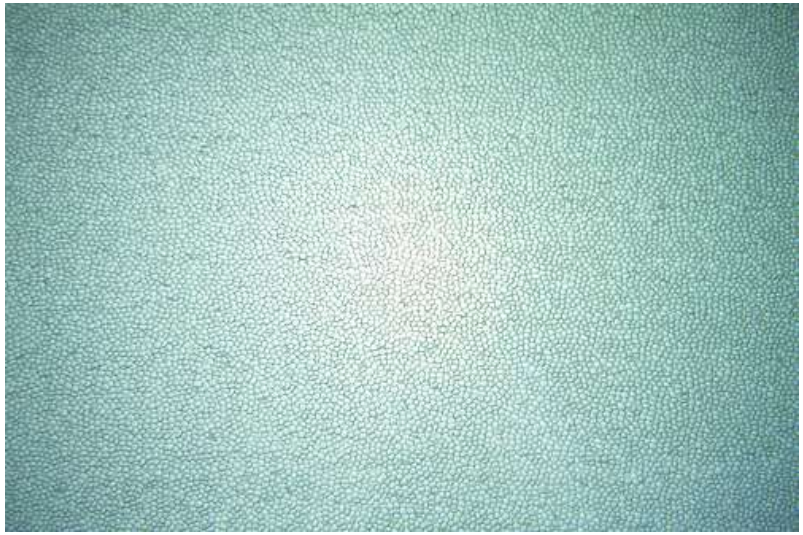
OBJECT DATA

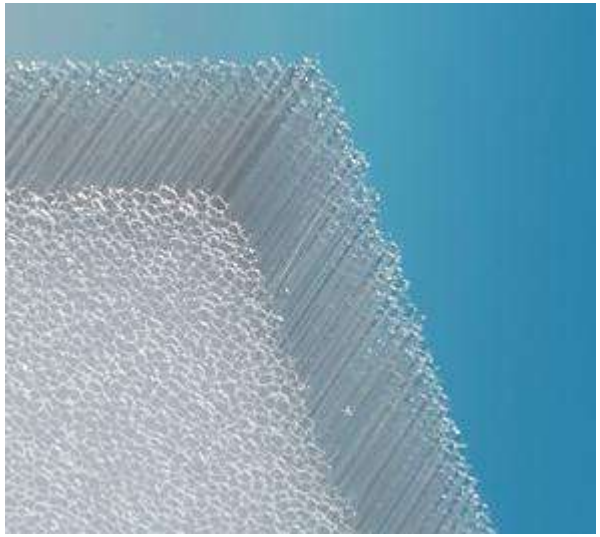
Type:	New Building of Terraced Houses
Constructor:	Stadt Vienna, MA 24
General Planning:	Arch. DI Dr. Martin Treberspurg
Bauphysics:	DI Wilhelm Hofbauer
Completed:	1996
Dimension:	4.300 m²
Amount :	41 accommodation units, 1 community centre
Heating energy demand:	40 kWh/(m²a)
Netto Building Costs:	ca. 5,23 Mio. EURO

