SUSTAINABLE BUILDINGS, EULACHHOF

PROF. DIETRICH SCHWARZ

Energy efficient construction

- Building envelope
- Building services
- Primary Energy

Conservation Strategy

- Compact building shape
- Effective thermal insulation
- Tight building envelope
- Energy loops within the building closed through use of waste heat recovery
- Ventilation, domestic hot water, waste

Gain strategy

- use and manage solar thermal gains
- passive and active
- photovoltaics
- heat pumps

The four components of the solar-gain-strategy

Transparent thermal insulation
- Allows for transmission of sunlight
- Blocks transmission of heat

The absorber
- Converts sunlight to heat

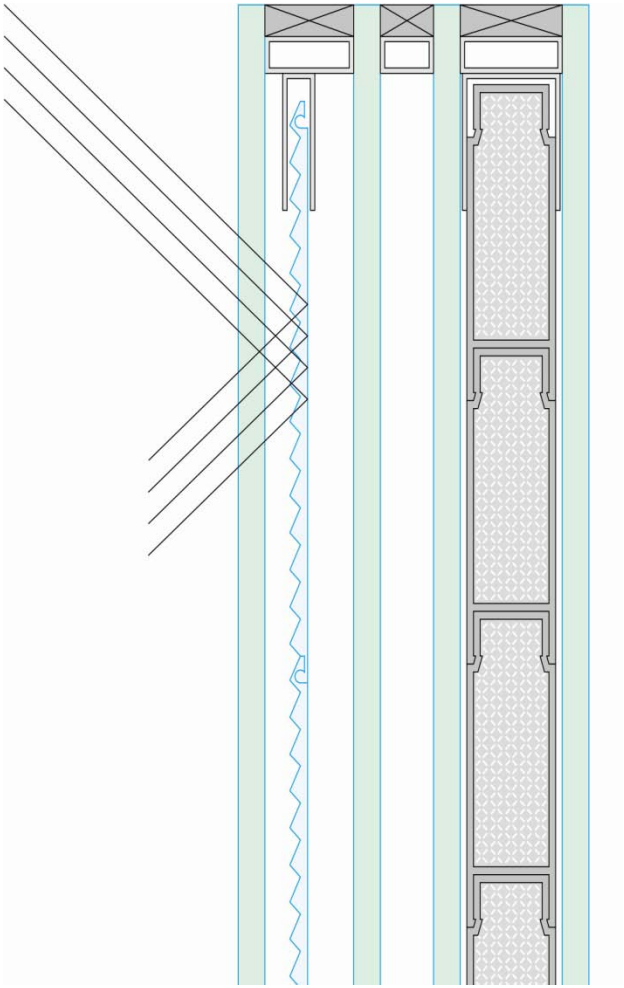
The storage
- Heat is stored as heated matter

Overheating protection
- Heating of the storage is inhibited

GLASSX®crystal

Transparent thermal insulation:

- Isolation glass with multiple layers of Low-E coating and inert gas fill



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Transparent thermal insulation

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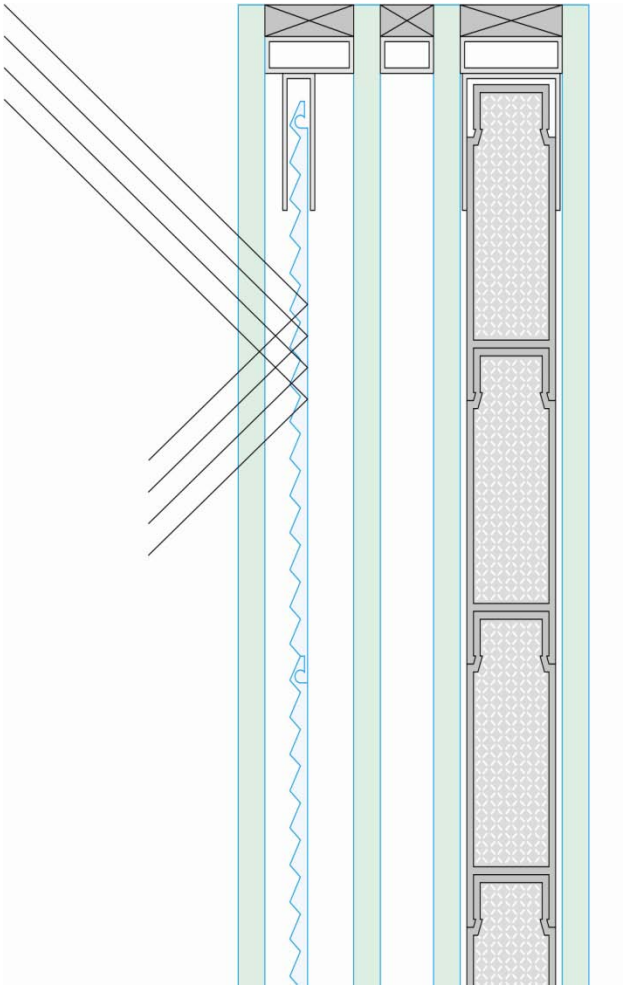
Overheating protection

- Prismatic glass



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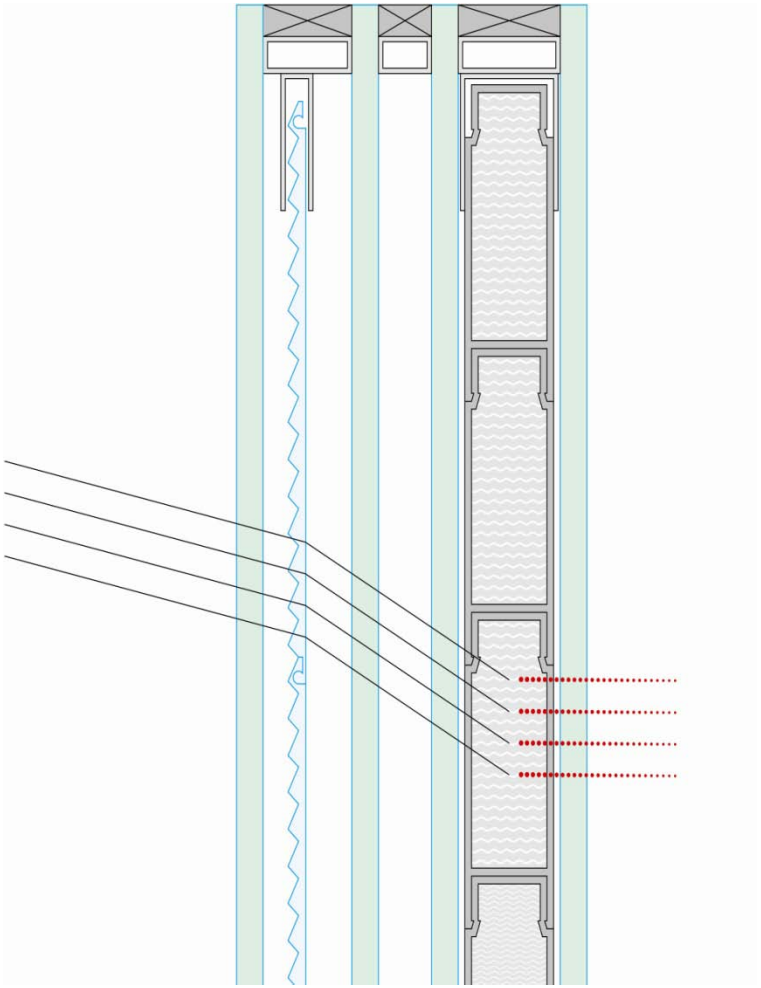
The storage

