

EXPOST



EXPOST
Province building N°11



EXPOST



The first and biggest public „Passivehouse“ and „Klimahouse Gold“ south off the Alps



Client:

Autonomous Province of Bolzano – Alto Adige

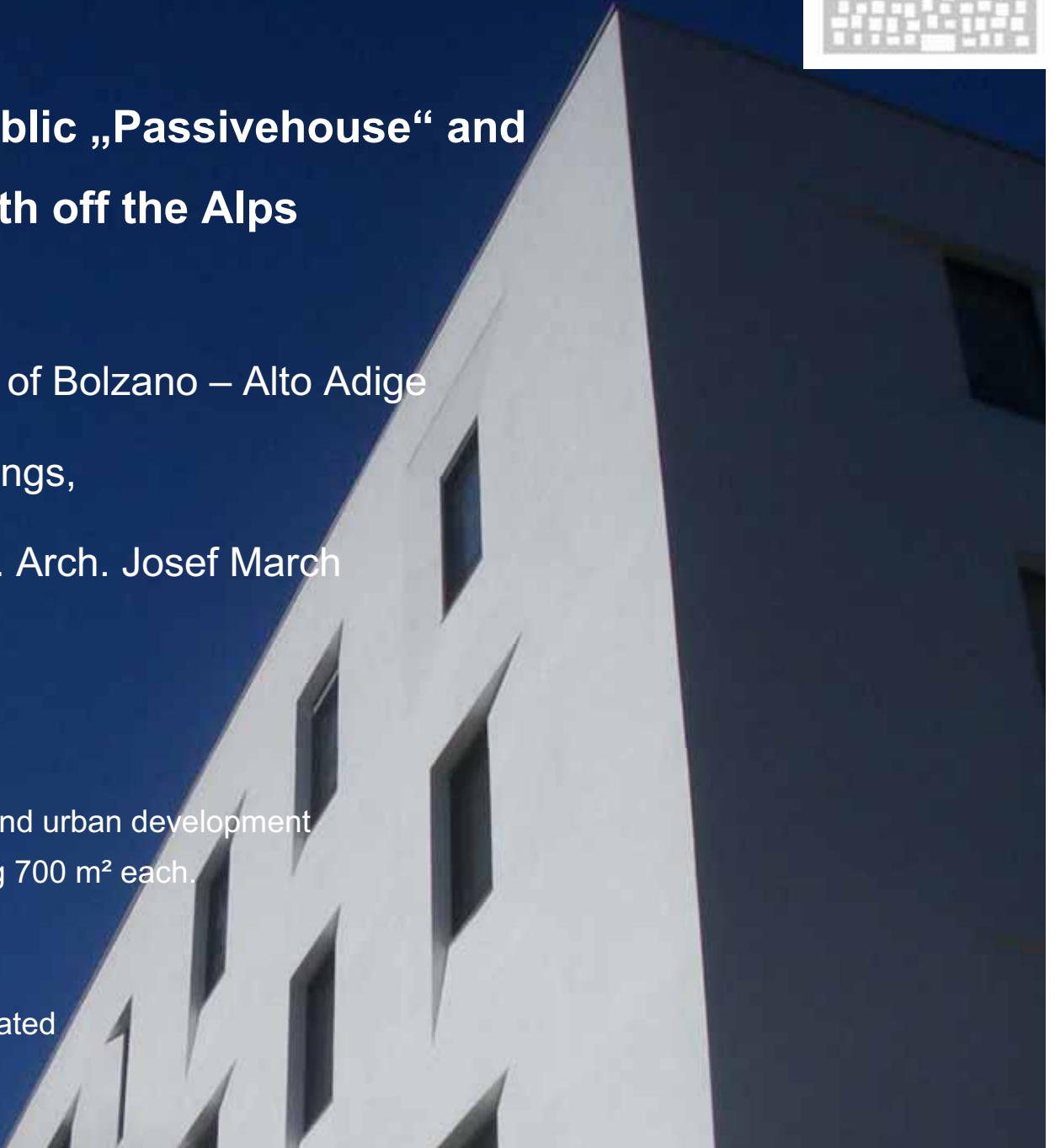
Departement off public buildings,
Head: dott. Florian Mussner
Head of administration: dott. Arch. Josef March

The building is used for:

**public offices
for Mister Laimer,**

Assessor for Environment, Energy, and urban development
110 work places on 5 floors, covering 700 m² each.

20.000 m³ total volume
of which 12.000 m³ have been renovated
and 8.000 m³ have been added.
(costs: about 241 €/m³)



EXPOST



EXPOST
Province building N°11



EXPOST



EXPOST 2004



EXPOST
2006



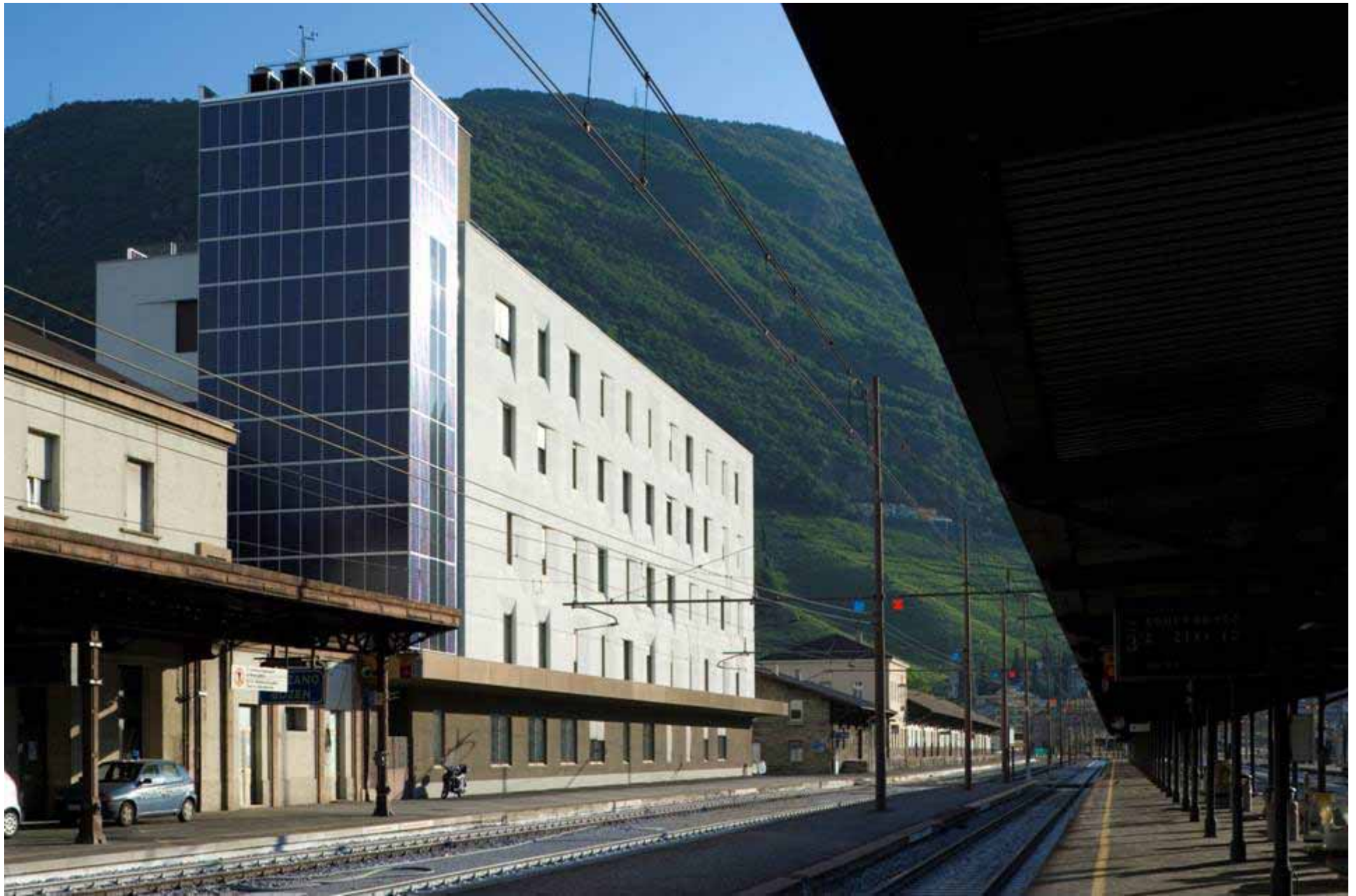


Foto: Ludwig Thalheimer/Lupe

EXPOST

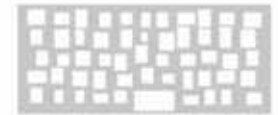


Premesse ideali per un risanamento in standard basso consumo:

- corpo edile **compatto**



EXPOST

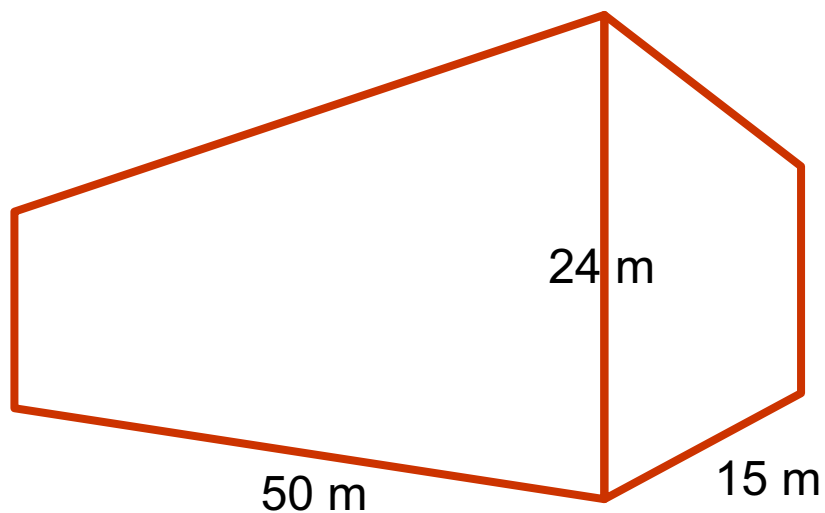


Premesse ideali per un risanamento in standard basso consumo:

- corpo edile **compatto** **Valore $A/V = 0,26$**

- **ottimo rapporto fra superficie e volume interno:**

$$4620\text{m}^2 / 18000\text{m}^3 = 0,2566$$



EXPOST



Premesse ideali per un risanamento in standard basso consumo:

- corpo edile **compatto**: $A/V = 0,26$
- regolare collocazione delle **aperture per le finestre**



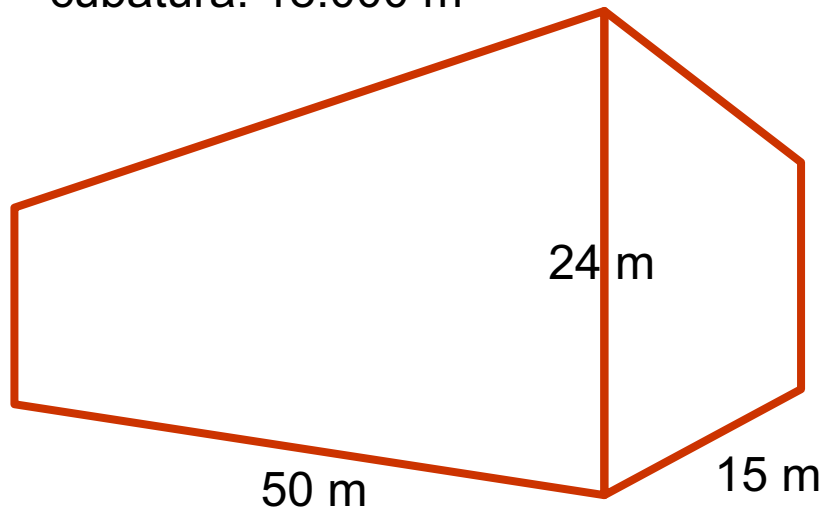
EXPOST



Premesse ideali per un risanamento in standard basso consumo:

- corpo edile **compatto**: $A/V = 0,26$
- regolare collocazione delle **aperture per le finestre**
generalmente poche finestre (16%)

cubatura: 18.000 m³



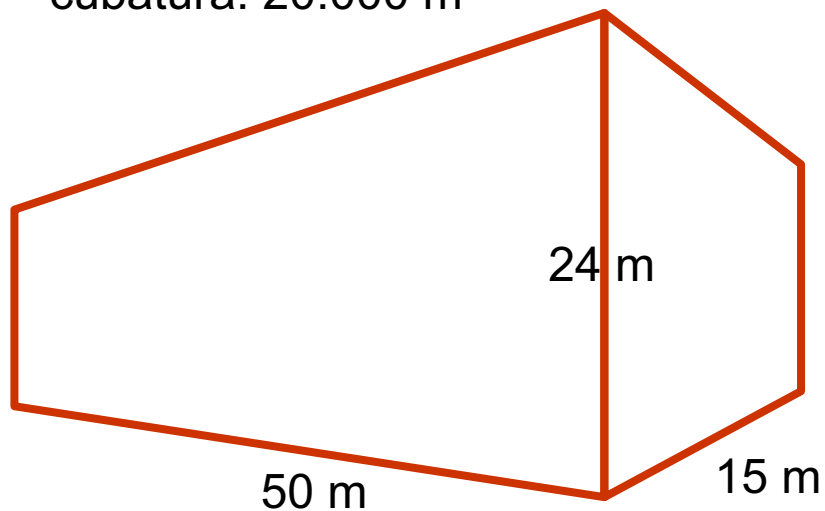
EXPOST



Premesse ideali per un risanamento in standard basso consumo:

- corpo edile **compatto**: $A/V = 0,26$
- regolare collocazione delle **aperture per le finestre**
generalmente poche finestre (16%)
- pochi ponti termici difficili