Transparent thermal Insulation

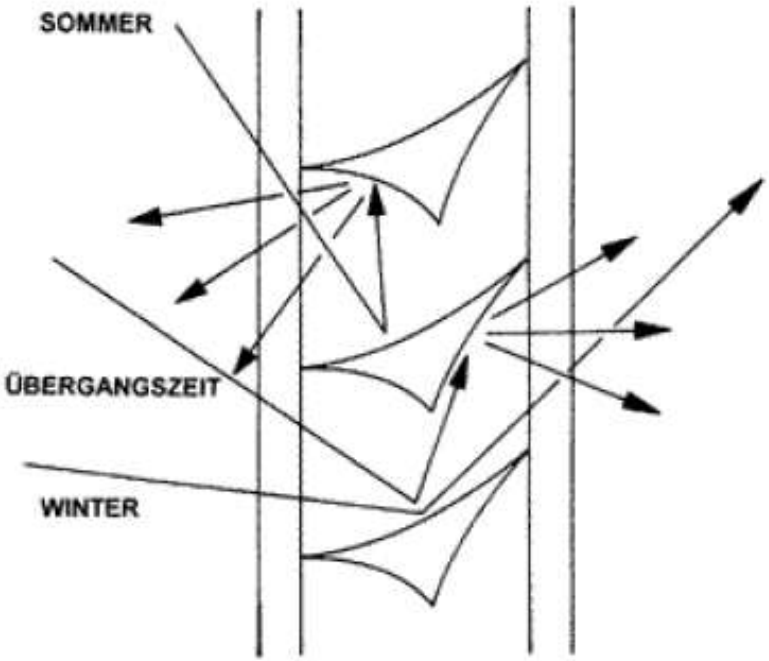








Sun Windows

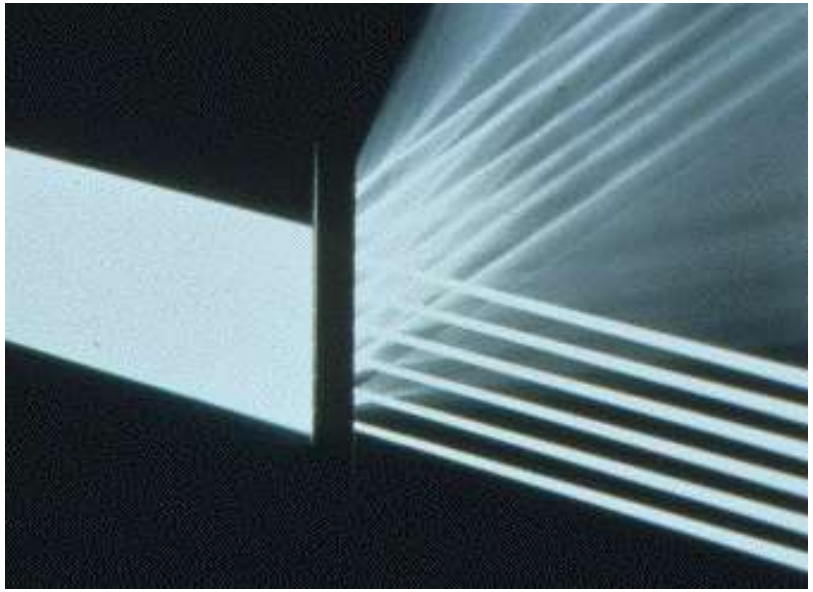


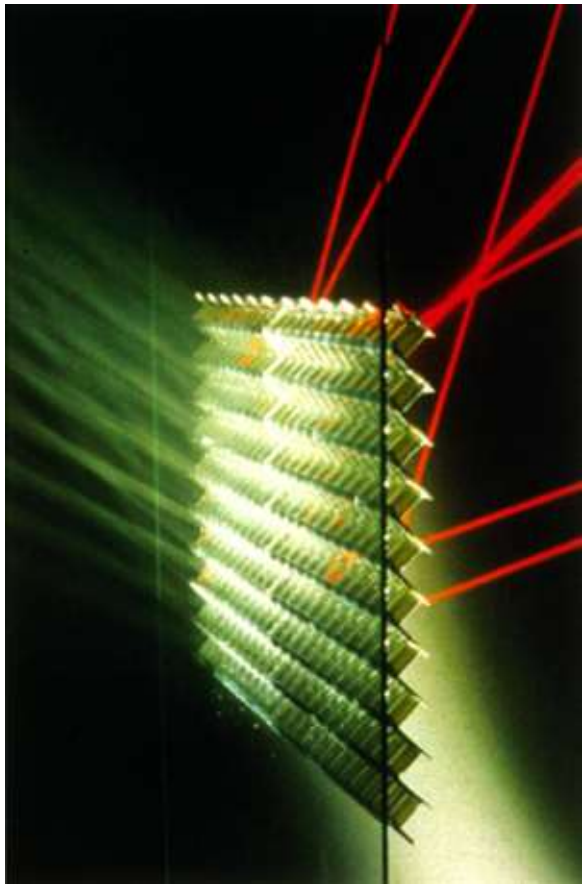
Okasolar-Grafik

Okasolar-Bild

Sun Windows

Isoliergläser mit fest angeordneten Spiegelprofilen im Luftzwischenraum





Example for Sun Window

AM HIRSCHENFELD

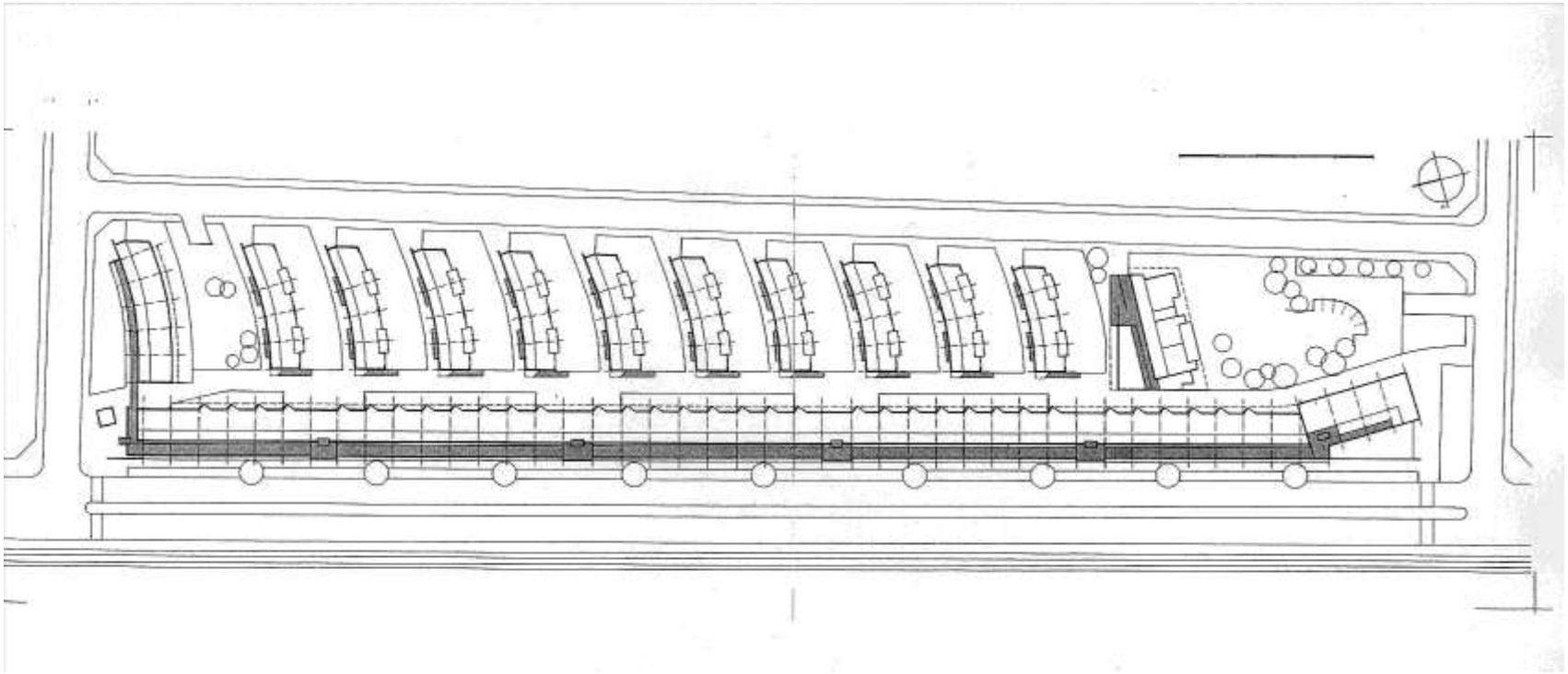
MULTI-RESIDENTIAL BUILDING