- Salt hydrate (paraffin) as latent heat storage



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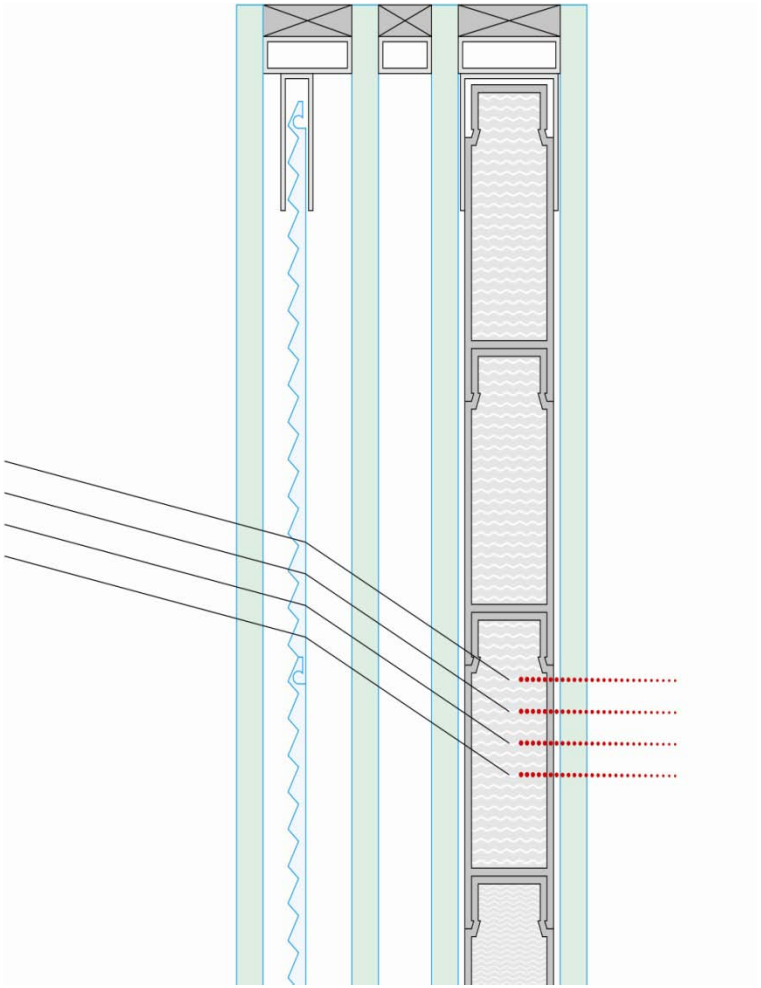
Absorber

- Salt hydrate (paraffin)



Large scale project in Winterthur 2004–2007

Housing estate with 136 flats and 8 shops

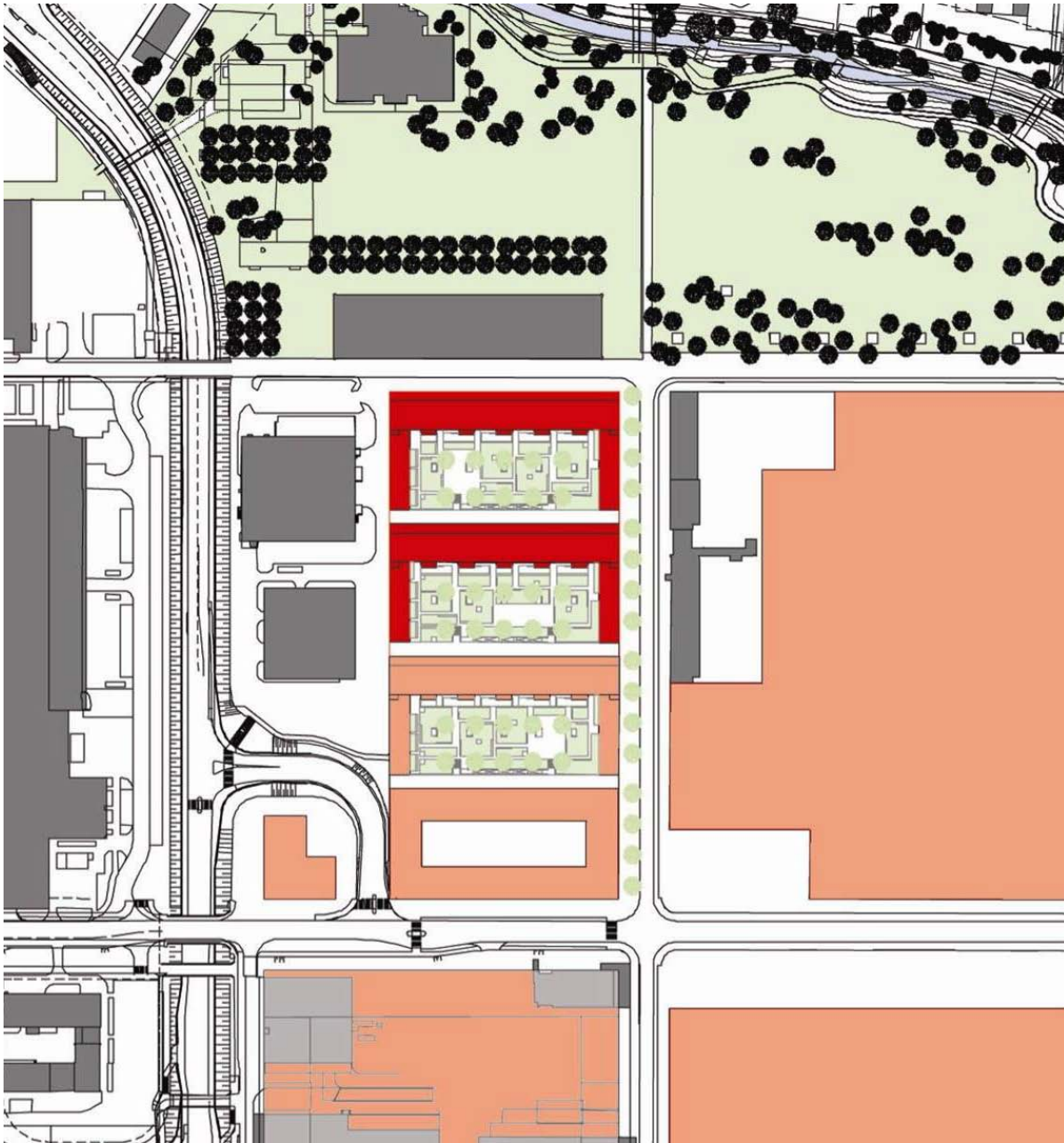
Swiss Solar Prize 2007
Leuchtturm award from 2000-Watt
Watt d'Or 2009