cubatura: 20.000 m³

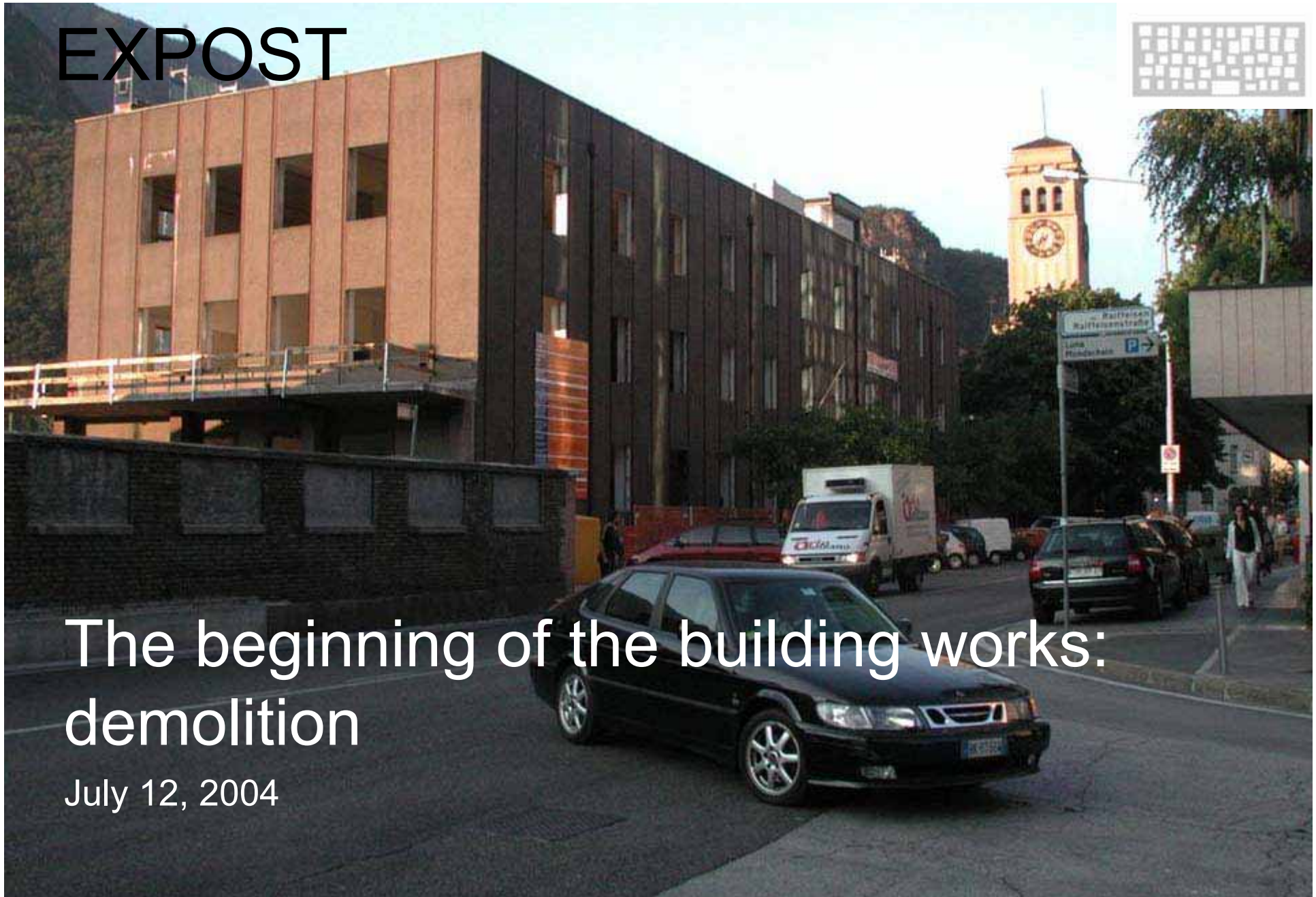


EXPOST



The beginning of the building works:
demolition

July 12, 2004



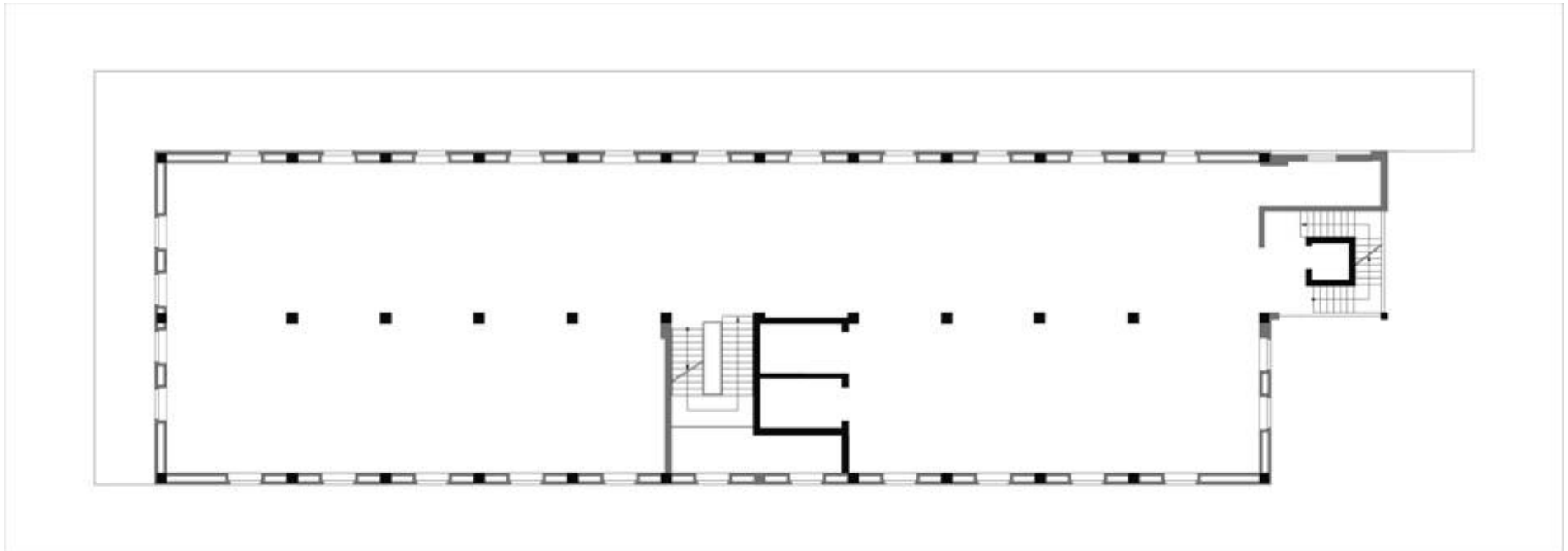
EXPOST



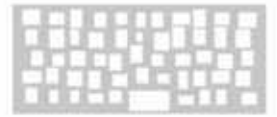
EXPOST



EXPOST



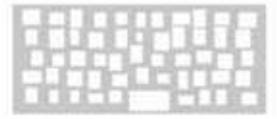
EXPOST



EXPOST



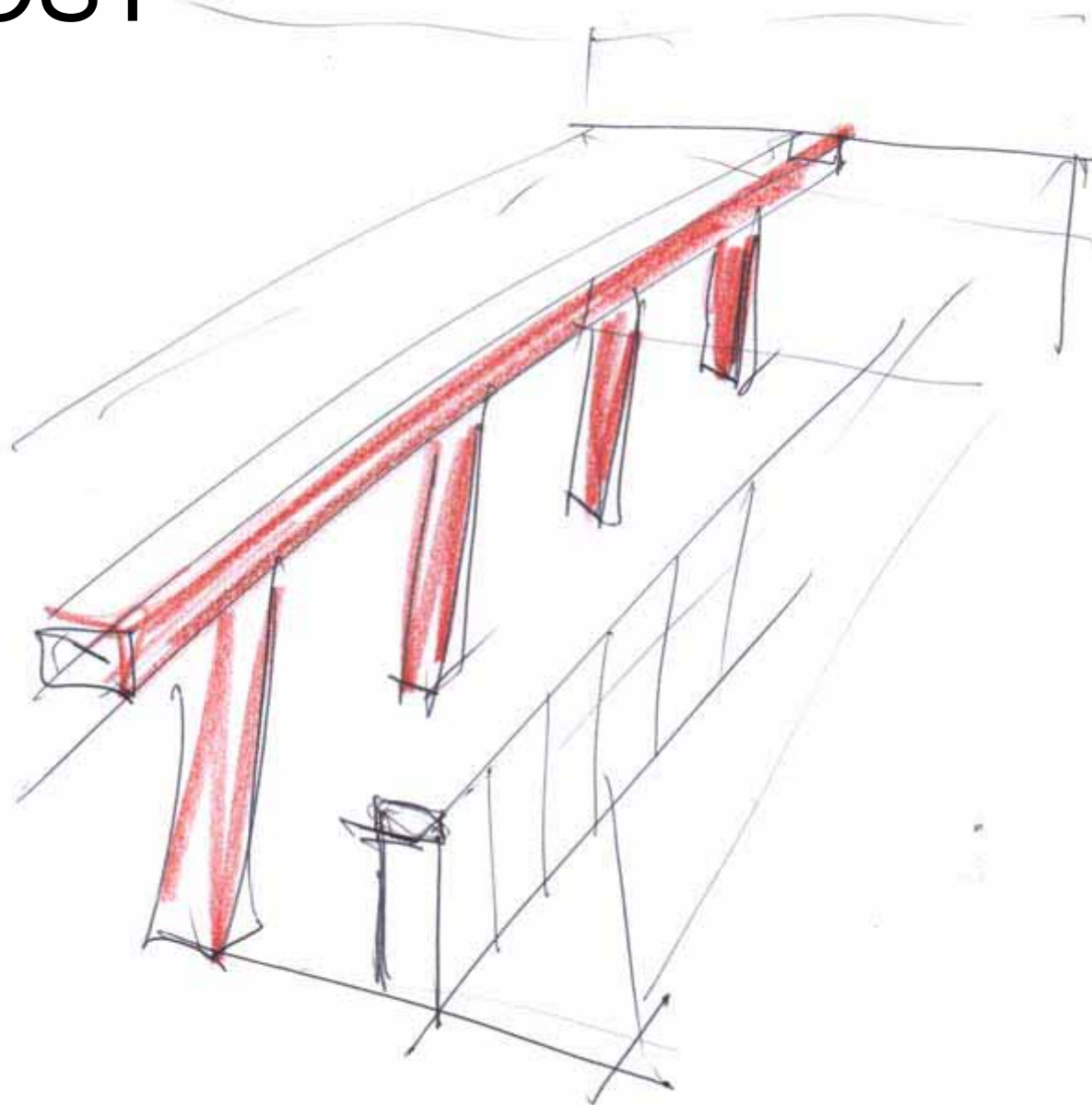
EXPOST



EXPOST



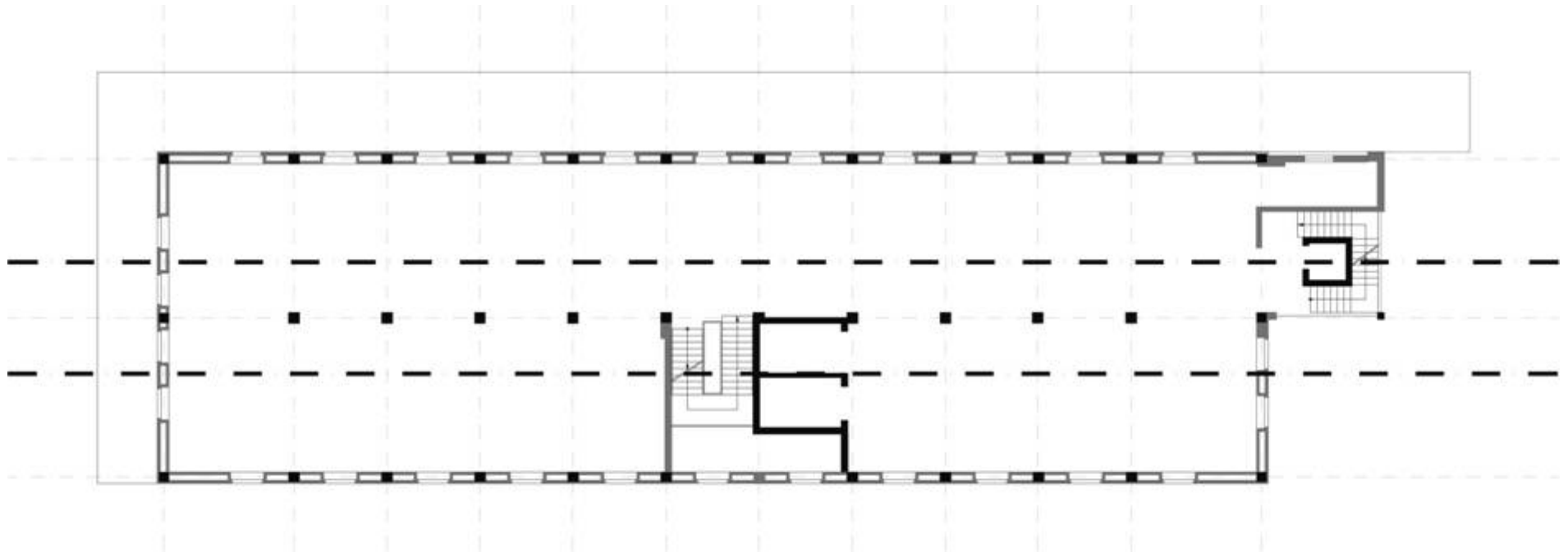
EXPOST



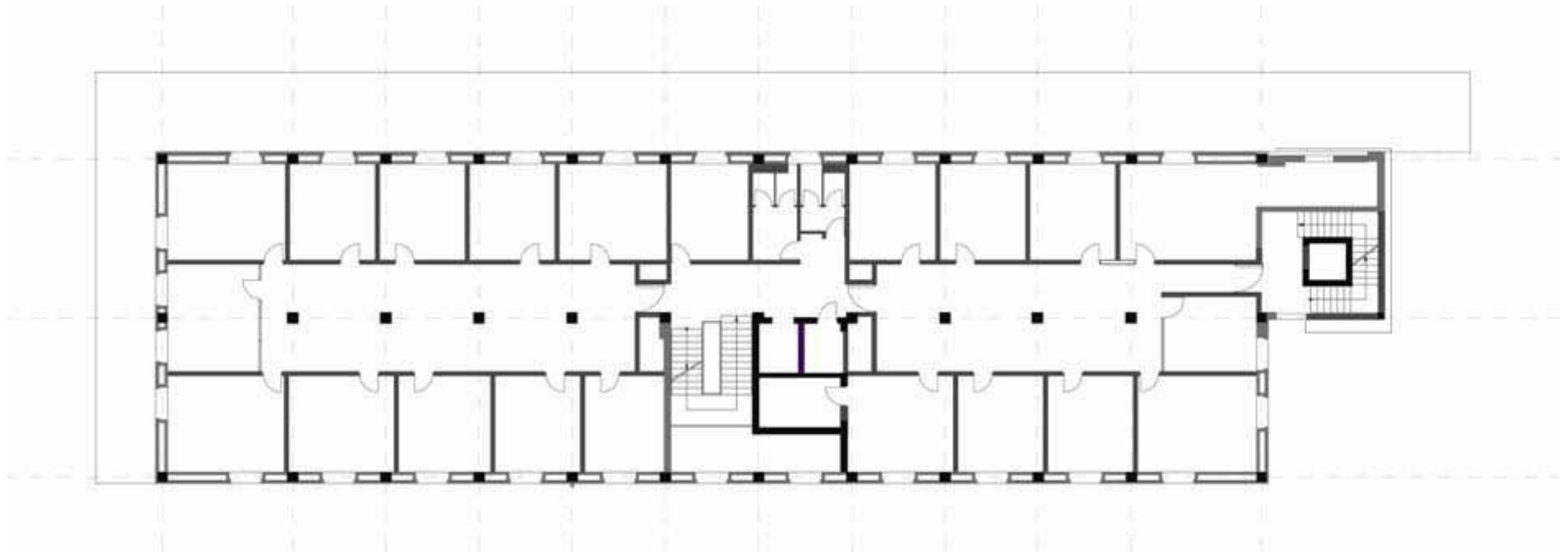