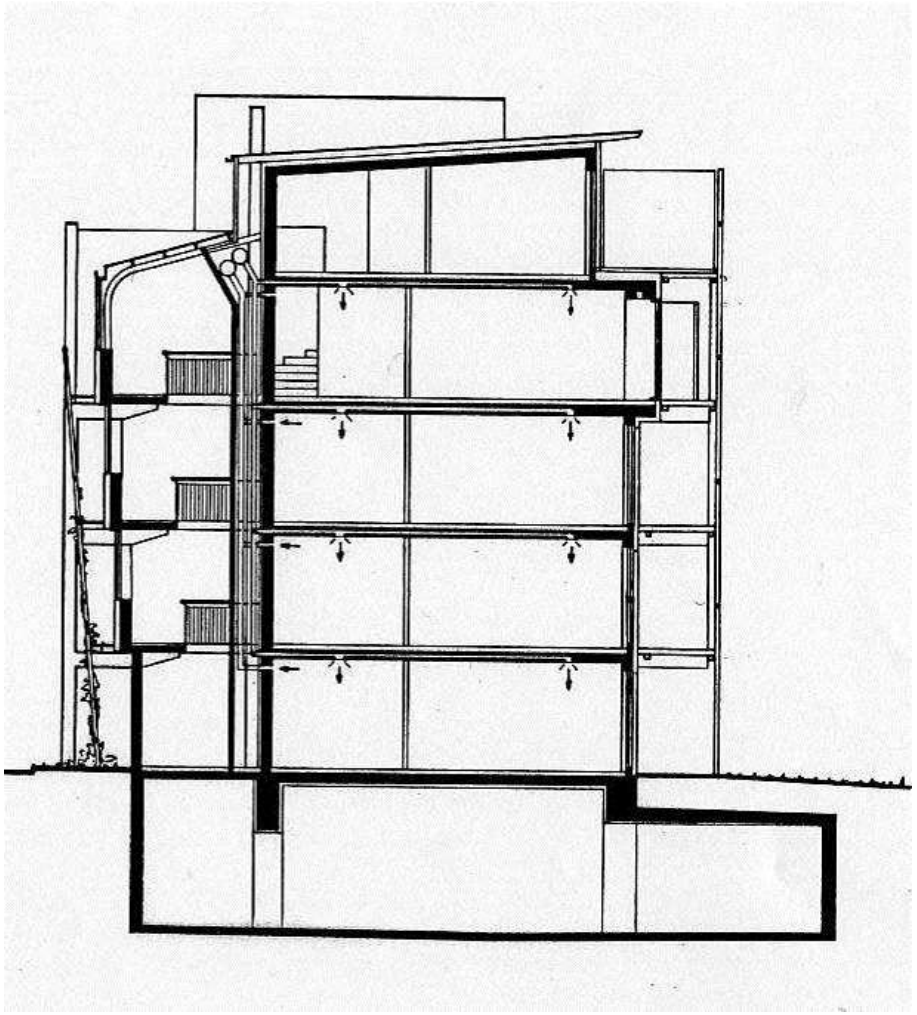
Brünner Straße 190, 1210 Vienna

OBJECT DATA

Type:	New building of Multi-family Houses
Constructor:	GESIBA, gemeinn. Siedlungs- und Bau AG
Planing:	Arge Architekten Reinberg - Treberspurg - Raith
Completed:	1996
Size:	23.380 m²
Amount:	215 accommod. units, KIGA, pub, basement garage
Heating energy demand:	Line: 22 kWh/(m²a), Houses: 35 kWh/(m²a)
Netto Building Costs:	ca. 24 Mio. EURO