First Minergie-P-Eco estate in Zurich, ZH-P-Eco 001 + 002

Zero energy standard

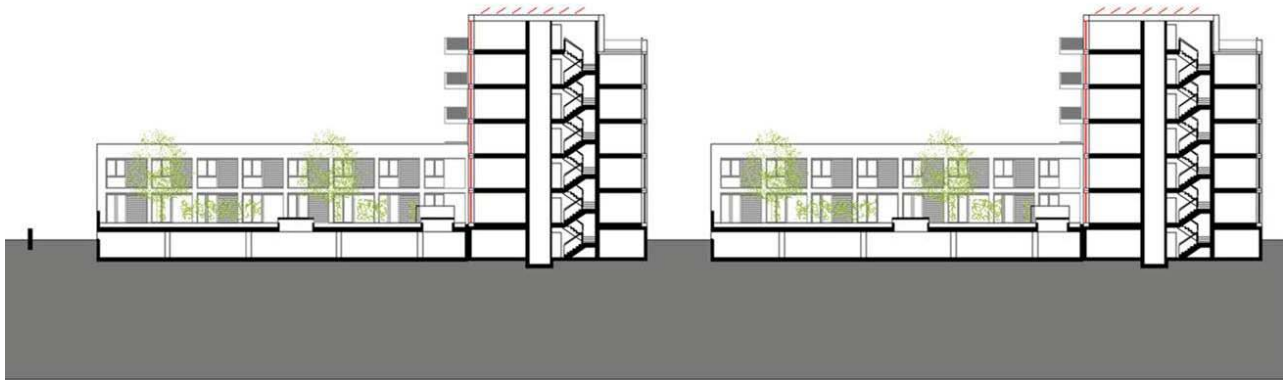
1200 sqm GLASSXcrystal

Team: Allreal, A+W, GLASSX



Large scale project in Winterthur
2004–2007

- Mezzanine
  Underground car park with
  natural ventilation
  Attica



Large scale project in Winterthur
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- Mezzanine
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- Low solar altitude in winter,
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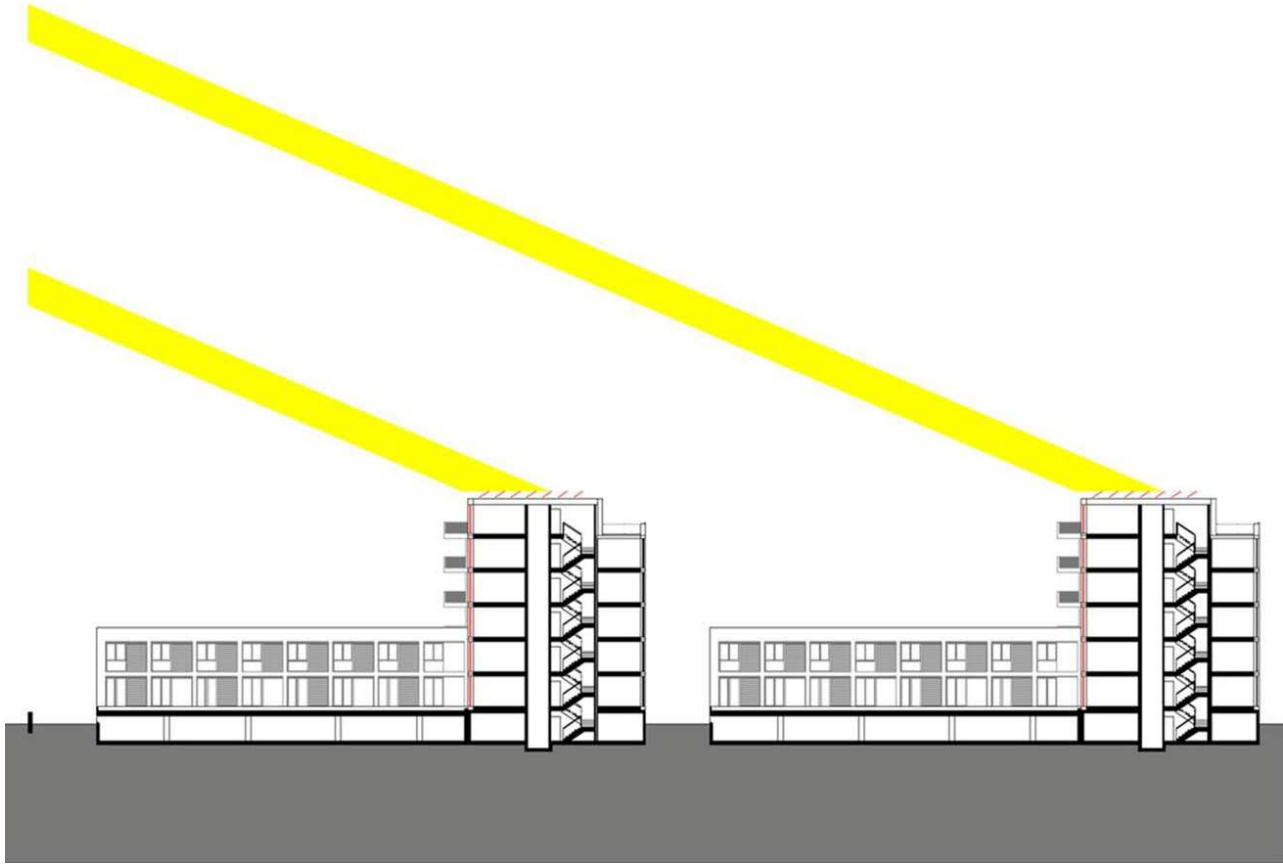

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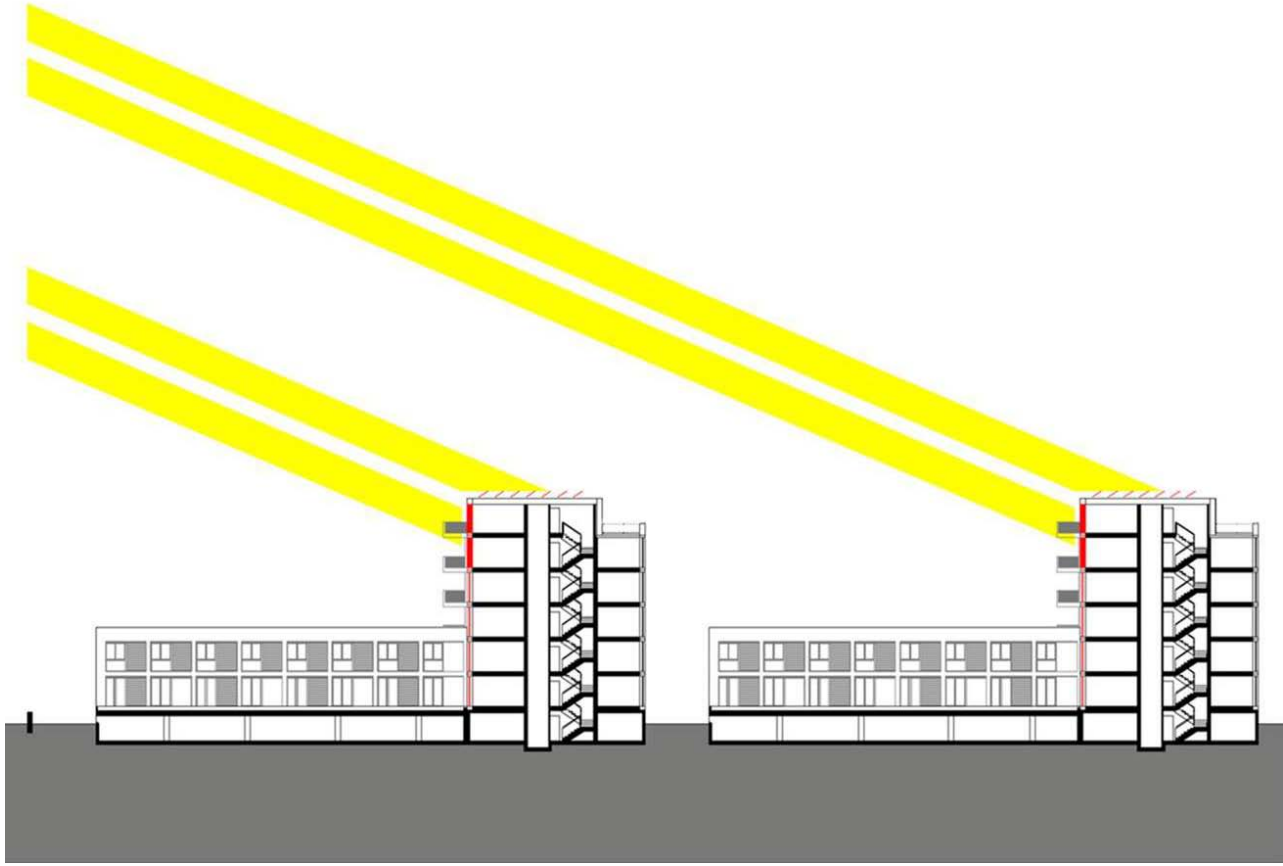
- 20% of solar radiation reaches the photovoltaics on the rooftops