EXPOST



EXPOST



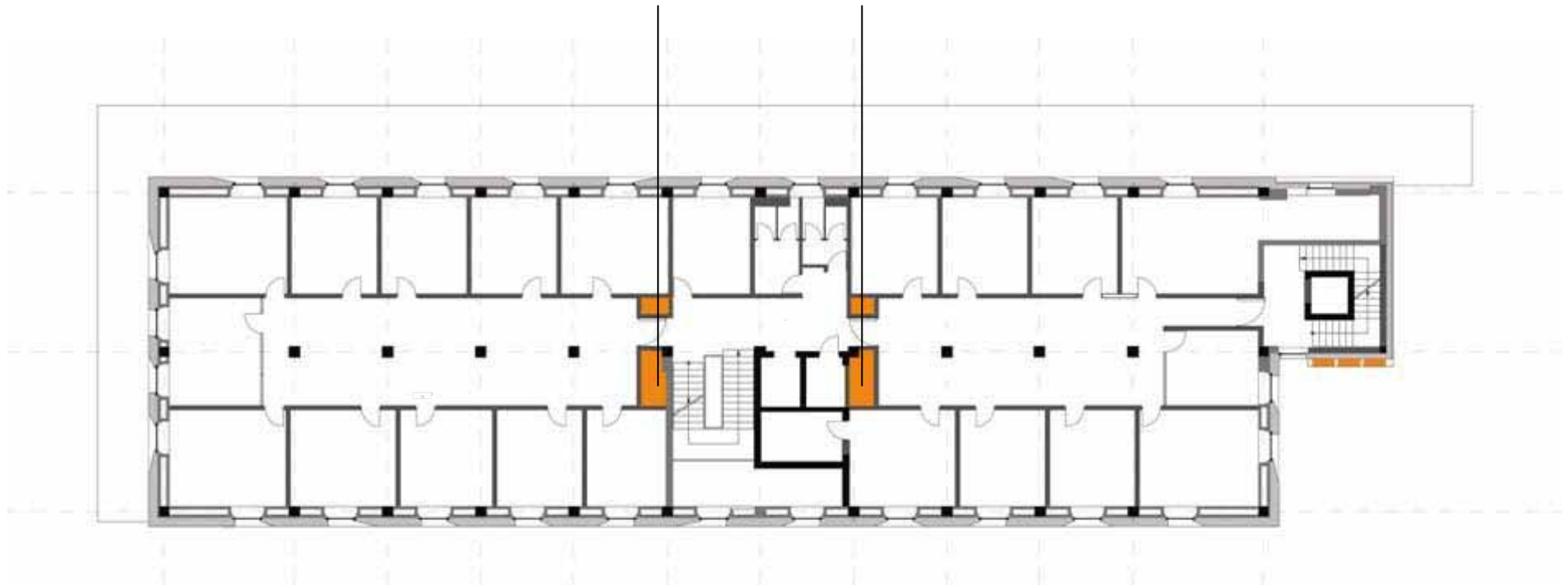
EXPOST



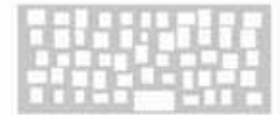
EXPOST



Installation shafts



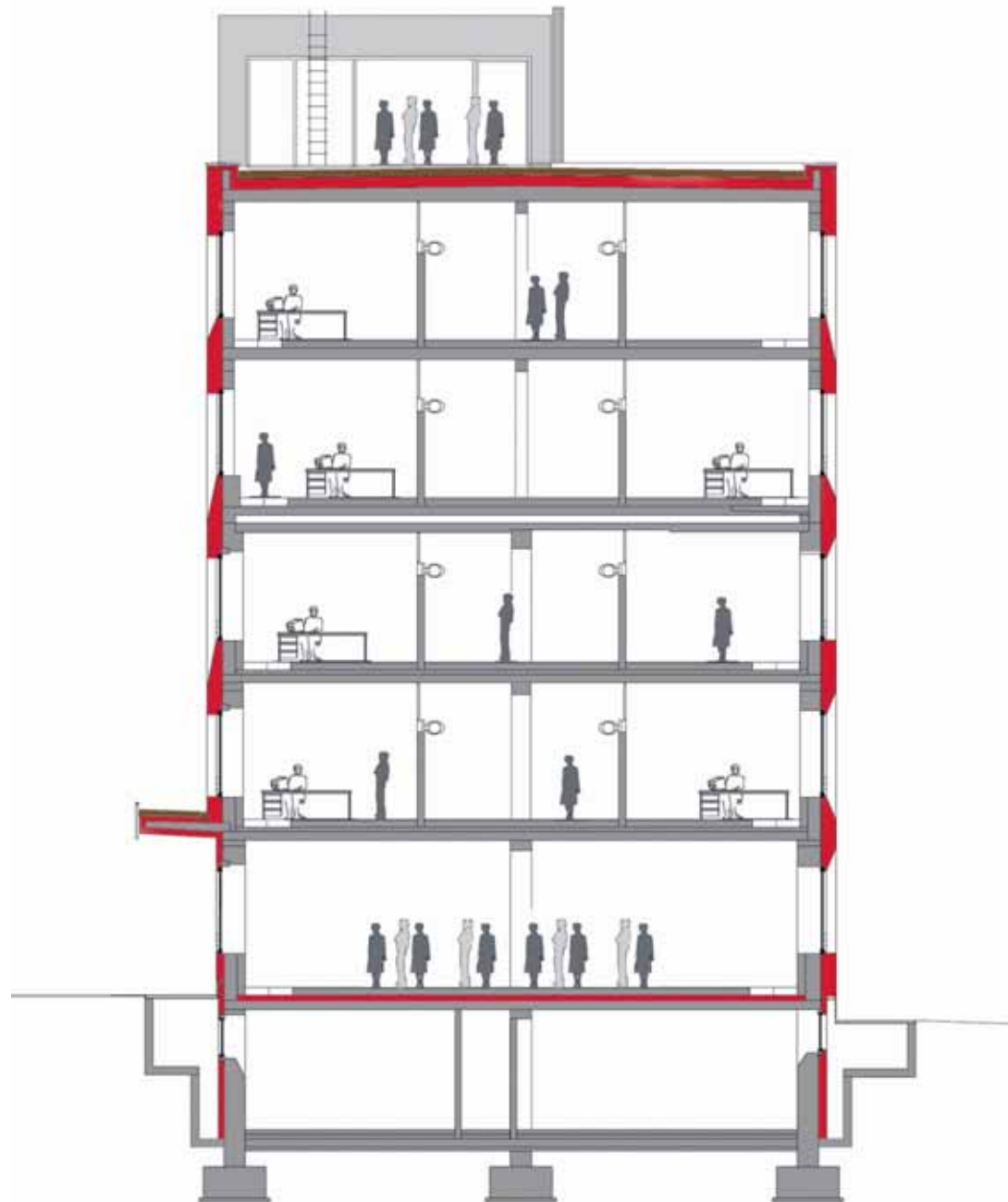
EXPOST

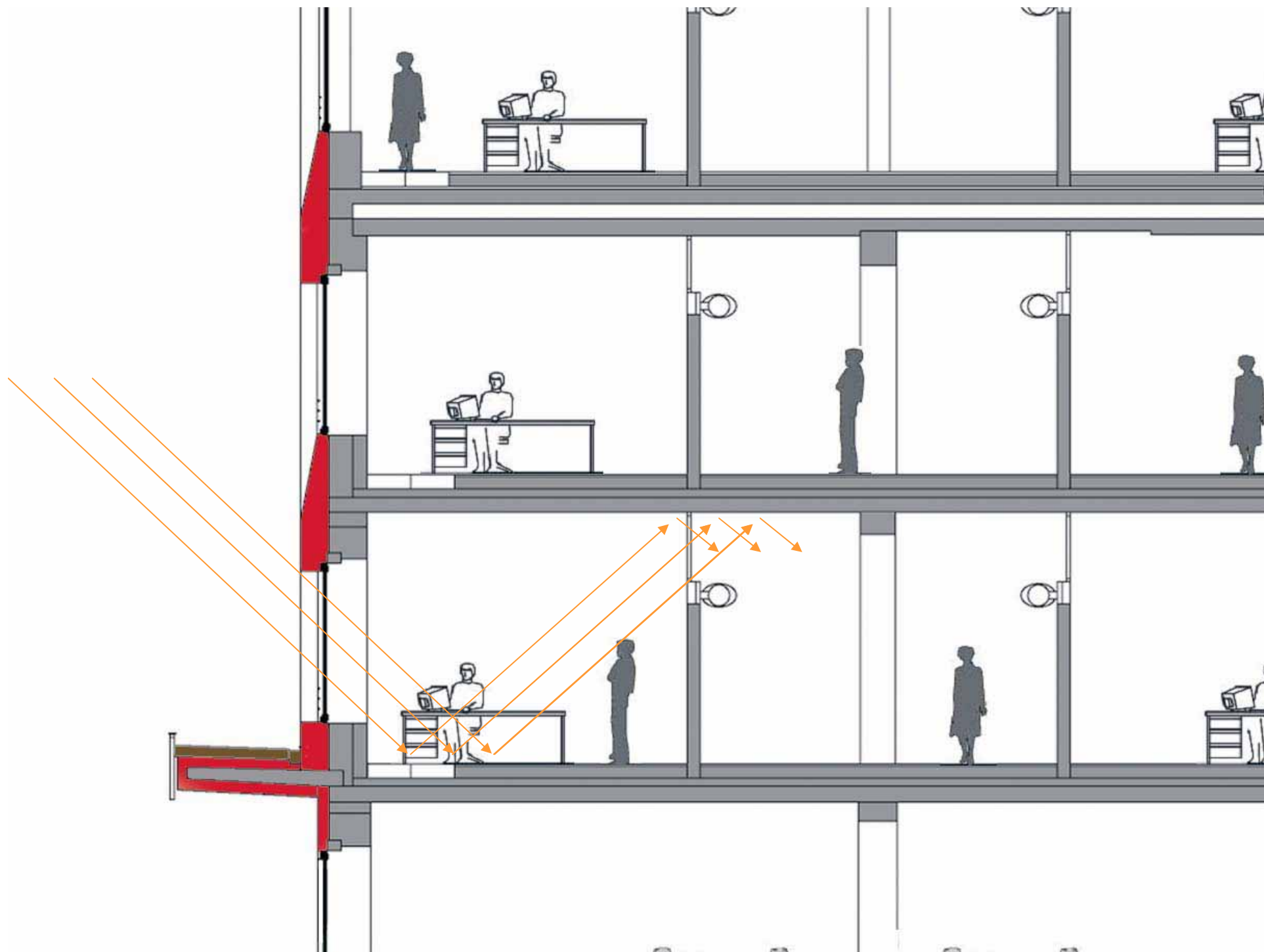


EXPOST



EXPOST













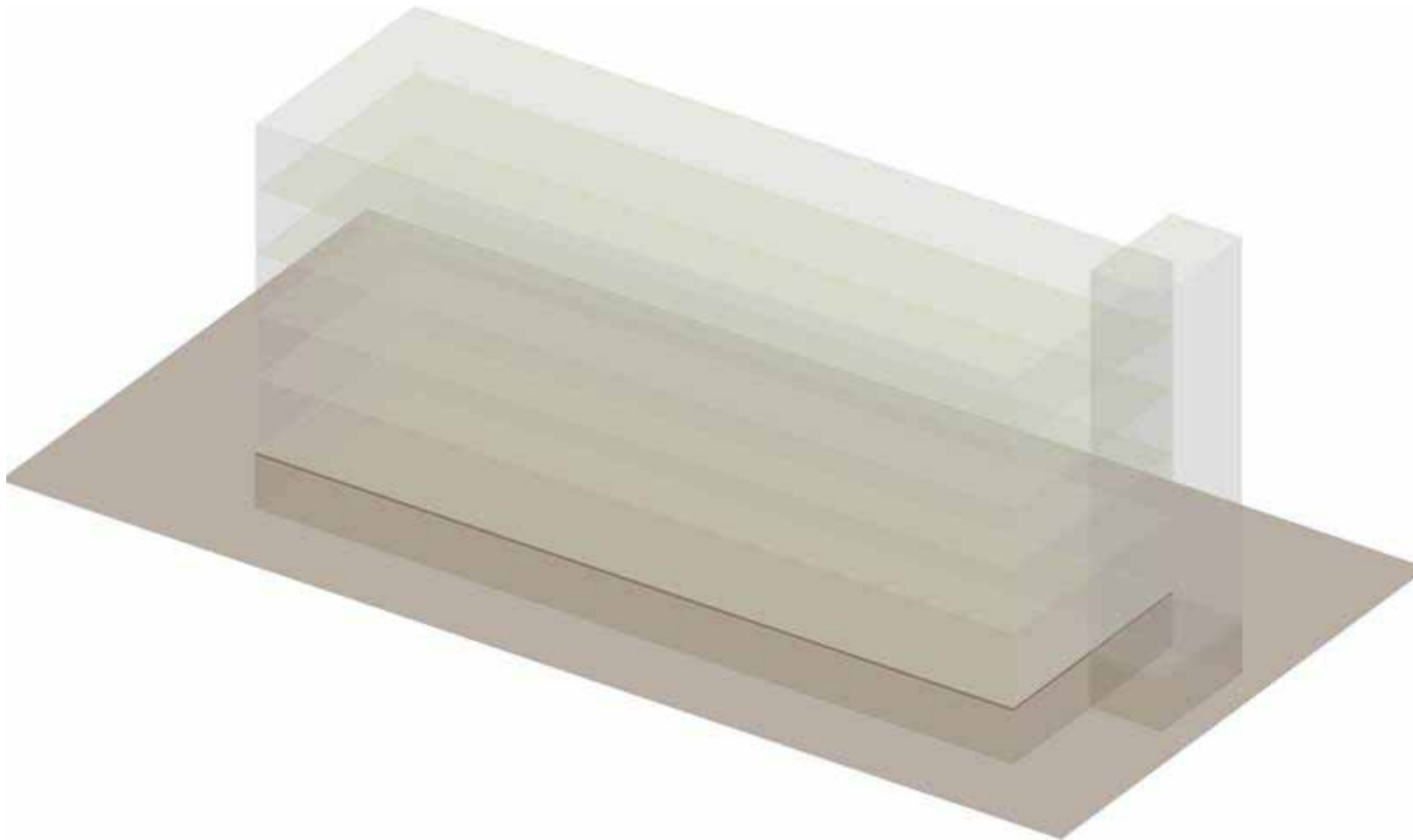




EXPOST Ventilation system



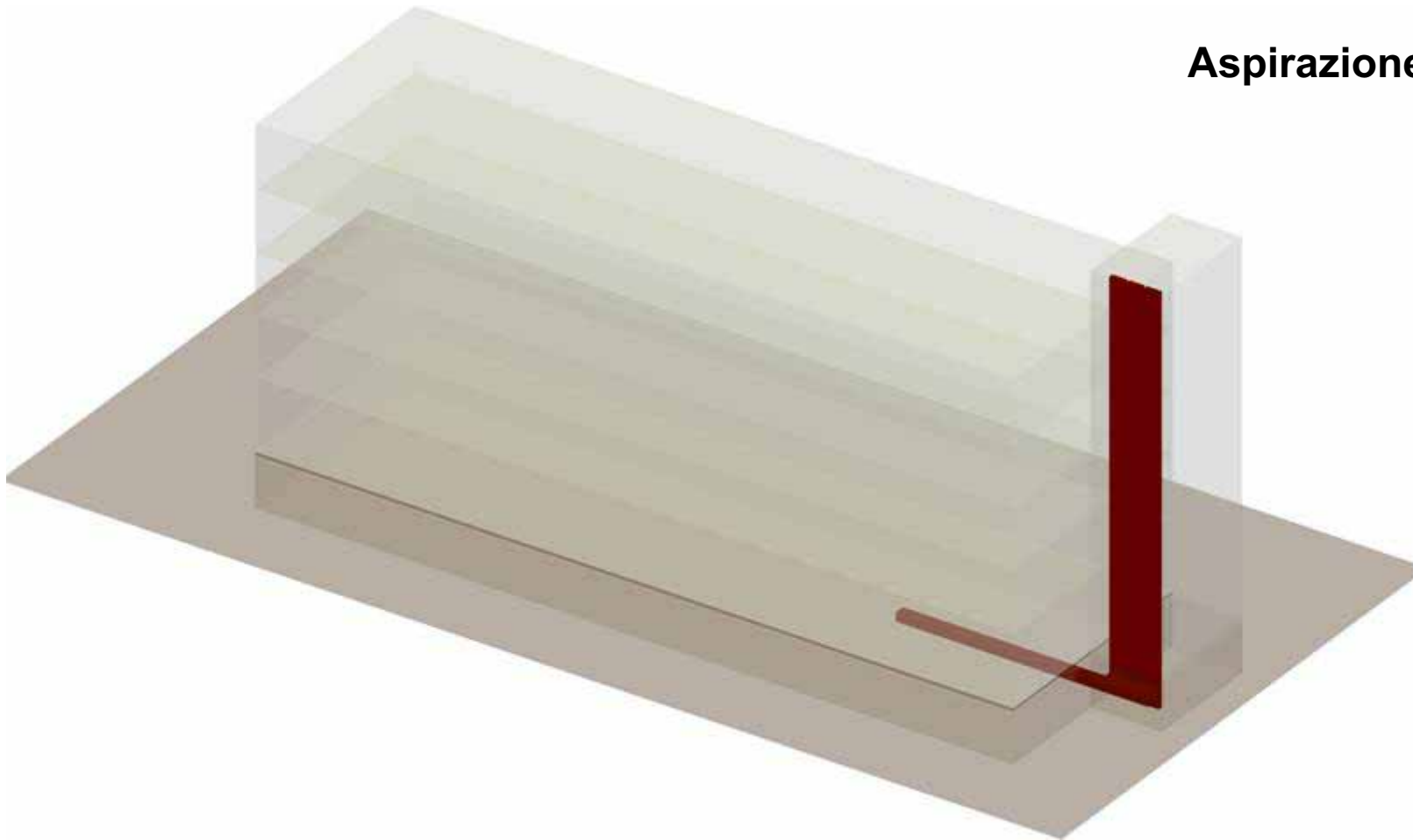
EXPOST Ventilation system



EXPOST Ventilation system