Focus: Forerunner of passive house concept: mechanical ventilation system with heat recovery in Line, district heating

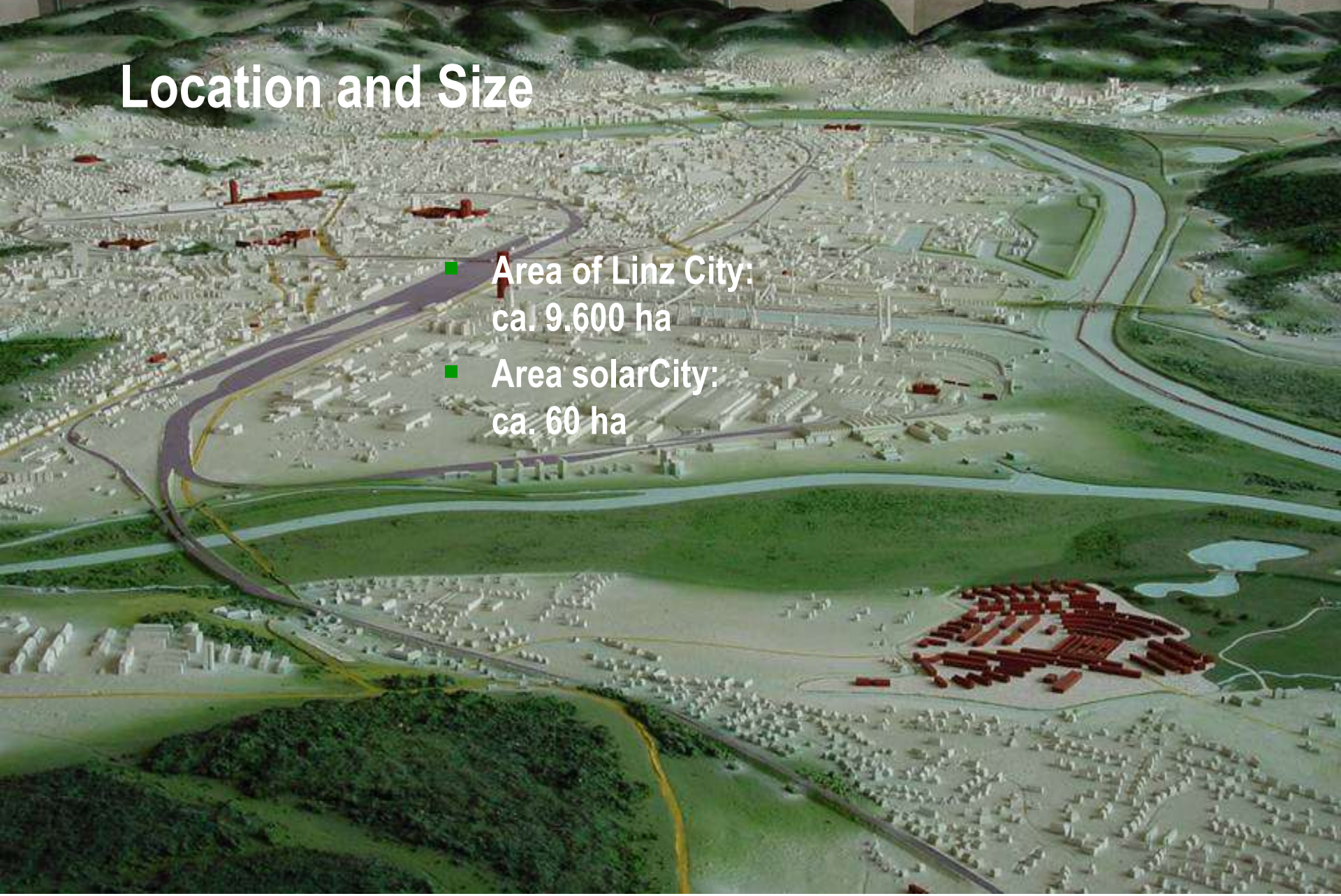




solarCity

Linz City Expansion Project
1996-2005

Location and Size



- Area of Linz City:
  ca. 9.600 ha
- Area solarCity:
  ca. 60 ha


Apartments: 1,298 apartments
Public transport: tram, bus
[credit: MAG Linz]

Solar City Linz Pichling

2003 FIRST PASSIVE HOUSE IN UPPER AUSTRIA!

Developer: EBS Wohnungsgesellschaft mbH Linz

Architects: Treberspurg & Partner Architects ZT GmbH

Premises for the Beginn

- 12.000 Acommodations needed in 1990
- City Expansion only in Pichling possible
- Idea of a „Solar City“

Solararchitecture

- Low energy construction method
- Partial passivehouse standard
- Min. heating energy Demands
- Compact style
- Very good Insulation
- Solar energy (passive/active)
- ecological. parts catalogue