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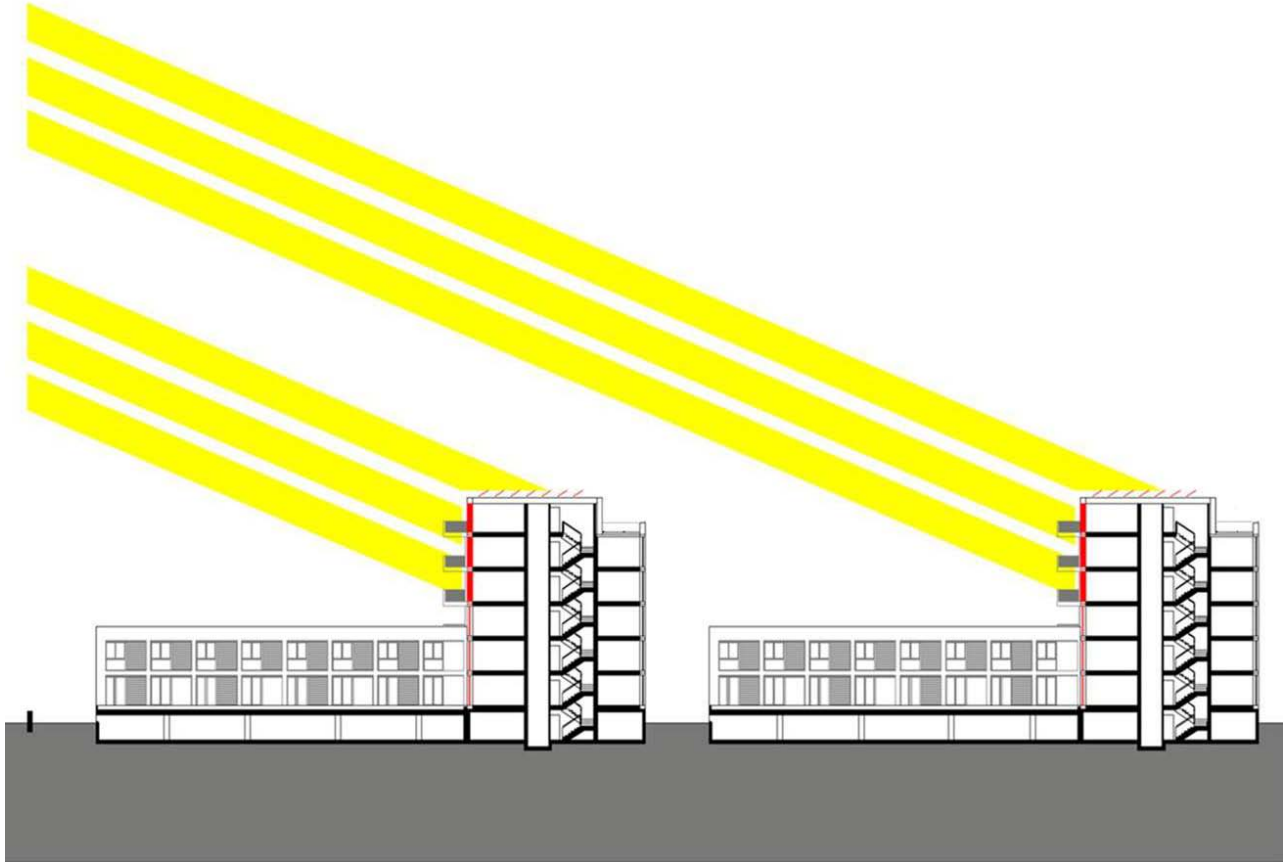

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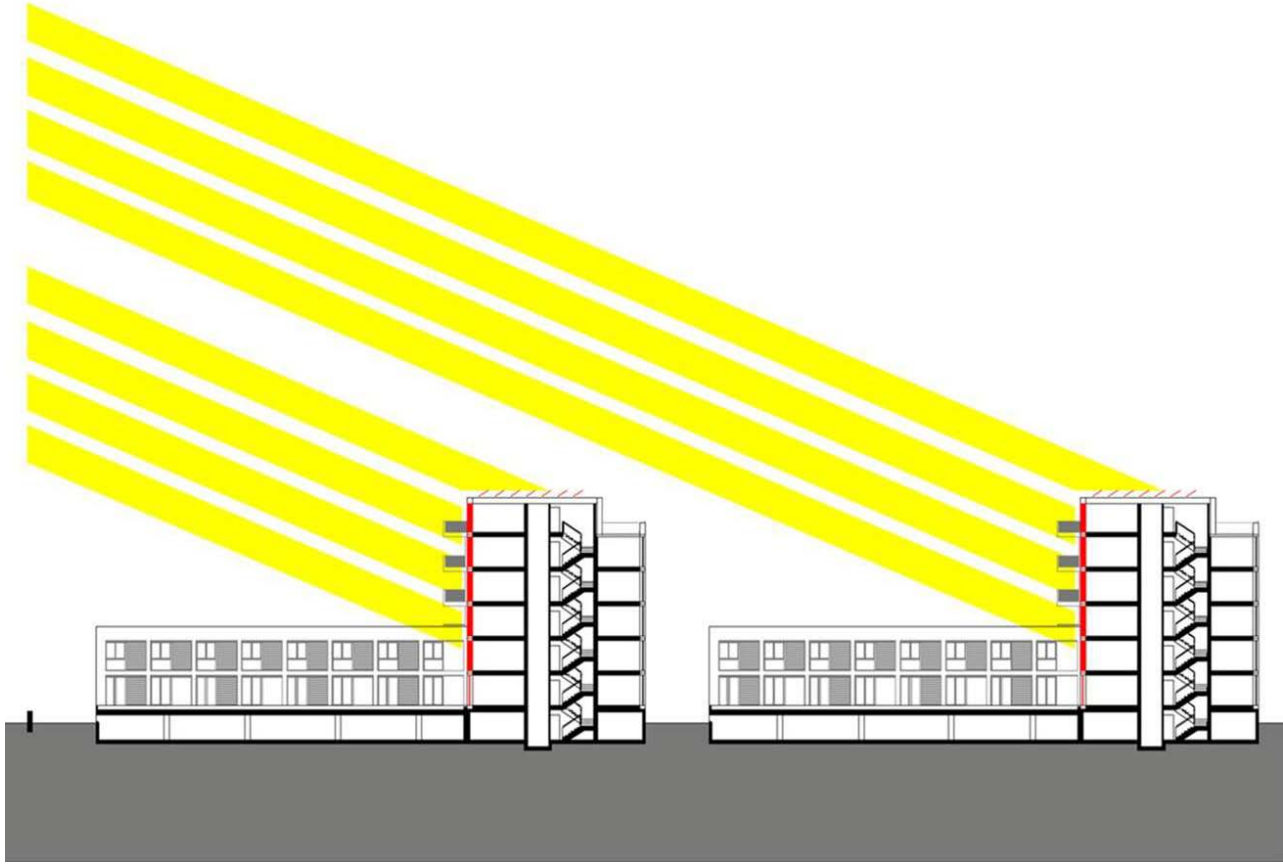
- Consistent use of solar energy in an urban settlement