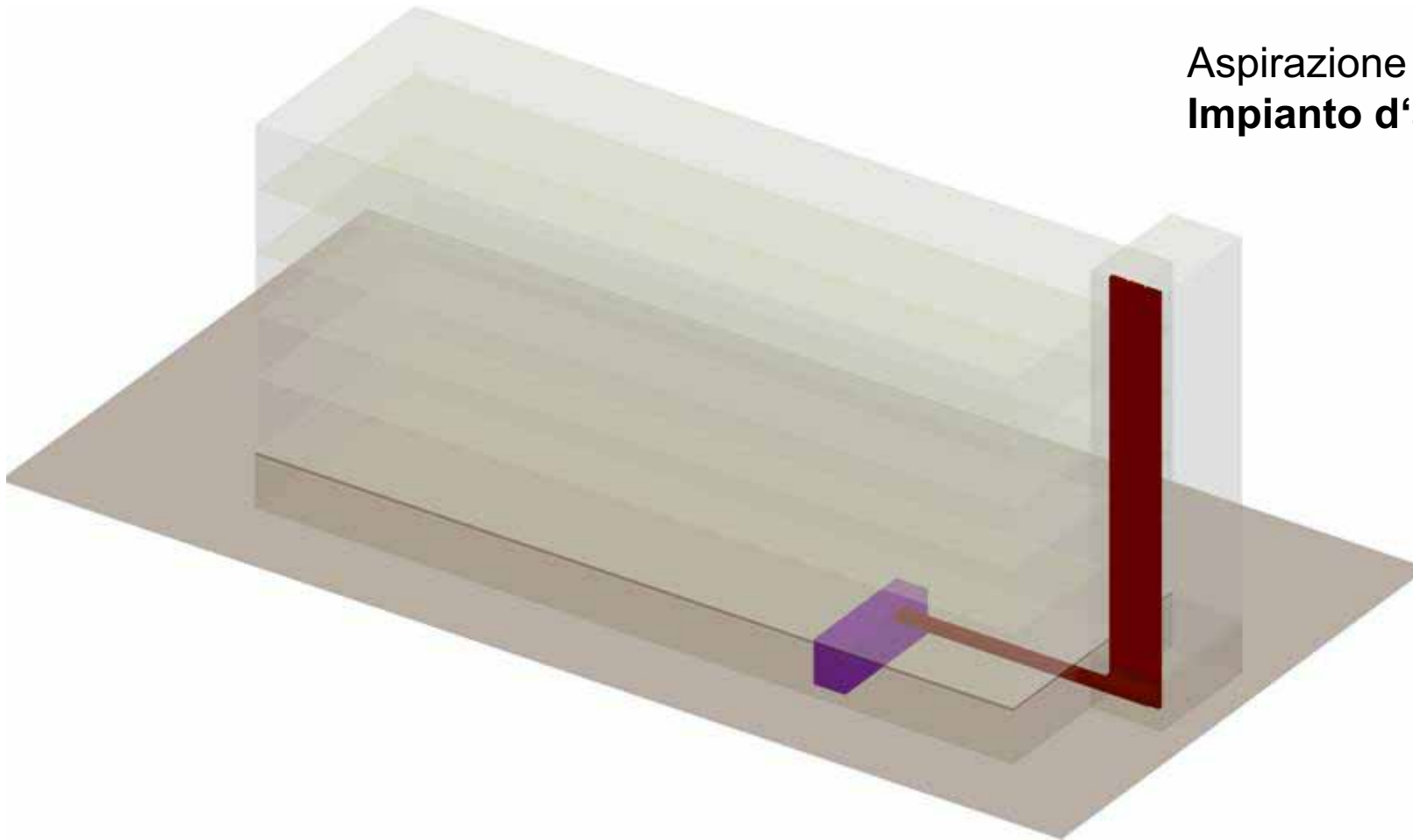
Aspirazione aria fresca



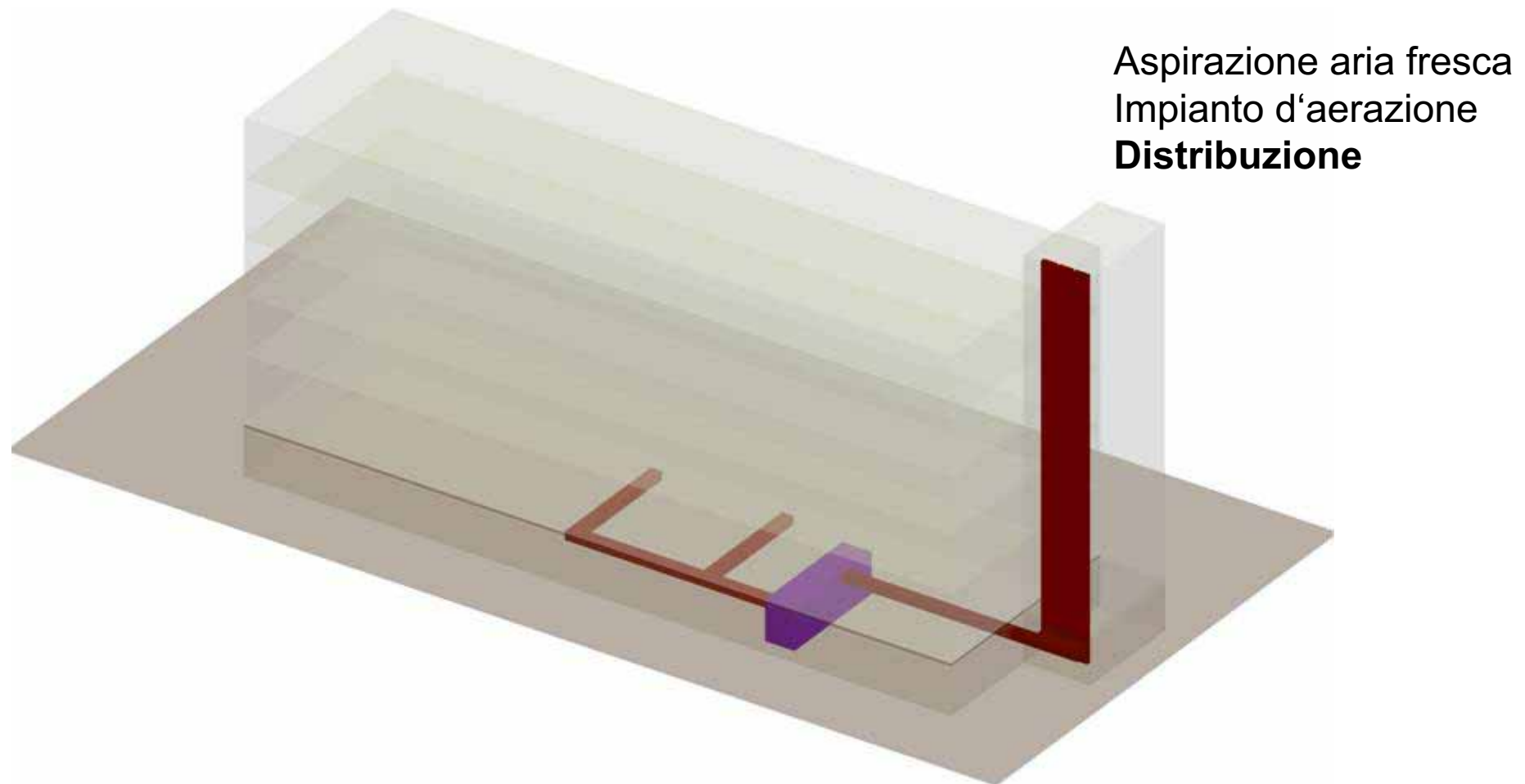
EXPOST Ventilation system



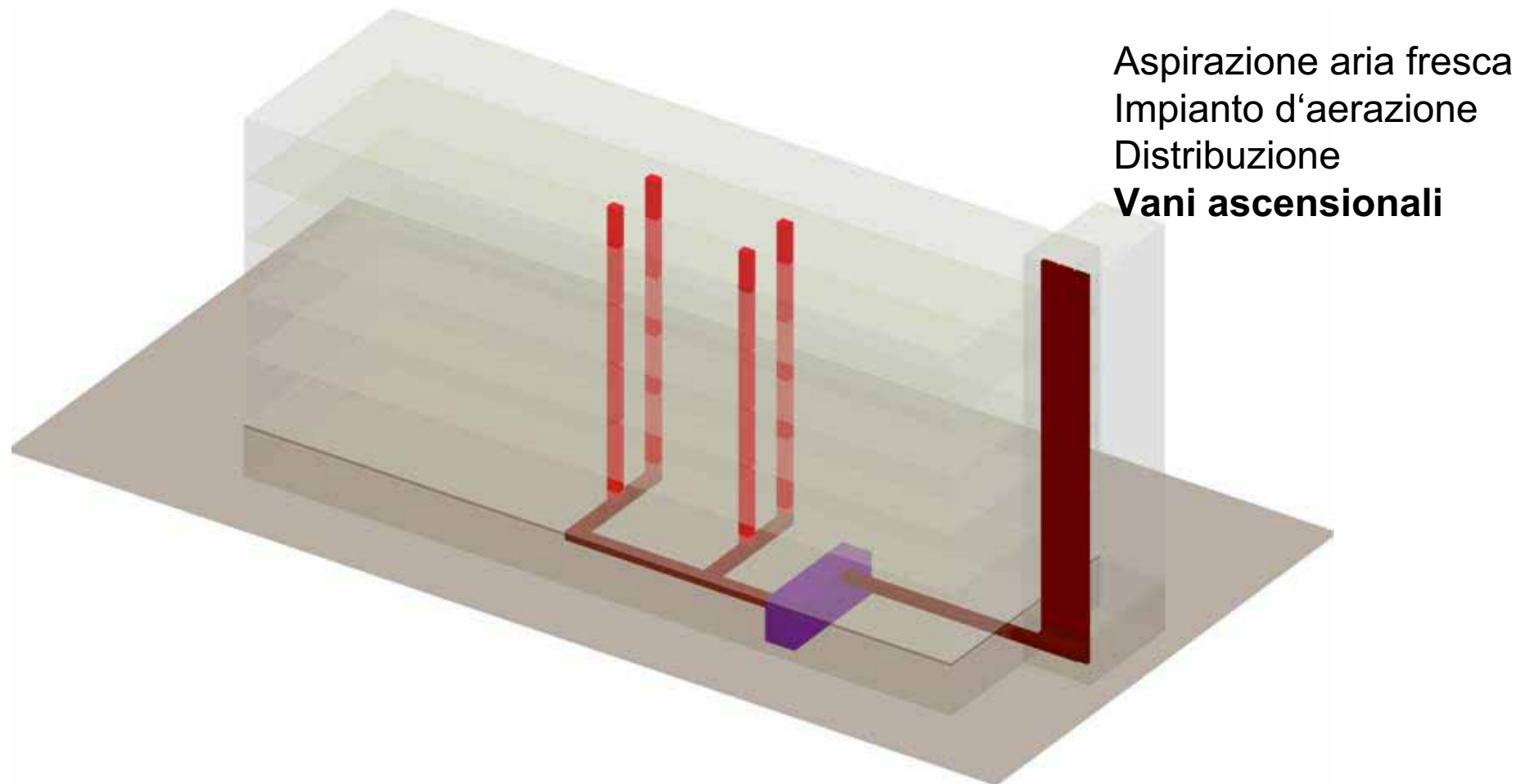
Aspirazione aria fresca
Impianto d'aerazione



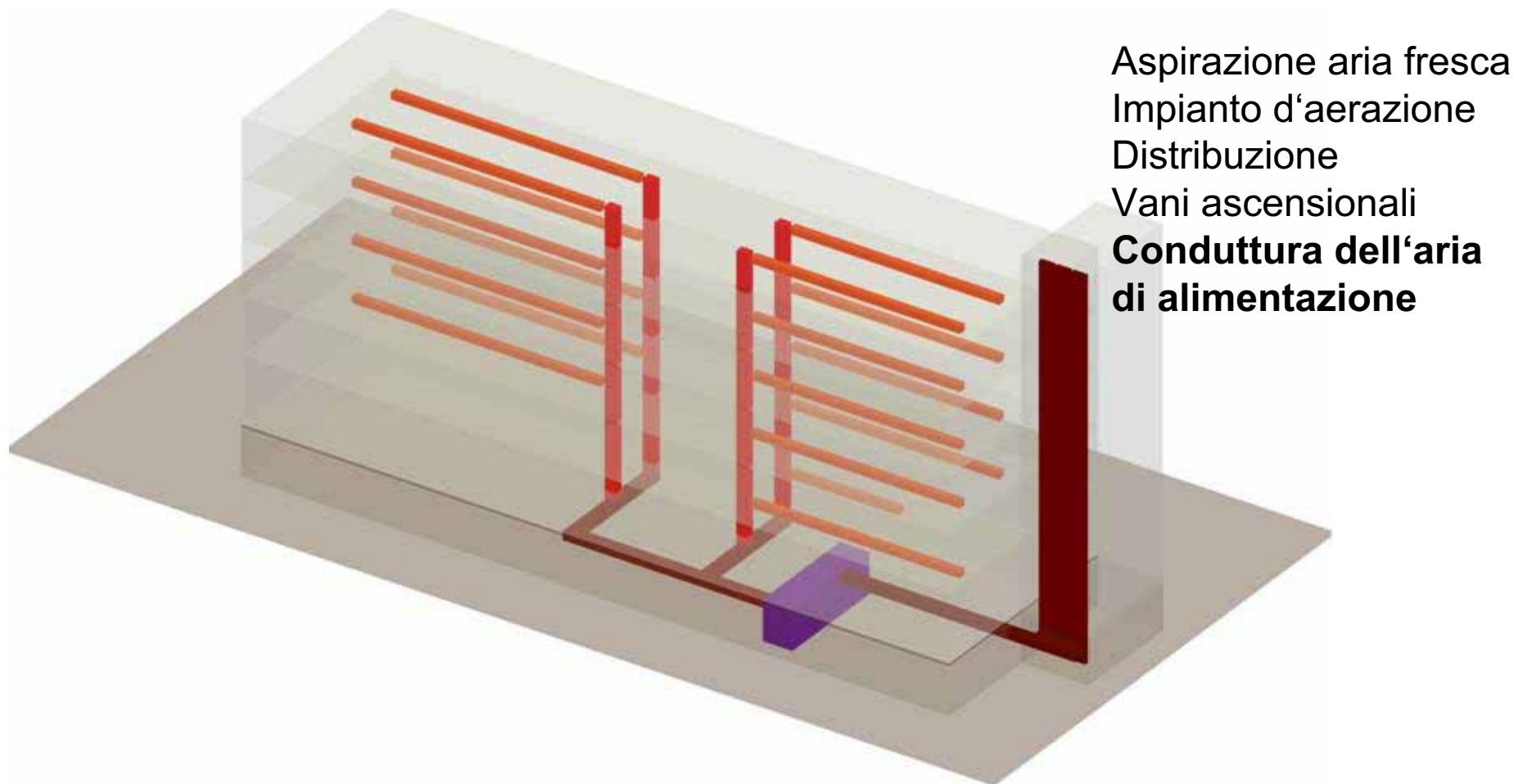
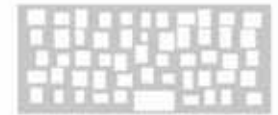
EXPOST Ventilation system



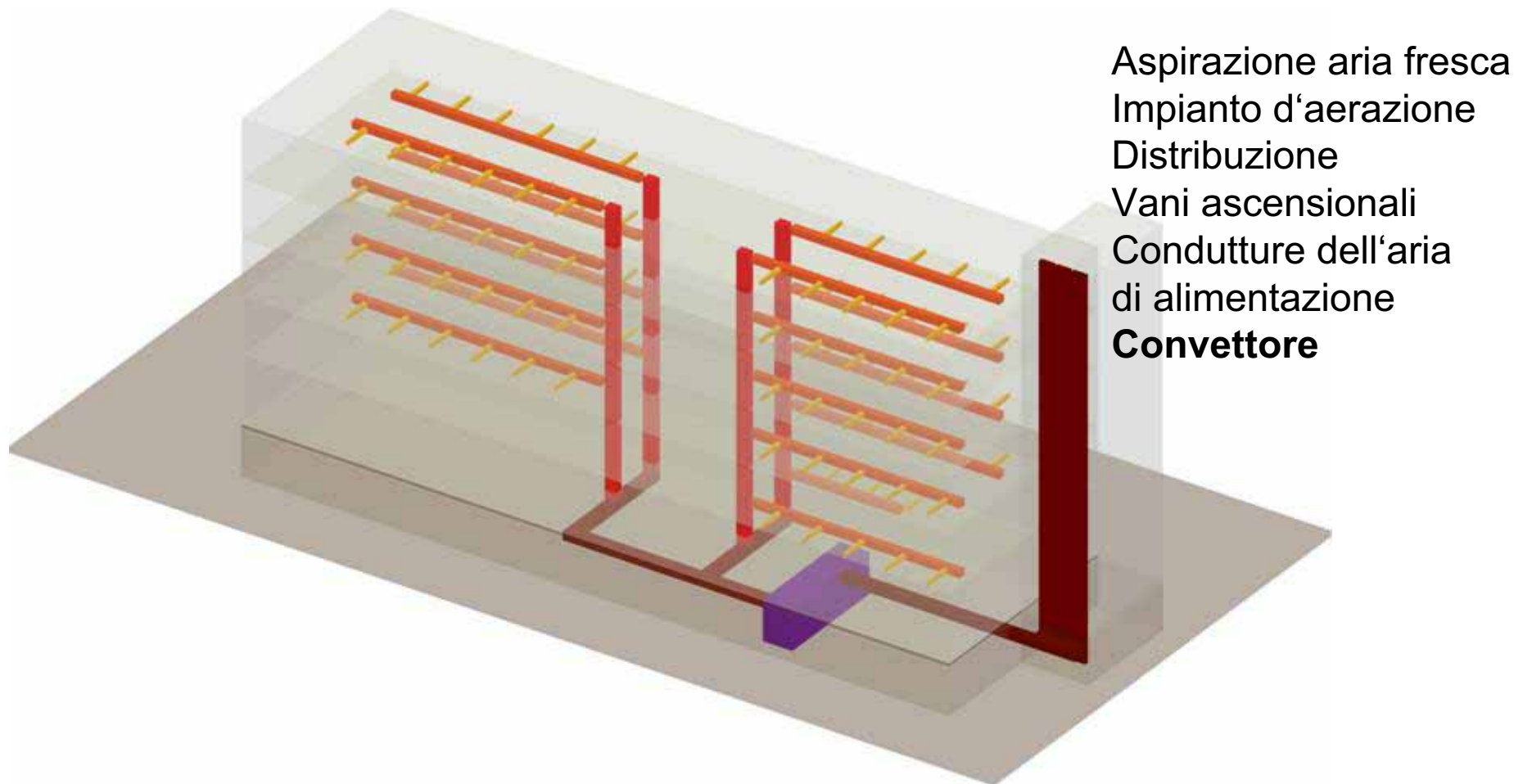
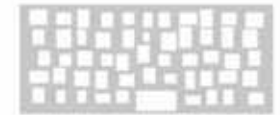
EXPOST Ventilation system