Traffic

- Walk- and Bicycle lanes
- Tram connection
- Rapidbus
- by-pass Ebelsberg
- medium-term quick railwaybound public transport

Energy supply

- solar panels
- district heat

Disposal

- Pilotproject „Effluent free settlement “
- Grey water cleaning in Plant cleaning facilities
- Rainwater cultivation

Foto: Magistrat Linz

House 2, 4-7:
Low energy House
Heating energy demand:
30-32 kWh/m²a
Standard-heater

House 3:
Almost-Passivehouse
Heating energy demand:
< 20 kWh/m²a
Decentral ventilation
smaller heater

HOUSE 1:
Passivehouse
Heating energy demand:
< 15 kWh/m²a
Decentrale ventilation mit earth preheating unit

Passivehouse-Residential facilities

12,2 kWh/m²a

Wohnhausanlage Solarcity Linz

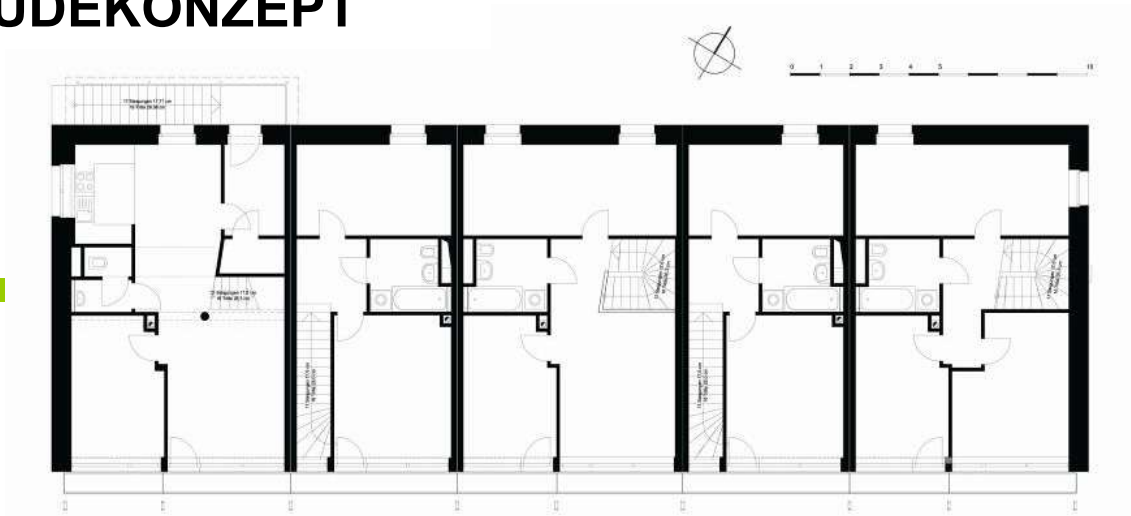
Wohnhausanlage der EBS, solarCity Linz-Pichling

Bauträger: **EBS Wohnungsgesellschaft mbH Linz**
Planung: **Treberspurg & Partner Architekten ZT GmbH**

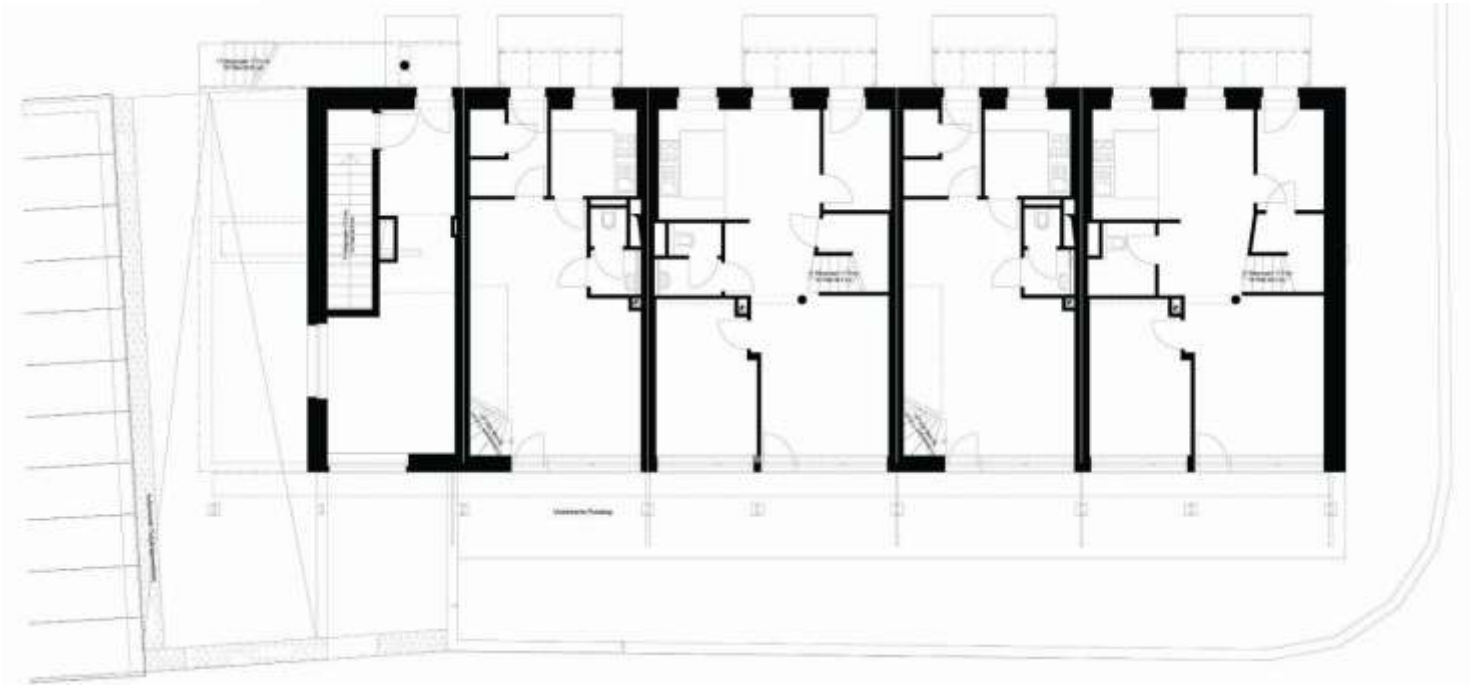
WHA EBS [Foto: MAG Linz]