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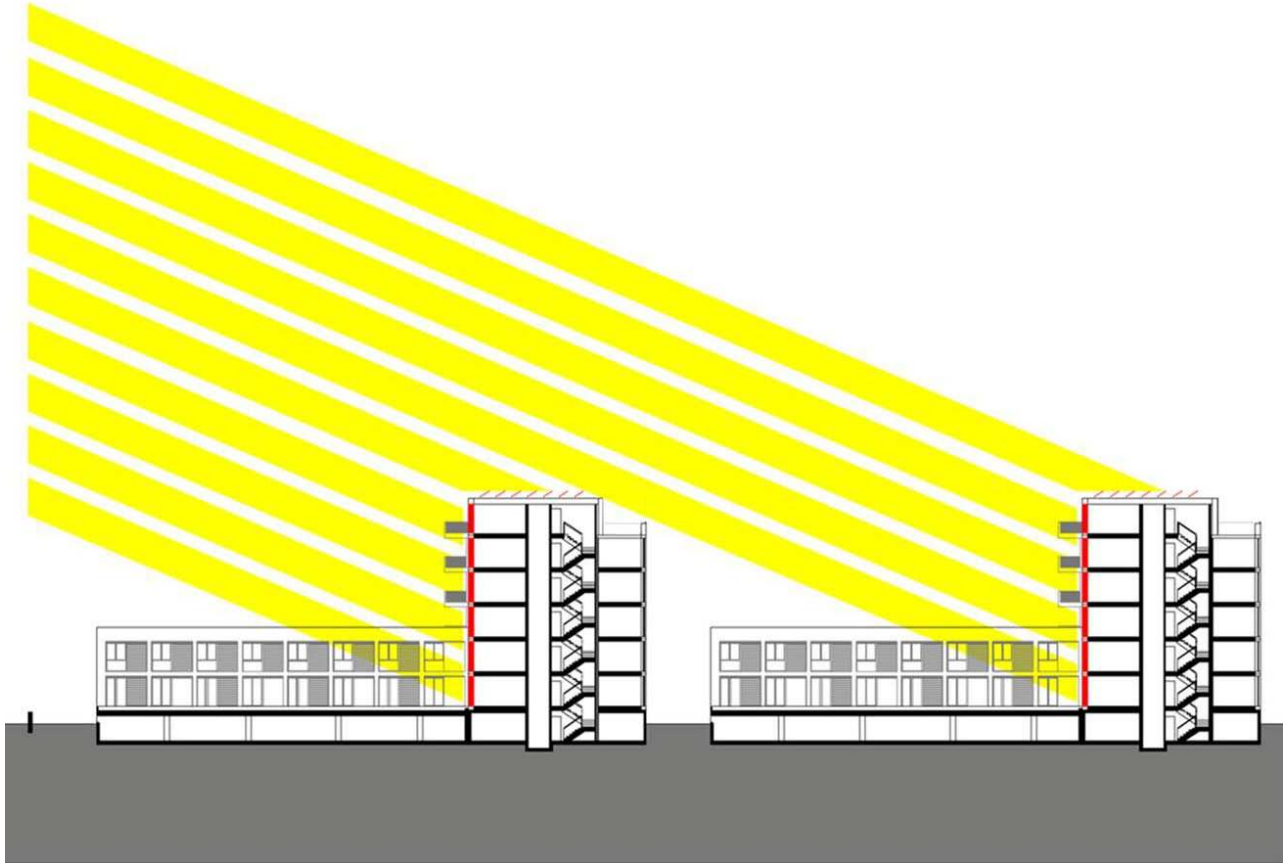
- Consistent use of solar energy in an urban settlement

- Every ray of sunlight is used



Large scale project in Winterthur 2004–2007

- Floor plan ground level
- Design plan, hybrid cluster
- Street space, courtcard, thoroughfares, stairways
- Family units, terraced houses, shops


handel
exportlogistik
document center
PARKARENA
PARKARENA

Large scale project in Winterthur 2004–2007

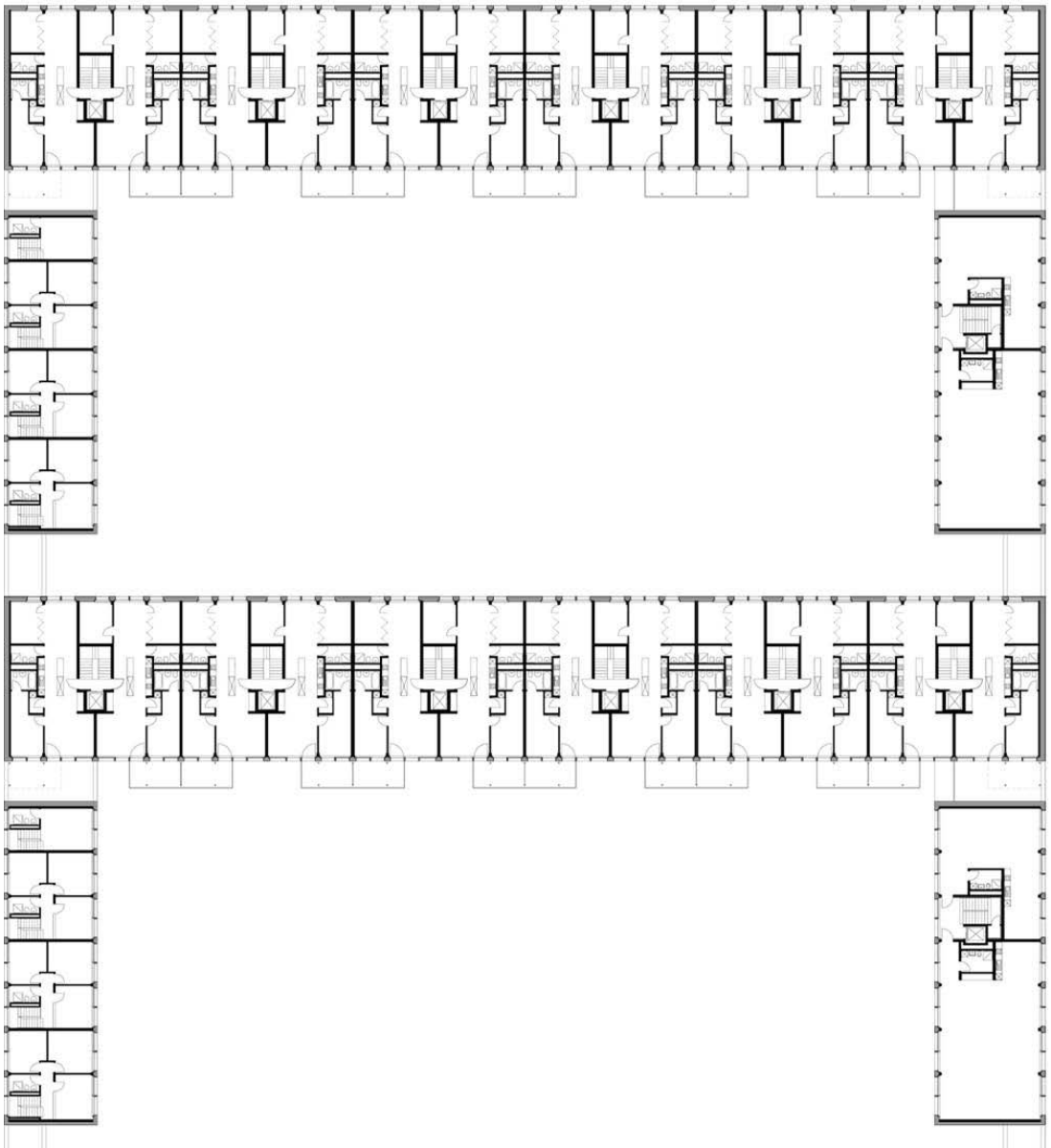
- Typical floor plan

- Open-plan, terraced houses, lofts

- Minimum of circulation areas, facades – main usage areas high cost-effectiveness