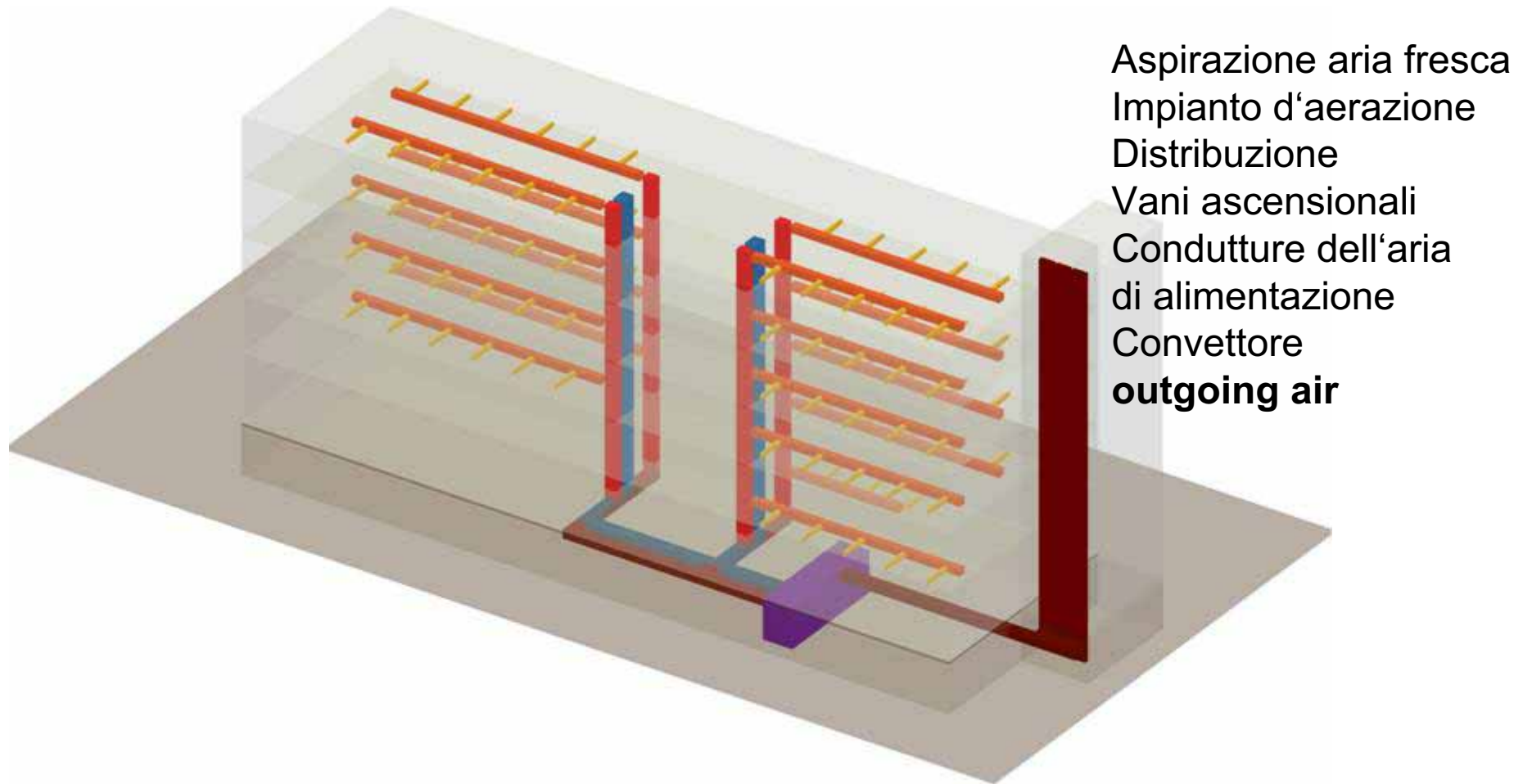
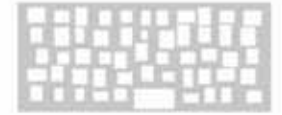
EXPOST Ventilation system



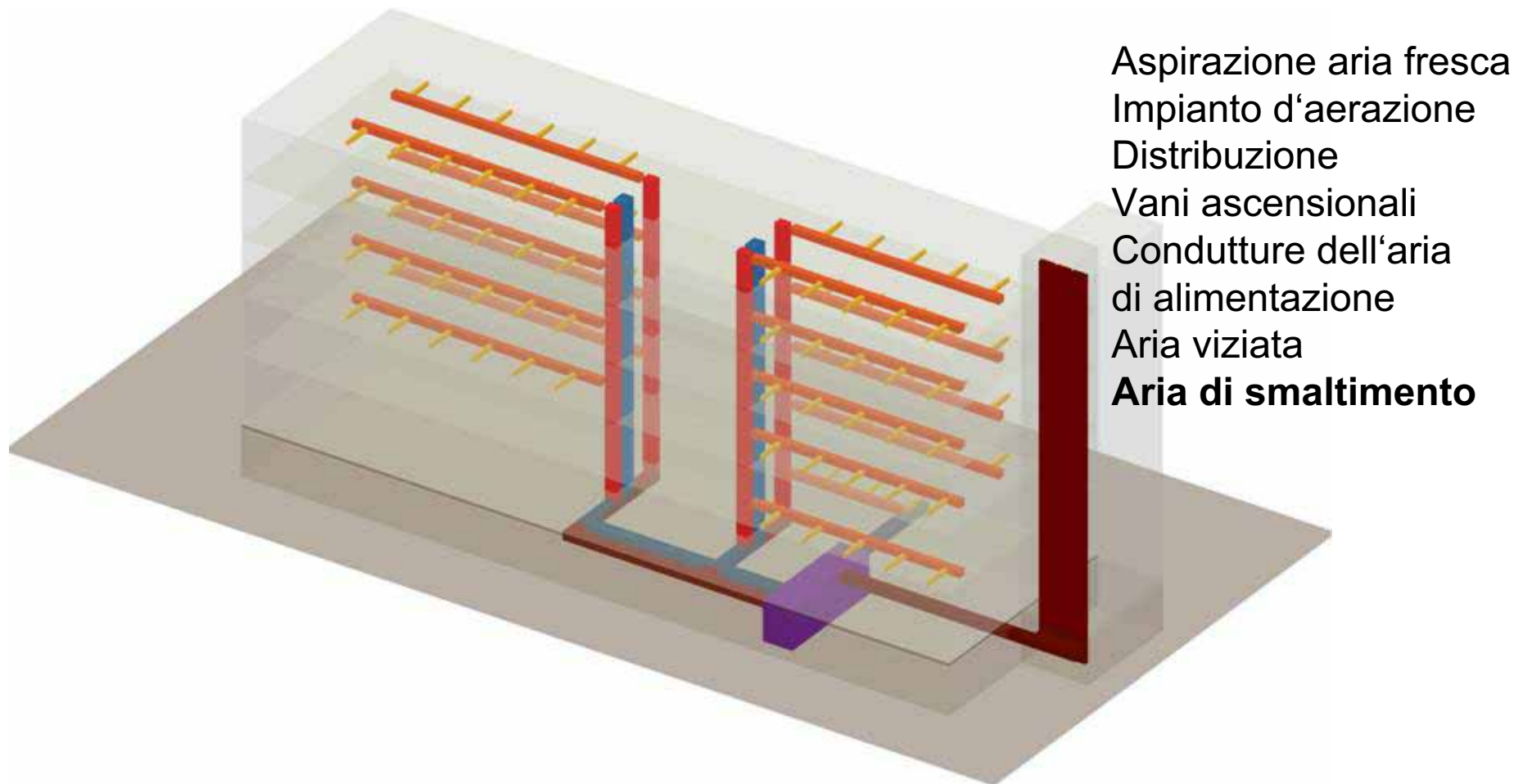
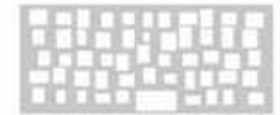
EXPOST Ventilation system