Quelle: HdZ-Bericht (9/2004): Treberspurg, Mühling, Hammer, et al. 2004

GEBÄUDEKONZEPT



Grundriss 1. OG



Grundriss EG


50
52

Kindergarden

Counseling Centre

School center

Town center

Planner/Developer

- 19 Architecture offices (GB, D, A)
- 2 Technician offices
- 12 nonprofit building Associations
- 3 Developers Infrastructure
- Municipality Linz
- Linz AG

Costs

	ATS	EURO
Housing	1.700.000.000,-	123.000.000,-
Infrastructure	1.000.000.000,-	73.000.000,-
Total	**2.700.000.000,-**	**196.000.000,-**
Eurofigher		***109.380.000,-***

(Quelle: www.airpower.at)

Green Roofs

Spar Supermarket

Engerthstraße 230A, 1020 Vienna
Used space: 684 m2
Green space: 1.105 m2
- 230 m2 for sport

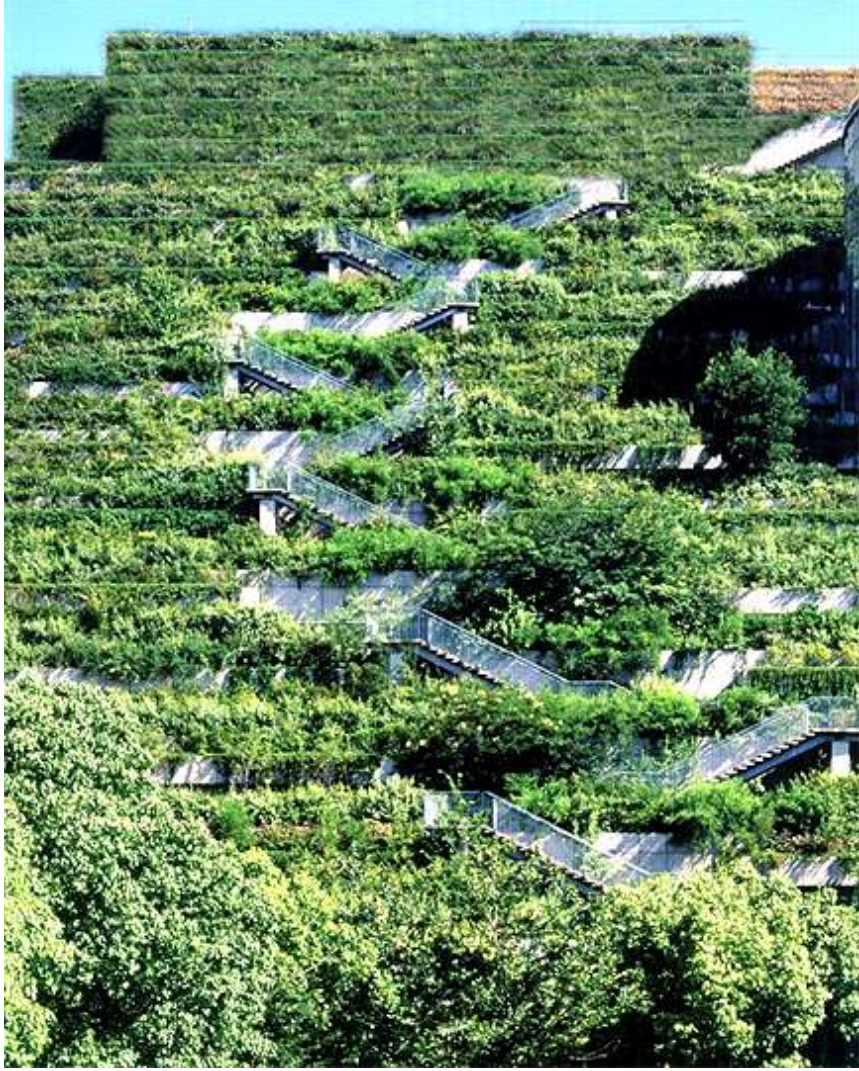

SPAR

ZUMTOBEL

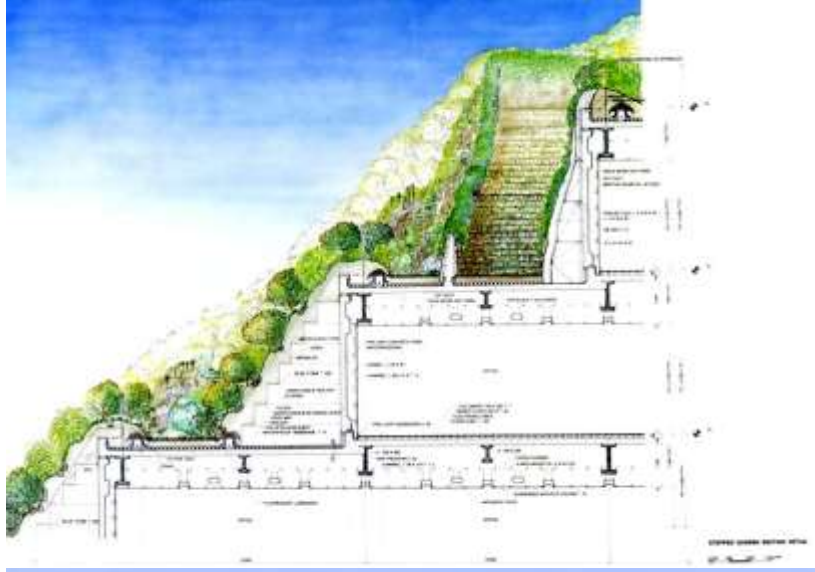
TANKE

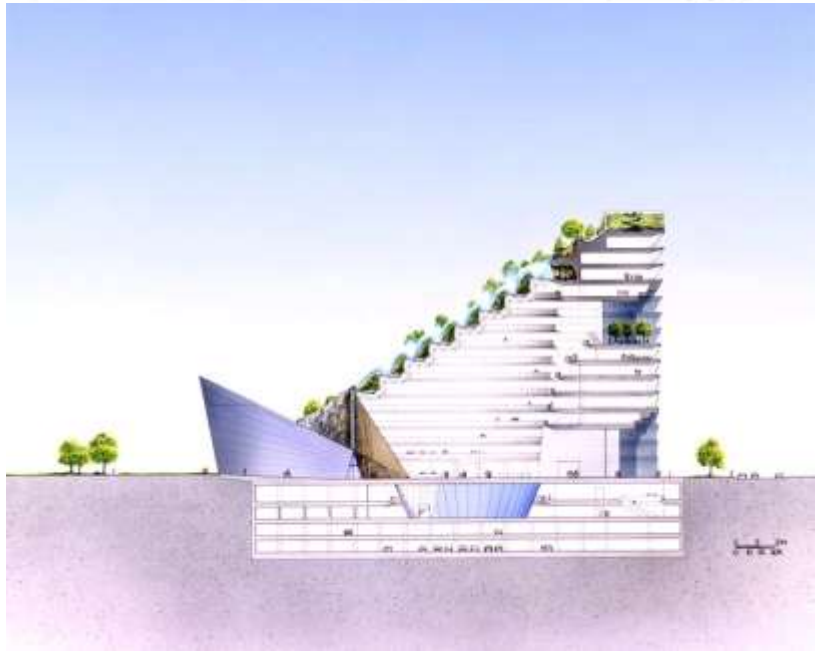
WIEN ENERGIE

TANKSTELLE



ACROS Fukuoka, offices under green terraces – Japan





ACROS Fukuoka, offices under green terraces – Japan

Art and Exhibition Hall roof garden – Bonn, Germany.

Chicago City Hall – the coolest place to be, thanks to this $2.5 million rooftop garden (*not* open to the public – the 11-storey drop might have something to do with this).