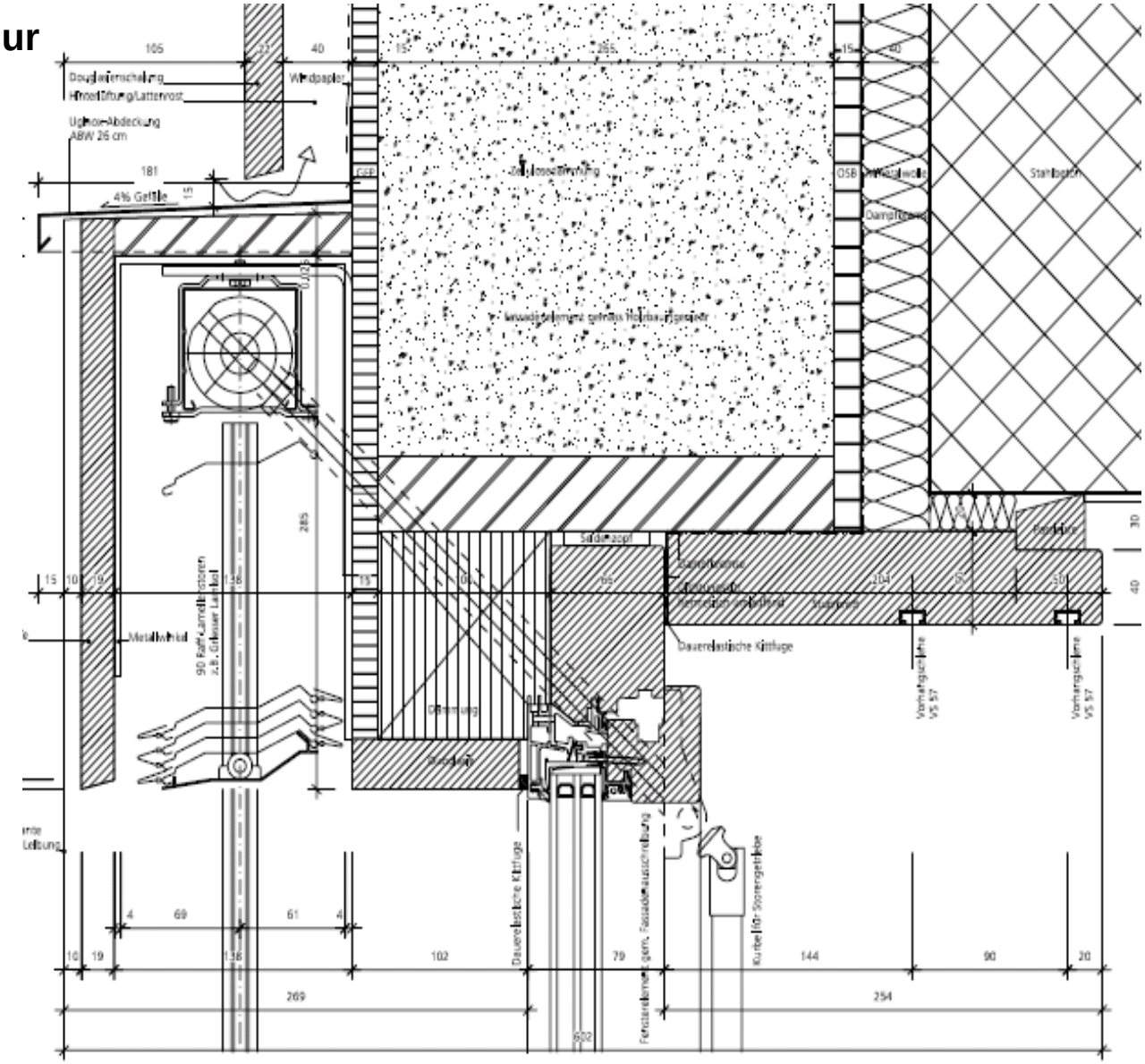
- 4½ room flat
  net rental fee CHF 1‘900.–
  service charges CHF 130.– fixed