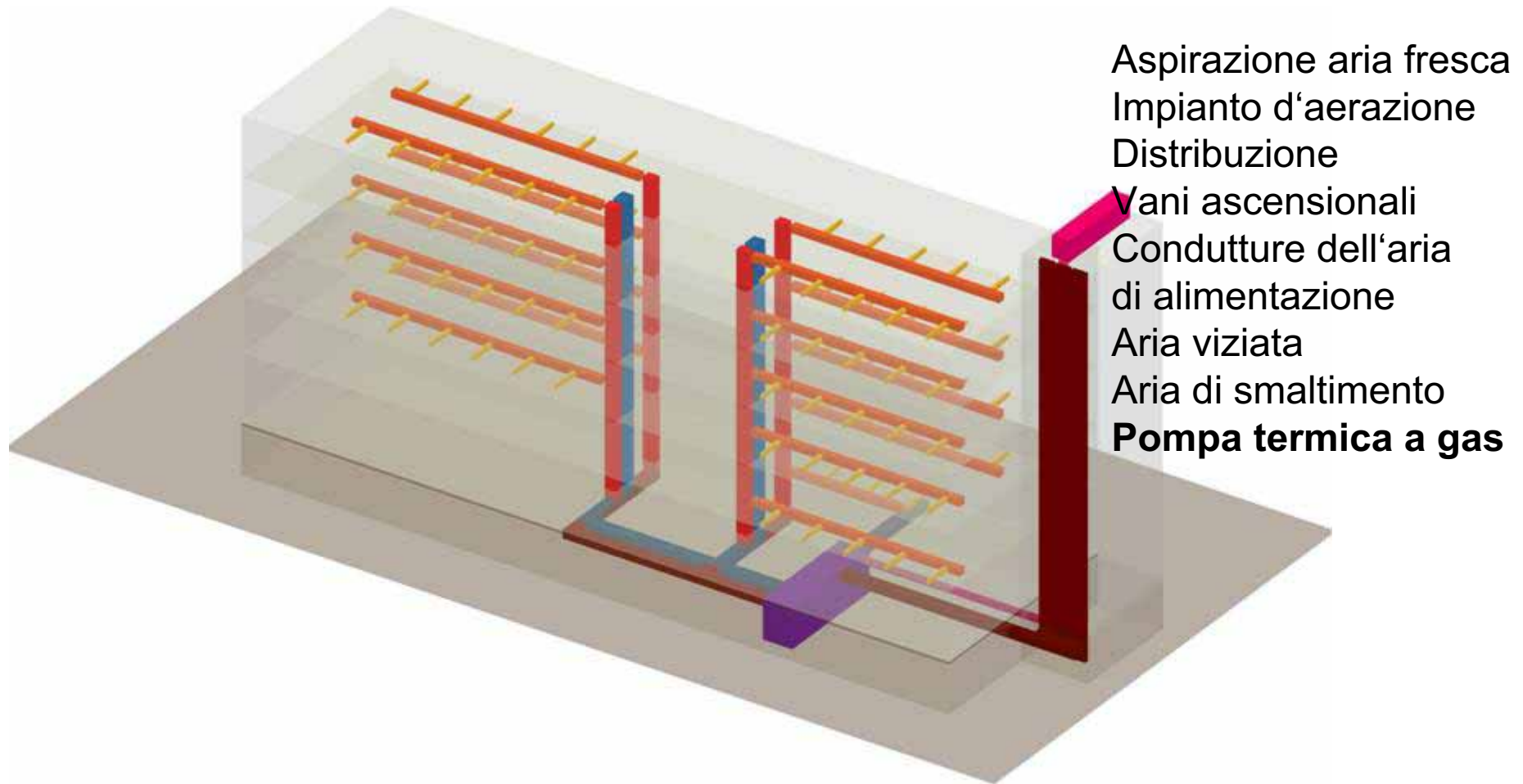
EXPOST Ventilation system



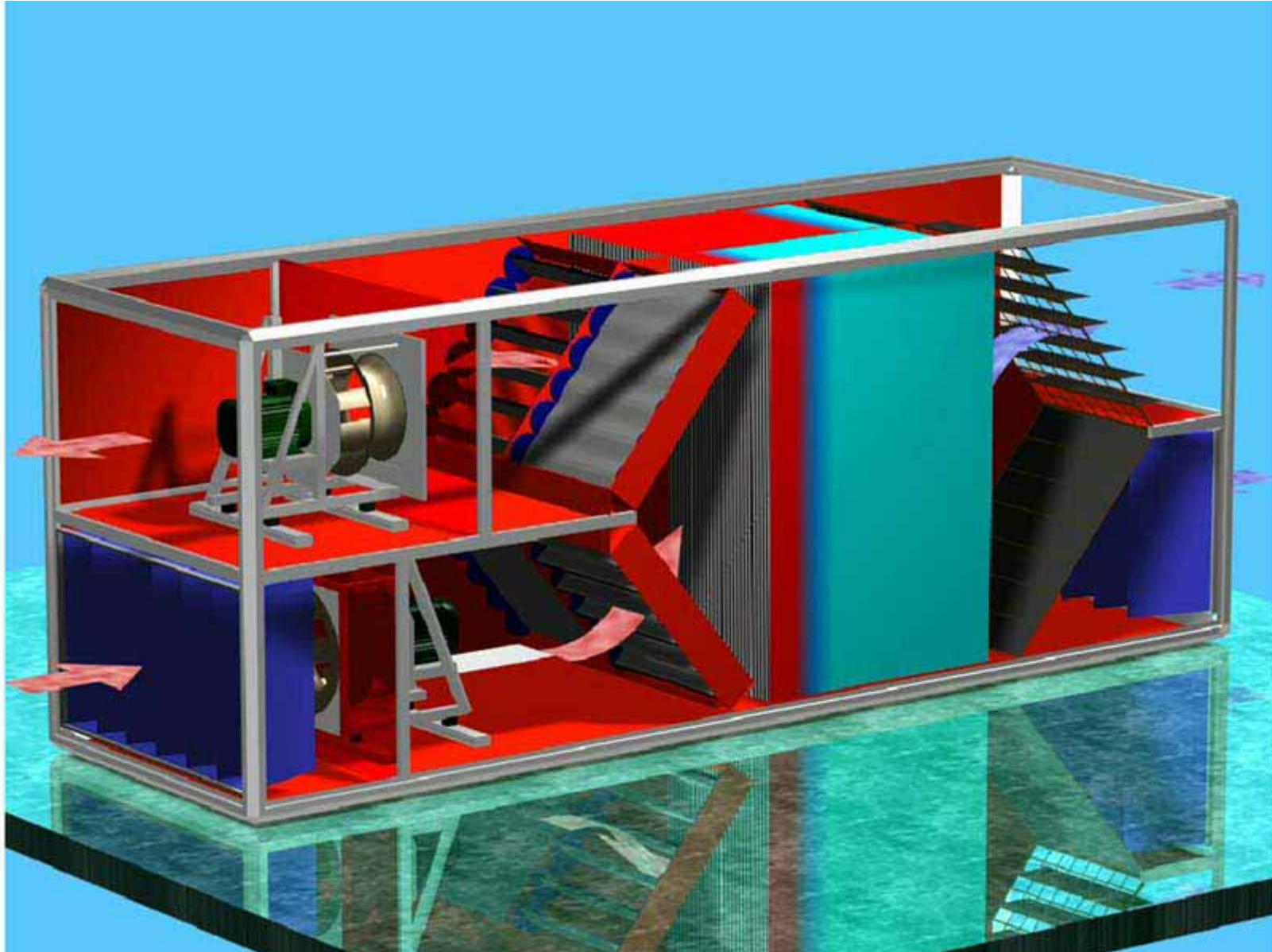
EXPOST Ventilation system

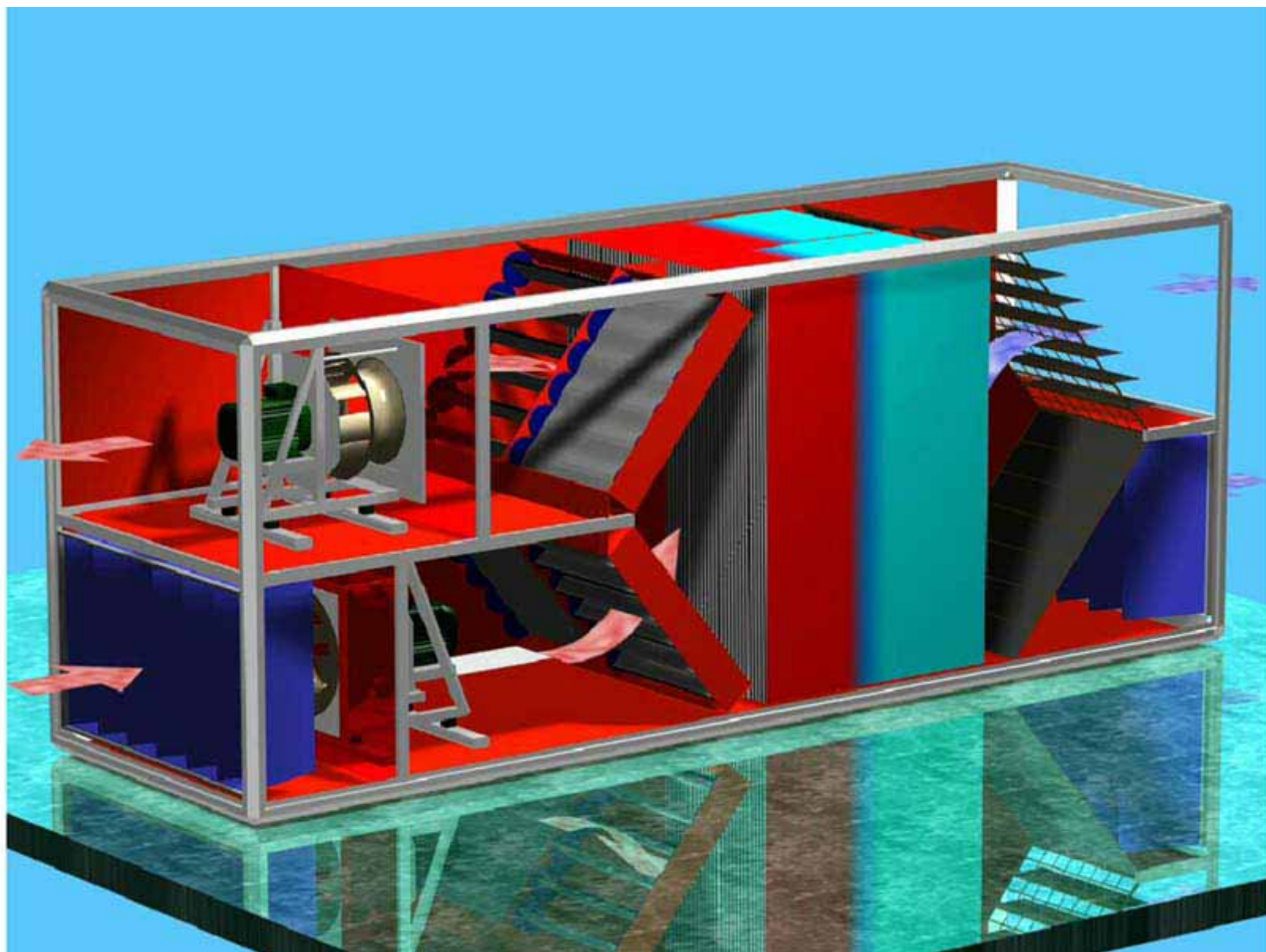


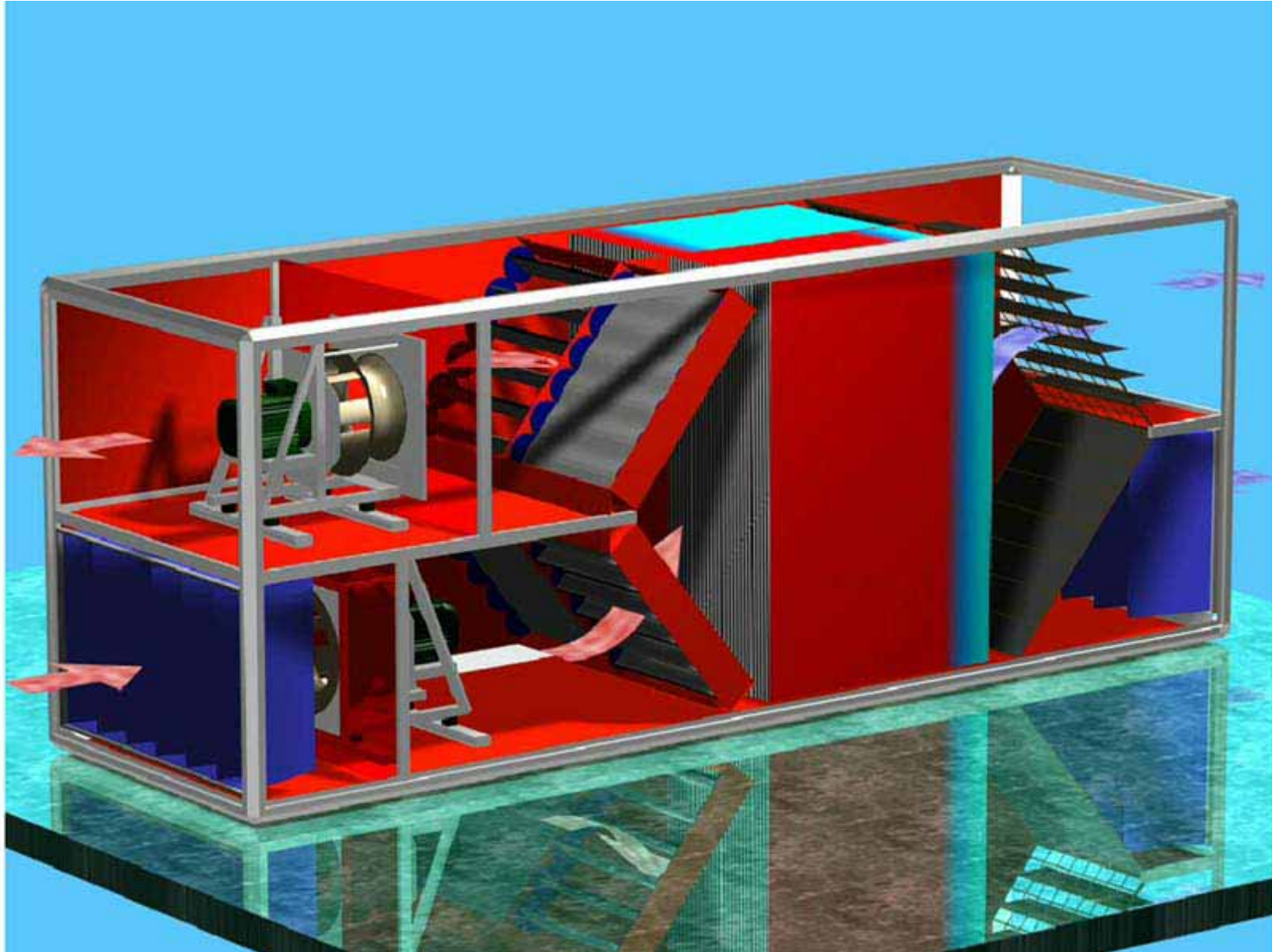
EXPOST Ventilation system