Green Walls

Patrick Blanc´s unique vertical garden

Musée du quai Branly / Quai Branly Museum , Paris

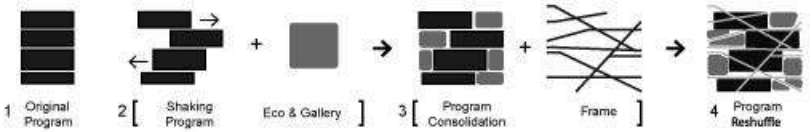
CaixaForum, Museum in Madrid

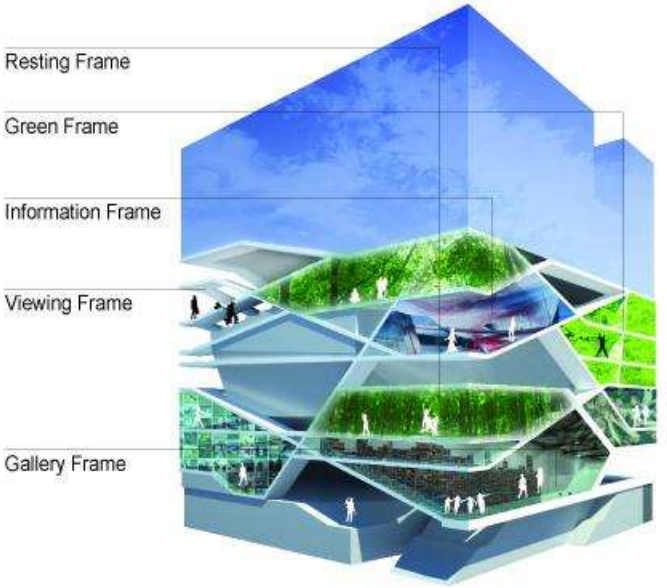
J&T Bank Cafee, Bratislava

Plants don’t need earth: only water, minerals, light and carbon dioxide”. Based on this simple axiom, Patrick Blanc built his first vertical garden in 1988, specifically in La Villette in Paris.

Future Projects

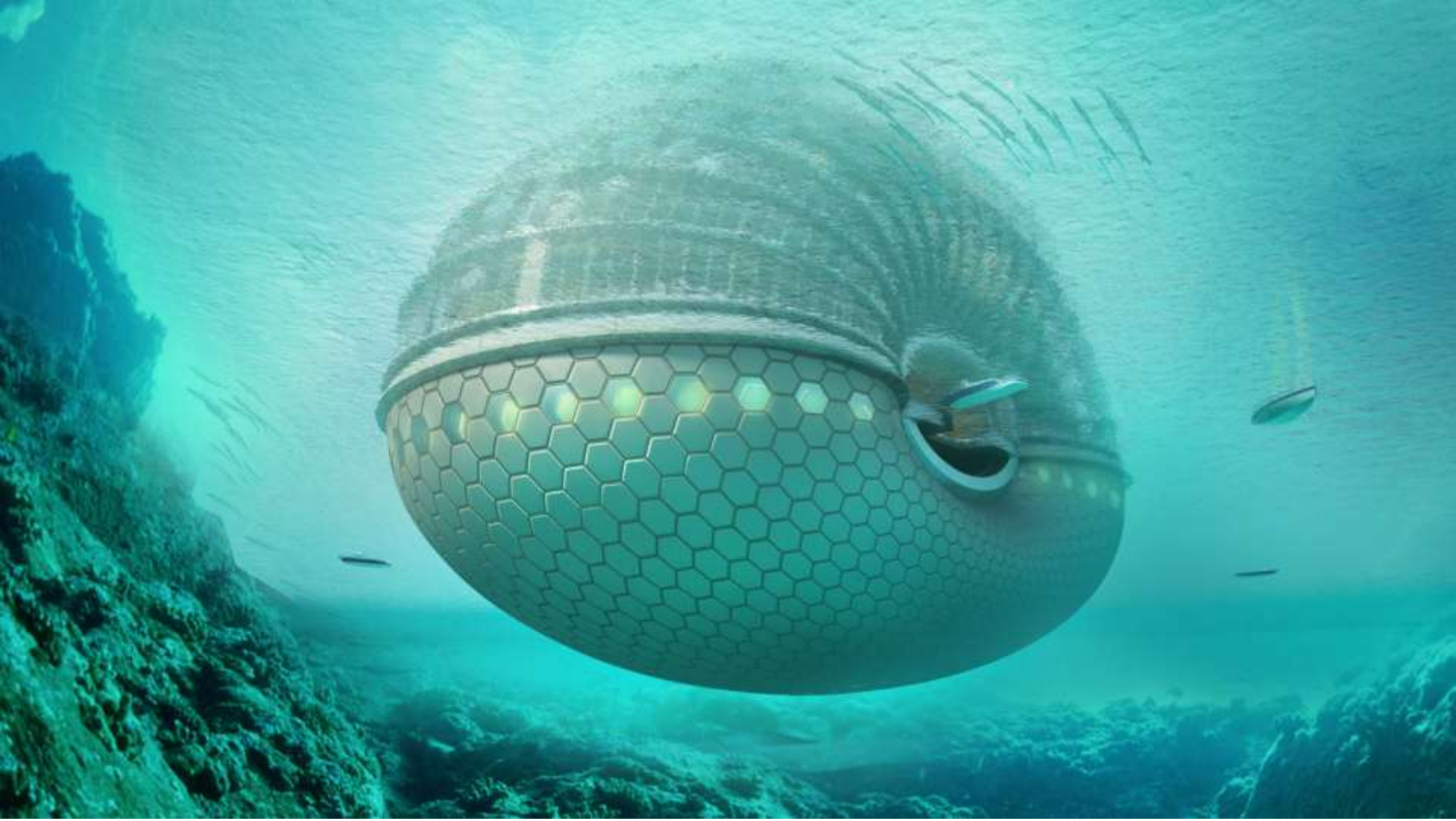
Culture Forest – Seoul, South Korea





Culture Forest – Seoul, South Korea

Culture & Art Center, Theater
Site Area: 1694m2



The Ark – Remistudio, Russia

-bioclimatic building with independent life-support systems that can be built on land or sea

Thank you for your attention