- First time tenancy



Large scale project in Winterthur 2004–2007

- Cross-section of the facade, detail



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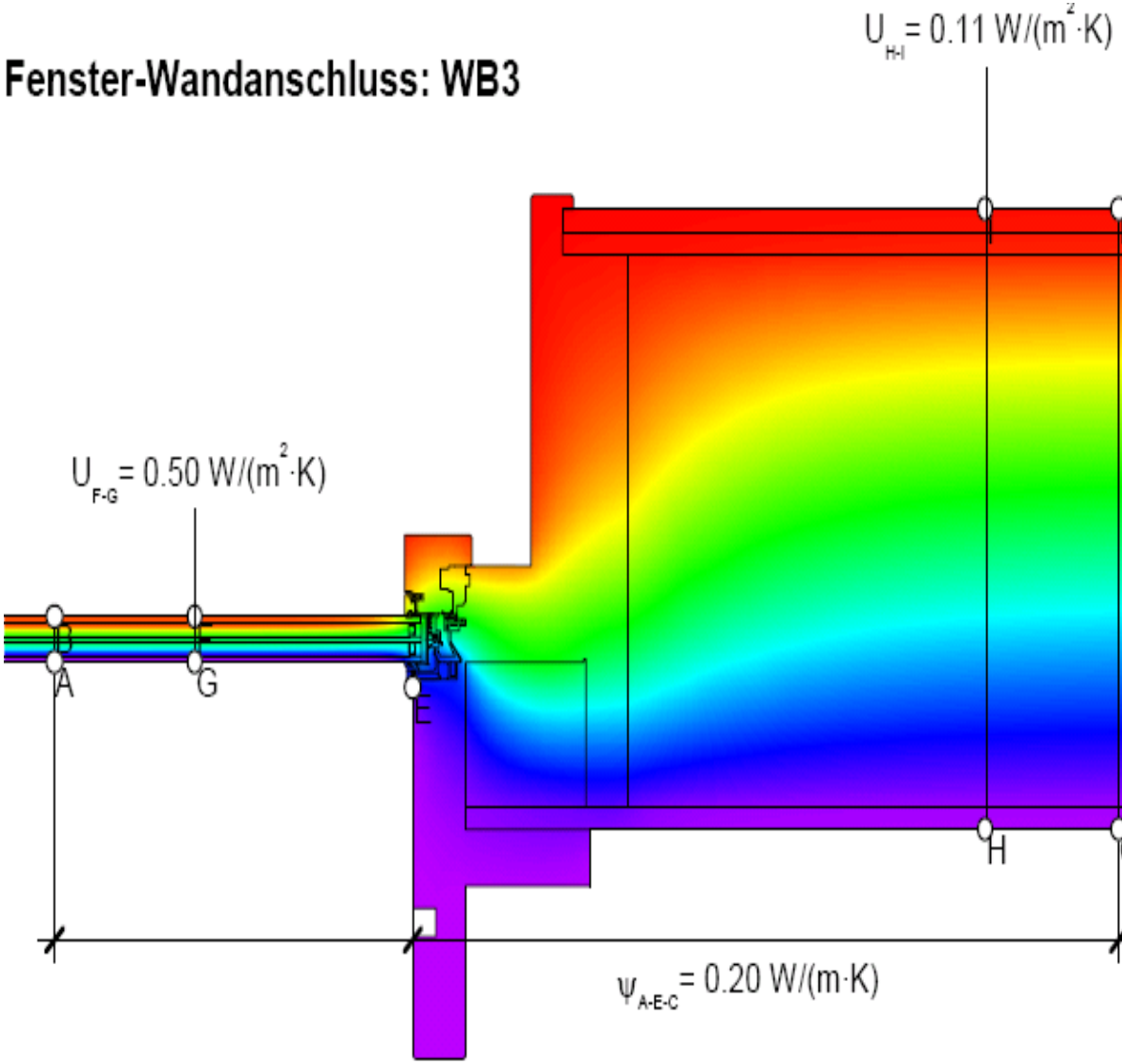
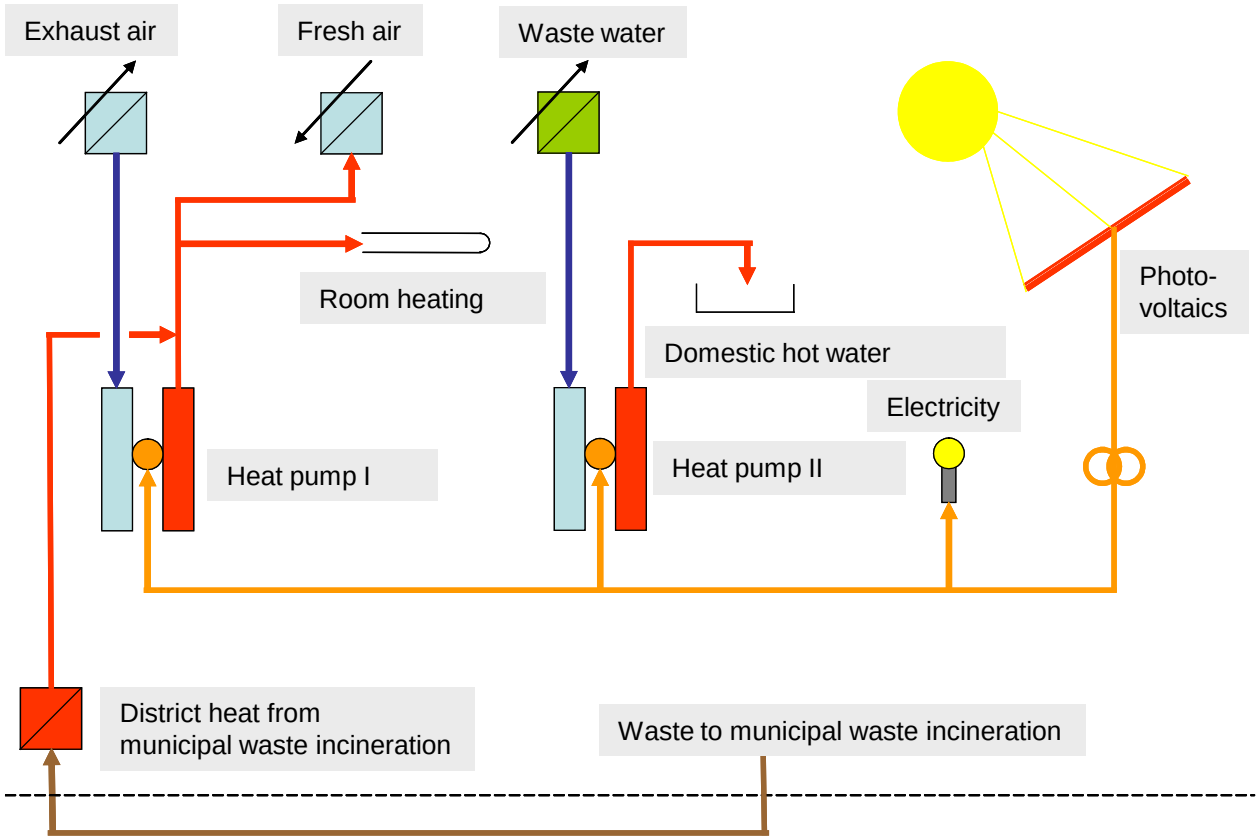


Energy concept

- Closing of all media loops
- Fresh air – WP I (heat pump)
- Domestic hot water – WP II (heat pump)
- Electricity – PV (photovoltaics)
- Waste – district heat KVA (municipal waste incineration)



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- Fresh air – WP I (heat pump)
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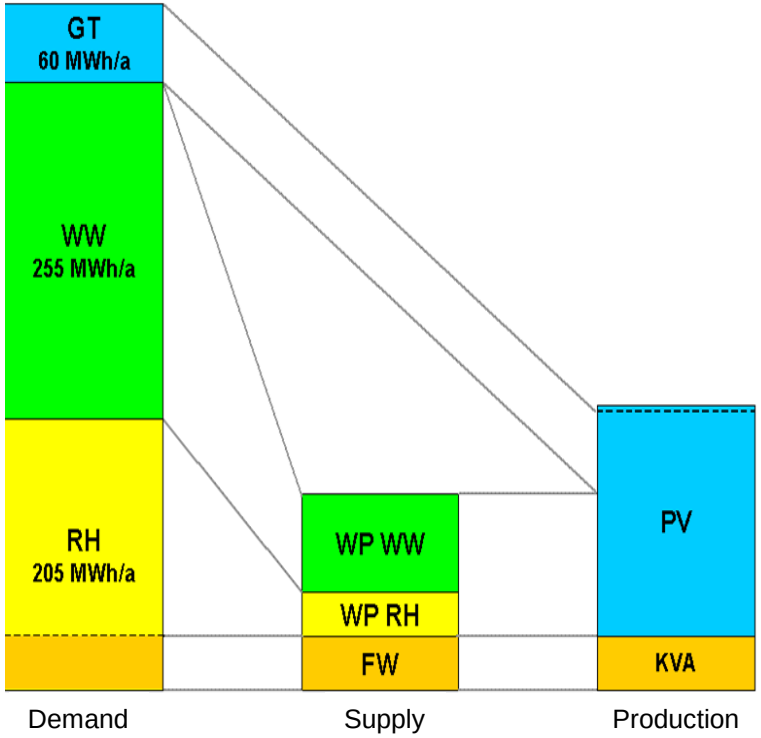
- Waste – district heat KVA (municipal waste incineration)
- WW + RH < 25 kWh/m²a
- Zero energy concept



Key:

GT	Building services
WW	Domestic hot water (DHW)
RH	Room heating
WP WW	Heat pump DHW
WP RH	Heat pump room heating
FW	District heat
PV	Photovoltaics
KVA	Municipal waste incineration