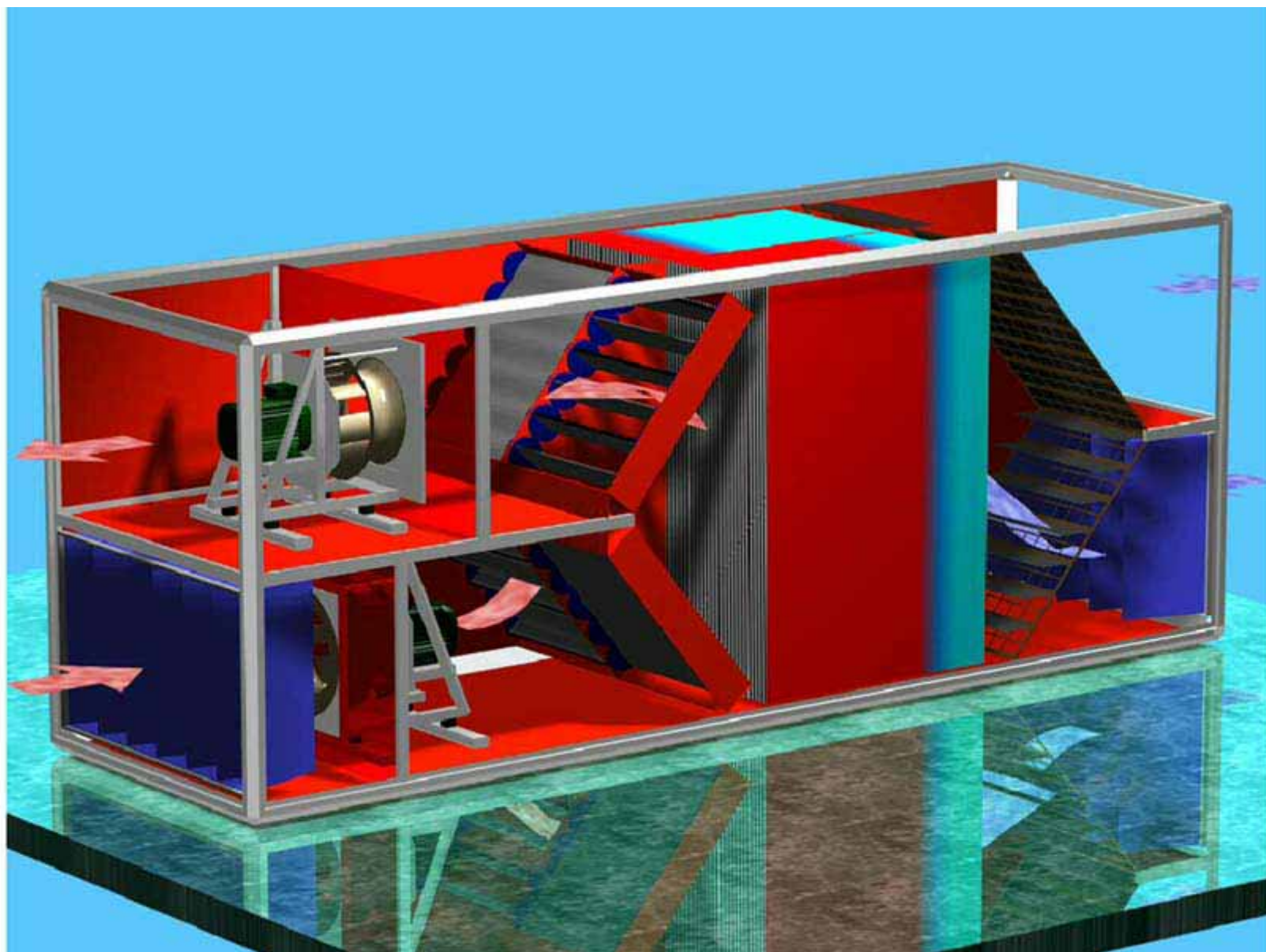


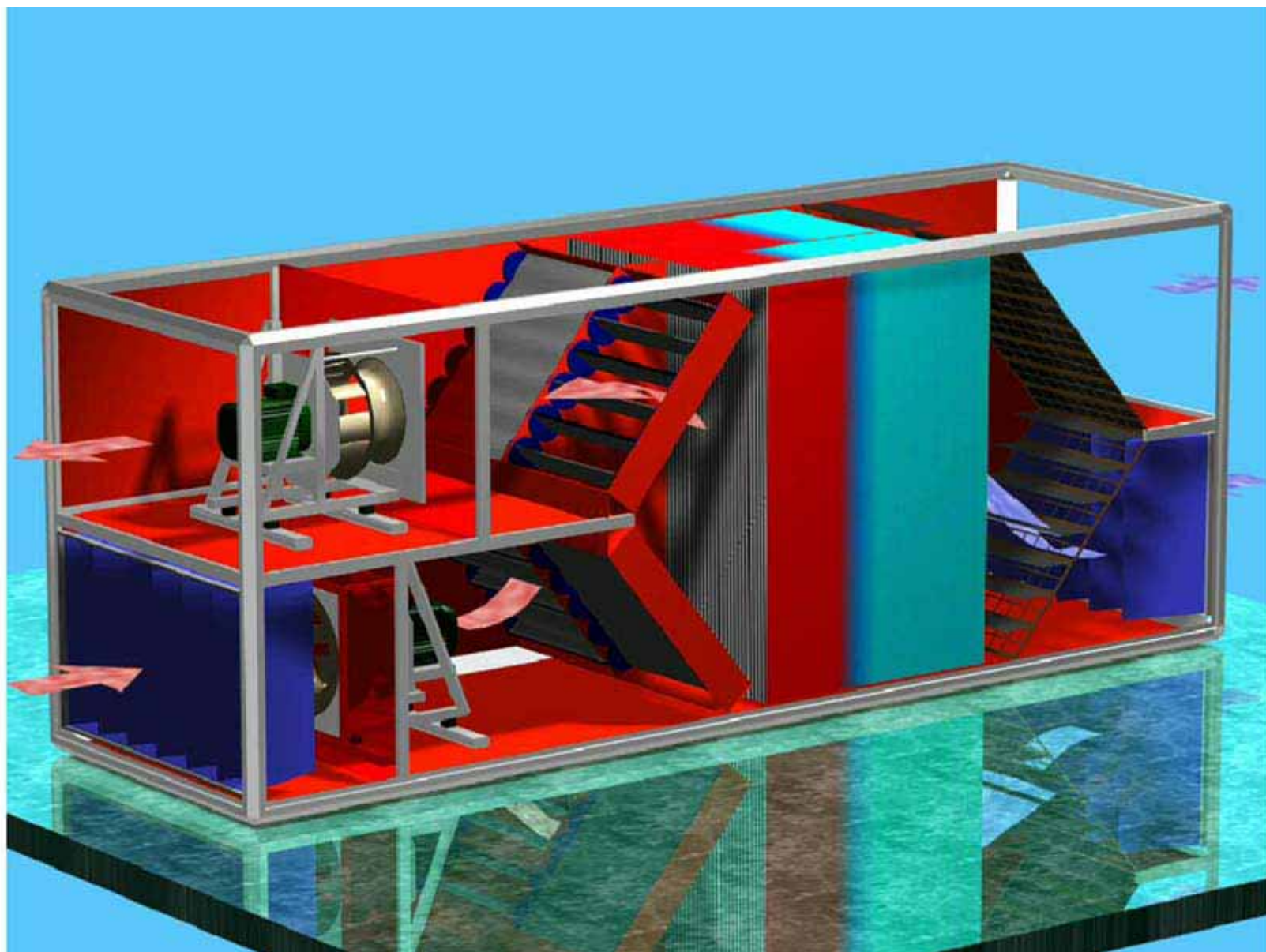


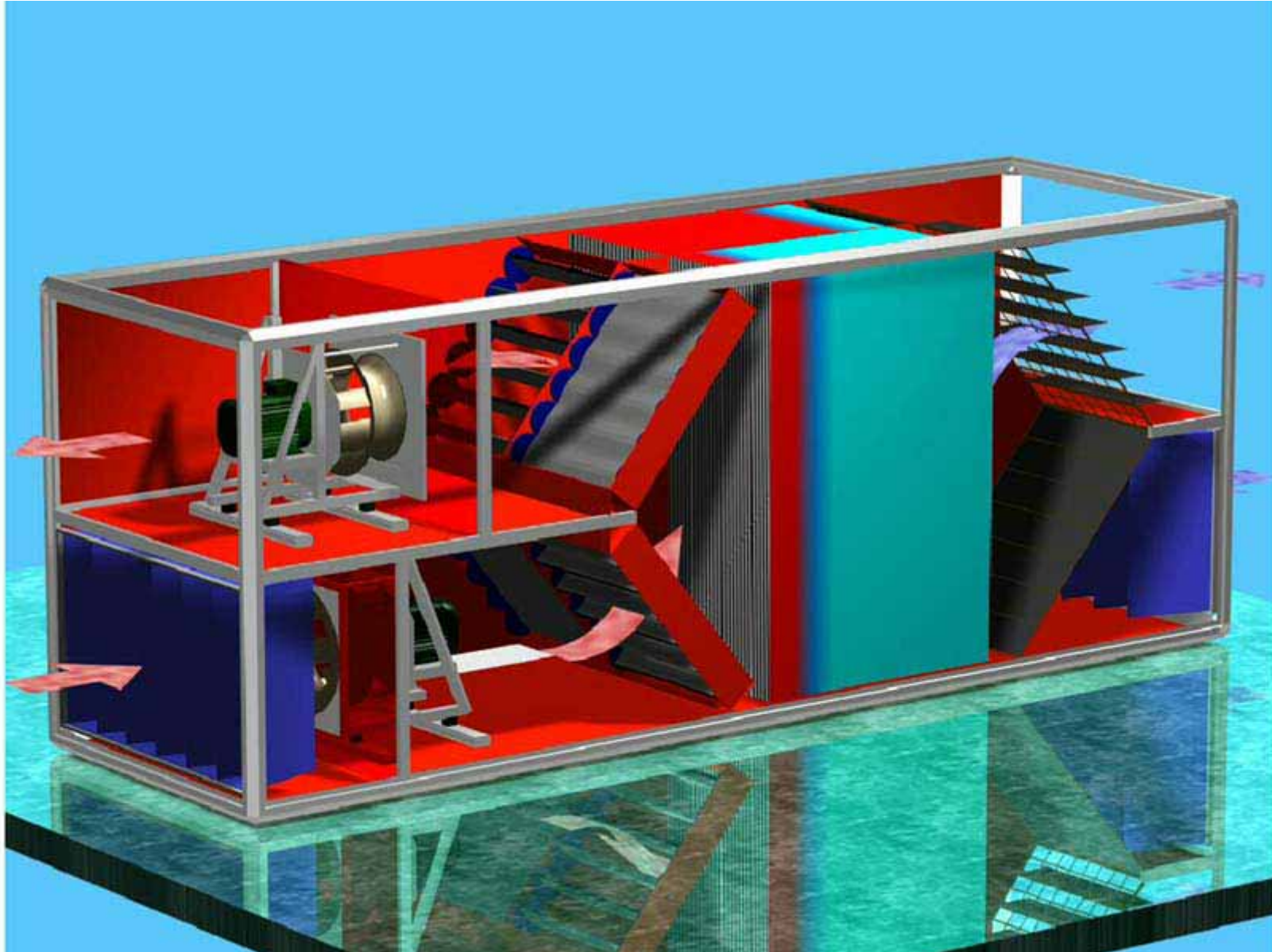


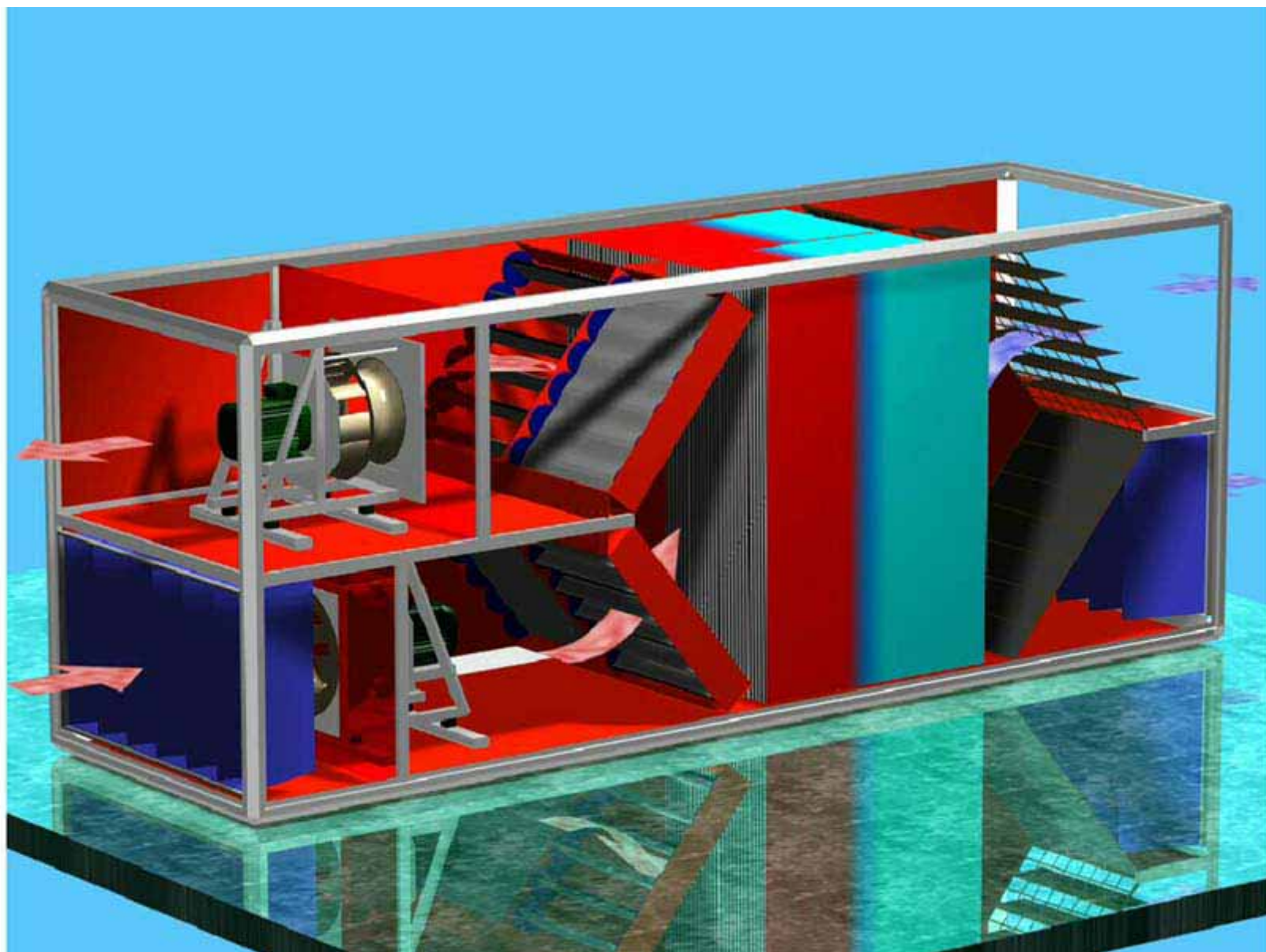


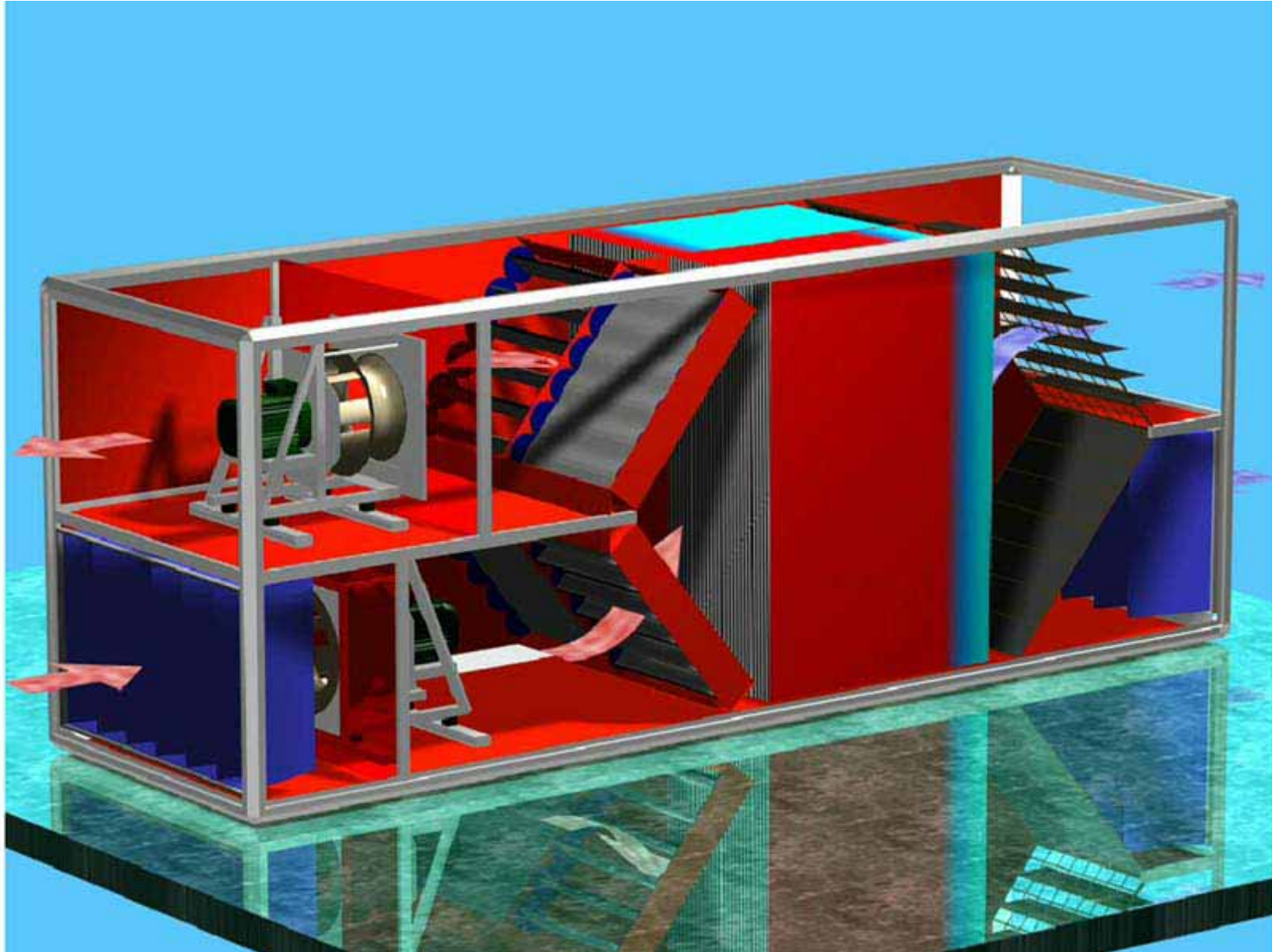