Large scale project in Winterthur 2004–2007

- Energy reference area:
  20‘400 m^2

- Energy consumption SIA 380/1:
  Total 8‘160‘000 MJ/a

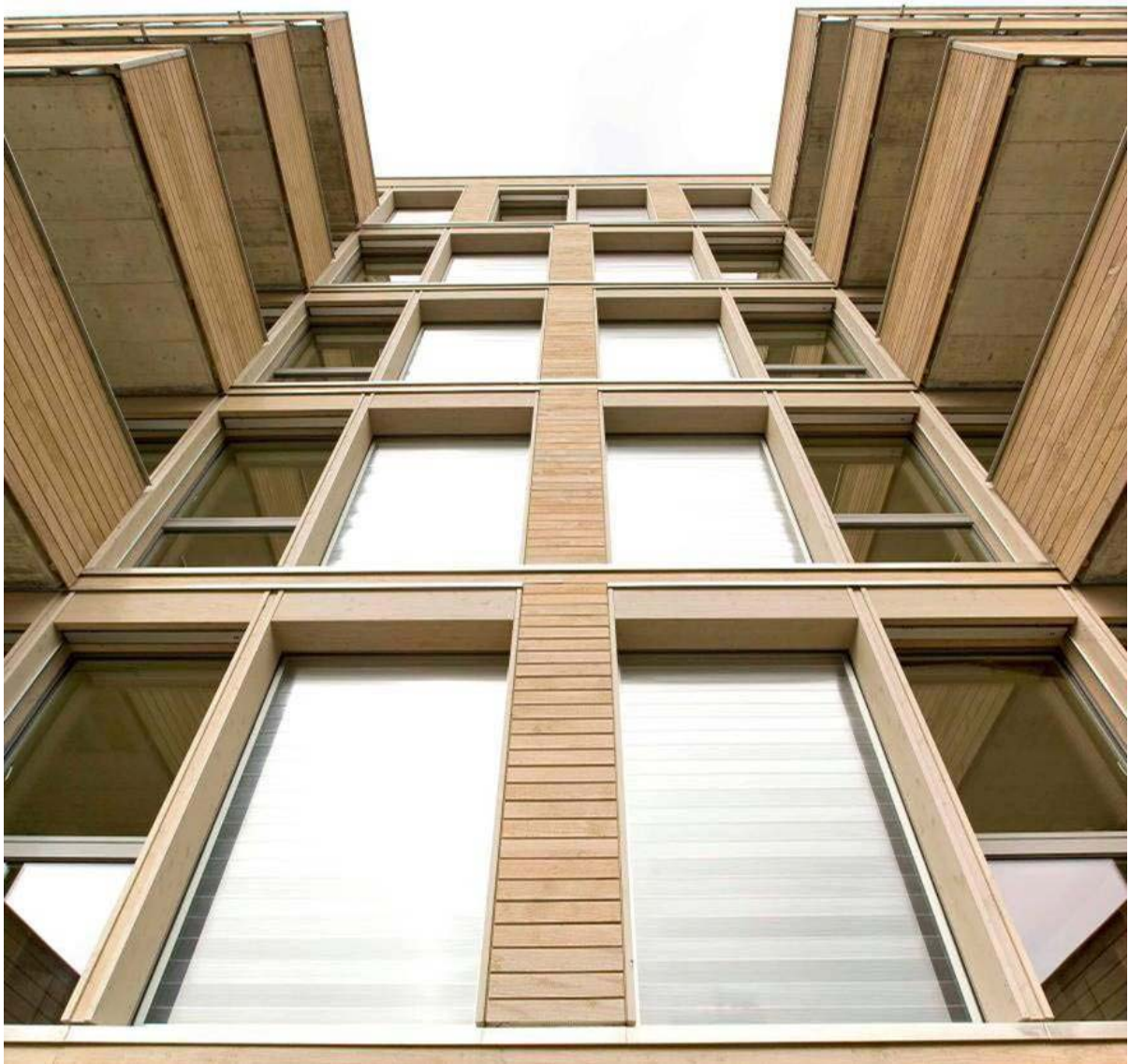
- Petroleum consumption:
  194‘285 kg/a

- CO_2-emissions:
  512‘914 kg/a

- Zero energy building:
  0 kg/a CO_2-emissions

- Reduction
  51‘300 tons CO_2

- ca. CHF 100.–/t CO_2



Large scale project in Winterthur 2004–2007

- Institutional investors
  Return on investment
- vs. cooperatives
- limited individuality
  no private gardens
- handicapped accessible construction
- Perimeter block
  public street space semi public
  courtyards
  public park

Case "Eulachhof"
Self-evaluation according to the SIA 112/1

highly relevant
relevant
not relevant

state of the art
achieved
not achieved
n/a

1 Society

Issue	Criterion Target agreements according to SIA 112/1	Relevance of criterion	Conformance to target agr.
1.1 Community	1.1.1 Integration, social intermix	relevant	achieved
	1.1.2 Social contacts	relevant	achieved
	1.1.3 Solidarity, fairness	relevant	achieved
	1.1.4 Participation		n/a
1.2 Design	1.2.1 Spatial identity, recognition	highly relevant	state of the art
	1.2.2 Individual design, personalisation	relevant	achieved
1.3 Use, development	1.3.1 Basic supply, mixed uses	highly relevant	achieved
	1.3.2 Slow traffic and public transport	highly relevant	state of the art
	1.3.3 Accessibility and usability for everyone	highly relevant	state of the art
1.4 Well-being, health	1.4.1 Security	relevant	achieved
	1.4.2 Light	highly relevant	state of the art
	1.4.3 Compartment air	highly relevant	state of the art
	1.4.4 Radiation	highly relevant	state of the art
	1.4.5 Thermal protection in summer	highly relevant	state of the art
	1.4.6 Noise, vibrations	highly relevant	state of the art

Large scale project in Winterthur 2004–2007

- Quarter development Z3
  Diversity of usage
- Minergie-P-ECO
  Primary energy with photovoltaics
  zero energy concept
- Additional costs 12–13%
  costs for energy CHF 0.–
  low maintenance costs

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Self-evaluation according to the SIA 112/1

highly relevant
relevant
not relevant

state of the art
achieved
not achieved
n/a

2 Economy

Issue	Criterion Target agreements according to SIA 112/1	Relevance of criterion	Conformance to target agr.
2.1 Building fabric	2.1.1 Location	highly relevant	state of the art
	2.1.2 Building fabric	highly relevant	state of the art
	2.1.3 Building structure, building alteration	highly relevant	state of the art
2.2 Building costs	2.2.1 Life cycle costs	highly relevant	state of the art
	2.2.2 Financing	highly relevant	state of the art
	2.2.3 External costs	highly relevant	state of the art
2.3 Operation and maintenance	2.3.1 Operation and servicing	highly relevant	state of the art
	2.3.2 Repair		

Large scale project in Winterthur 2004–2007

- Minergie-P-ECO
  limited gray energy
  no harmful substances
  recycling

- Energy indicator
  room heating and DHW < 25 kWh/m^{2}a
  primary energy with photovoltaics

- High utilisation factor
  limited land consumption
  natural retention in the garden

Case "Eulachhof"
Self-evaluation according to the SIA 112/1

highly relevant
relevant
not relevant

state of the art
achieved
not achieved
n/a

3 Ecology

Issue	Criterion Target agreements according to SIA 112/1	Relevance of criterion	Conformance to target agr.
3.1 Building materials	3.1.1 Resources: availability	highly relevant	state of the art
	3.1.2 Environmental impact	highly relevant	state of the art
	3.1.3 Harmful substances	highly relevant	state of the art
	3.1.4 Deconstruction	highly relevant	state of the art
3.2 Operation energy	3.2.1 Heat (cold) for indoor environment	highly relevant	state of the art
	3.2.2 Heat for warm water	highly relevant	state of the art
	3.2.3 Electricity	highly relevant	state of the art
	3.2.4 Coverage of energy demand	highly relevant	state of the art
3.3 Soil, land	3.3.1 Site area	highly relevant	state of the art
	3.3.2 Outdoor installations	highly relevant	state of the art
3.4 Infrastructure	3.4.1 Mobility	relevant	achieved
	3.4.2 Waste from operation and use	highly relevant	state of the art
	3.4.3 Water	relevant	achieved

THANK YOU FOR YOUR ATTENTION

PROF. DIETRICH SCHWARZ