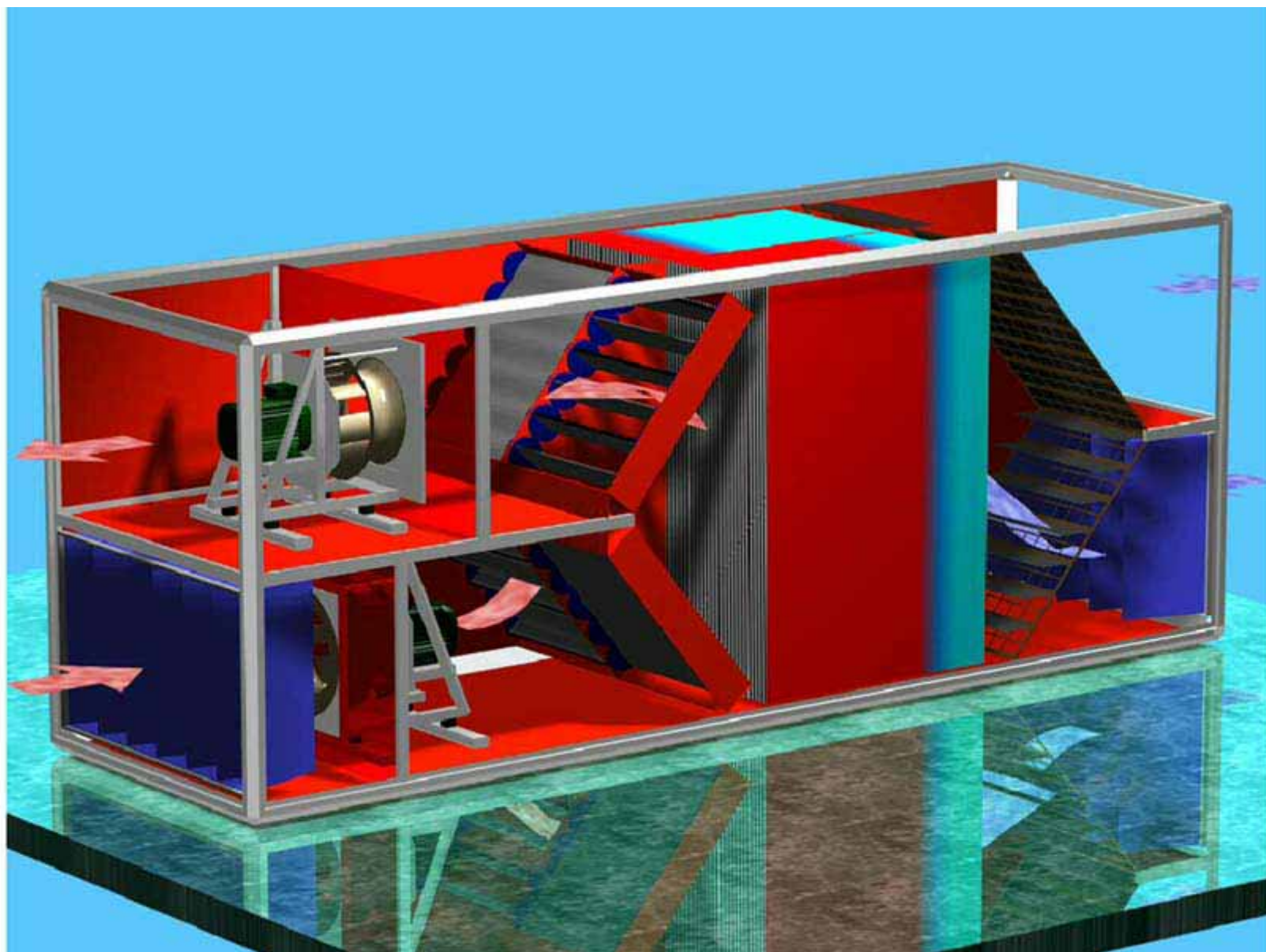


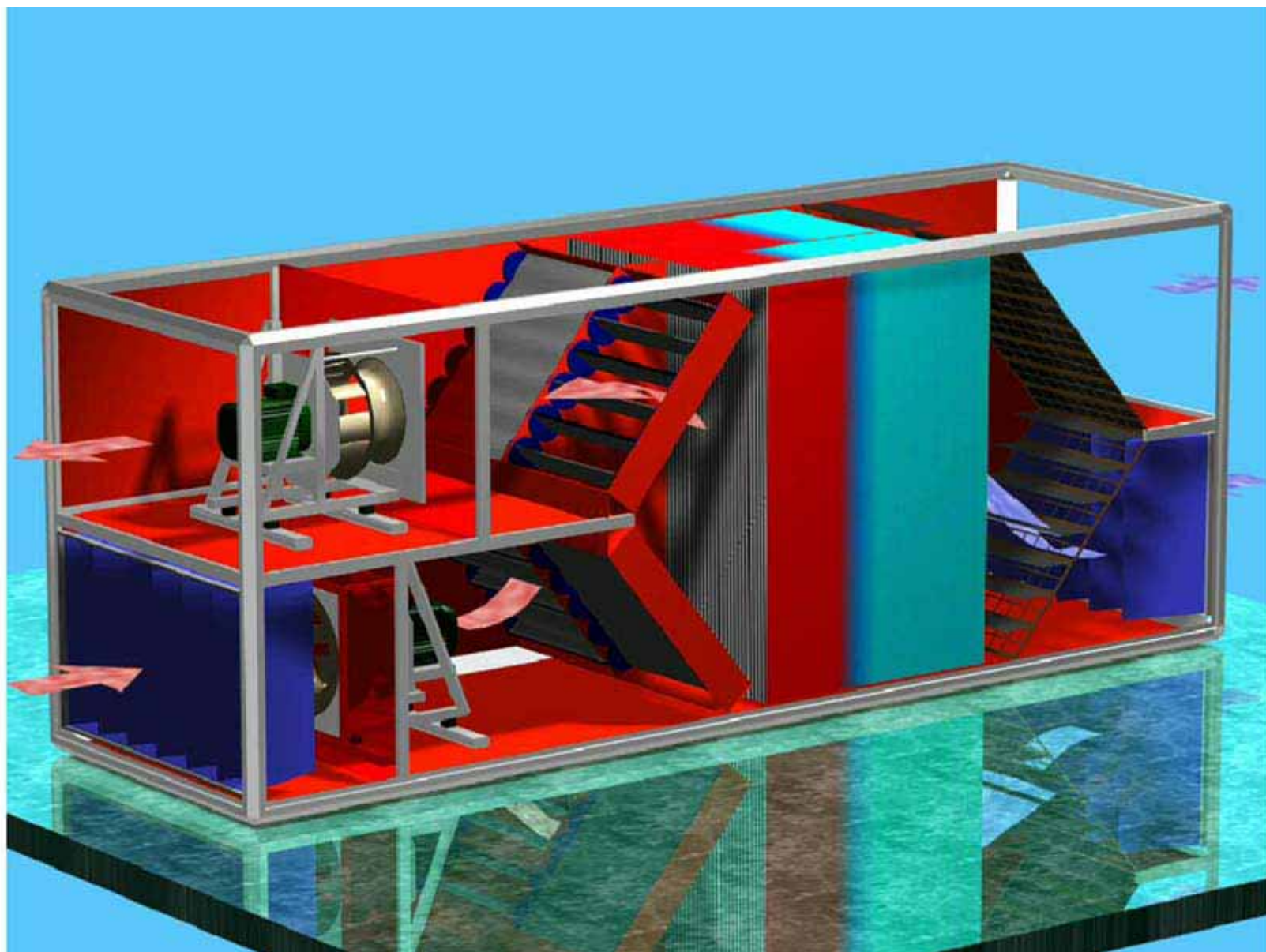


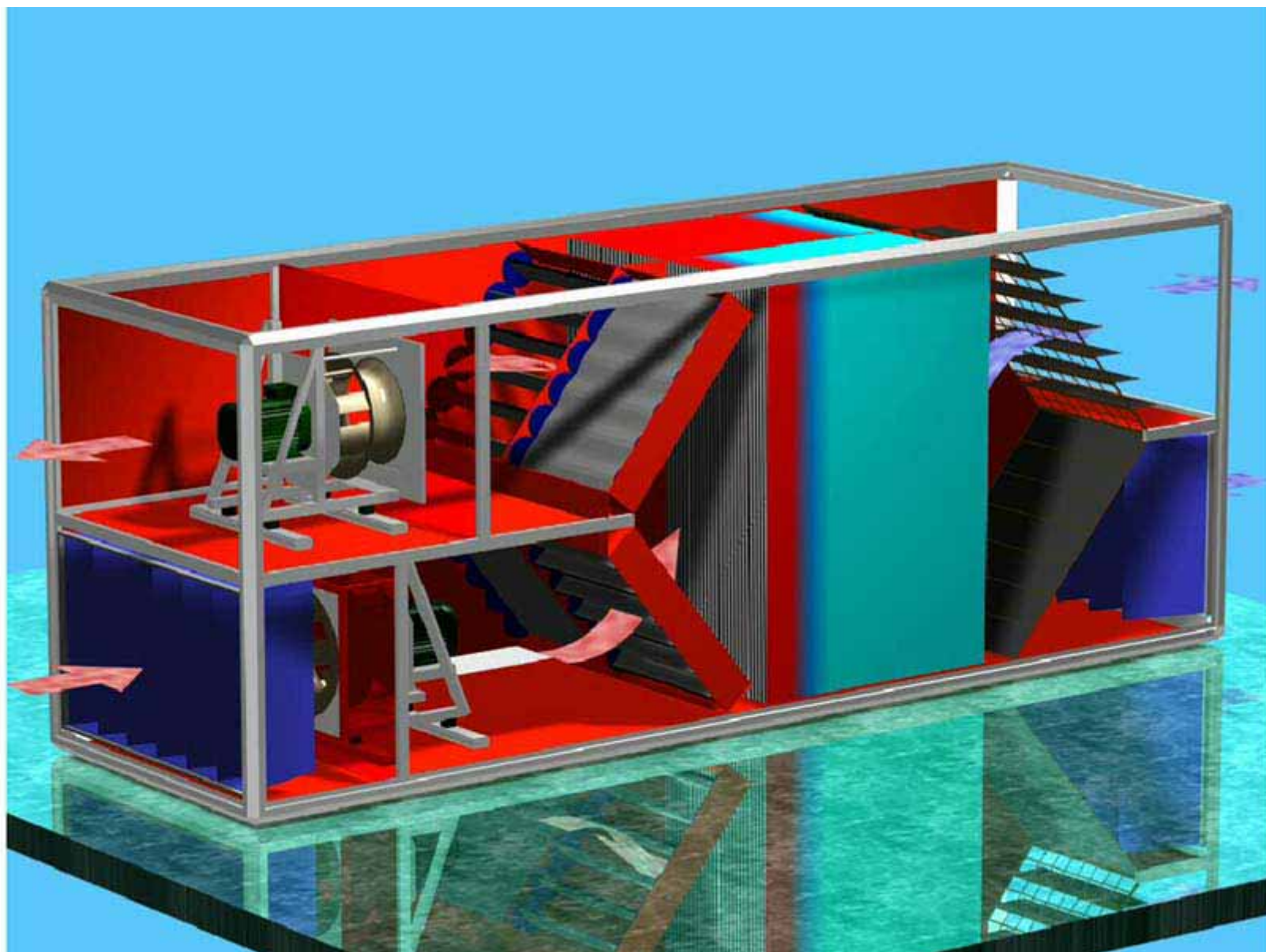


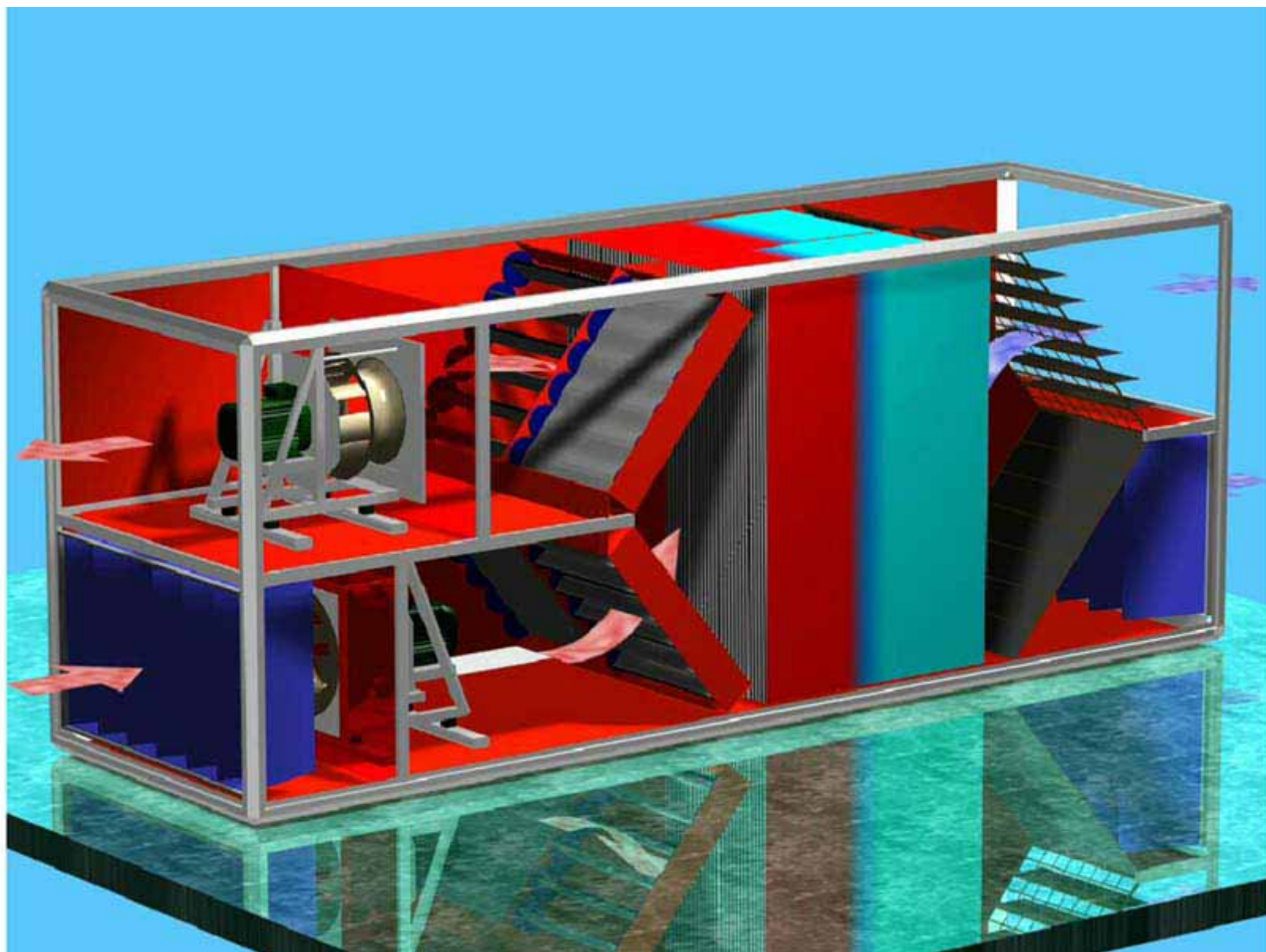


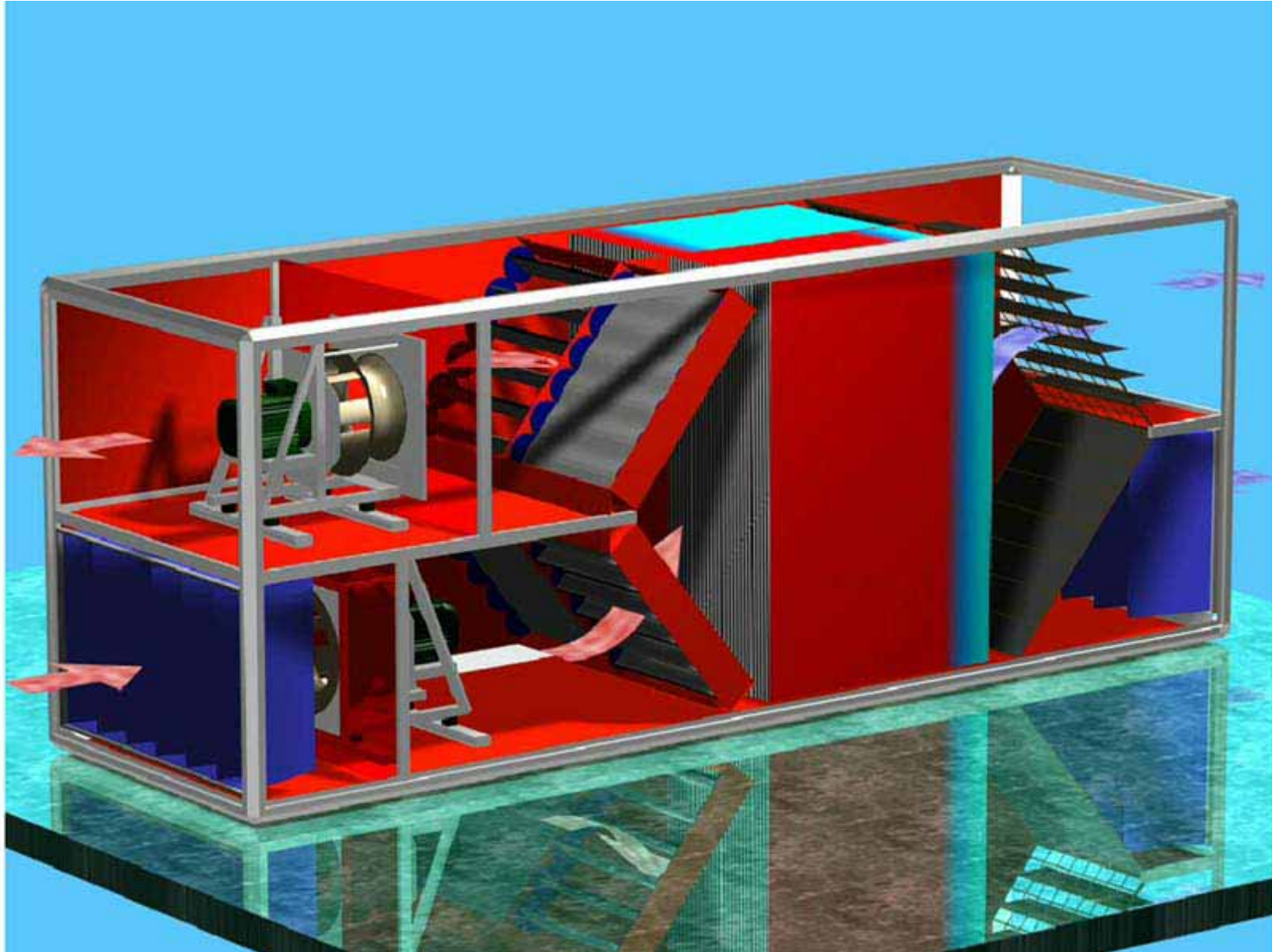


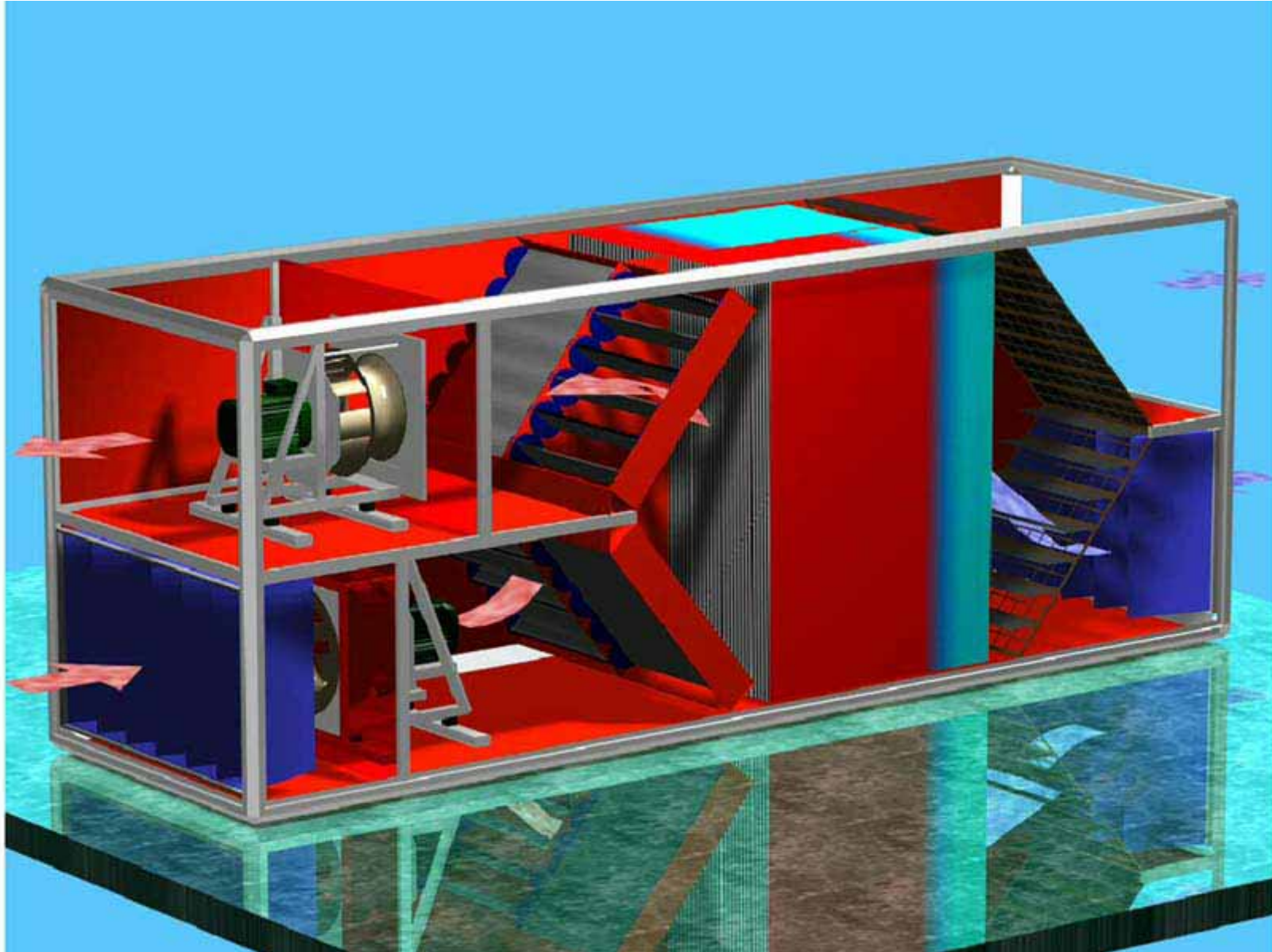


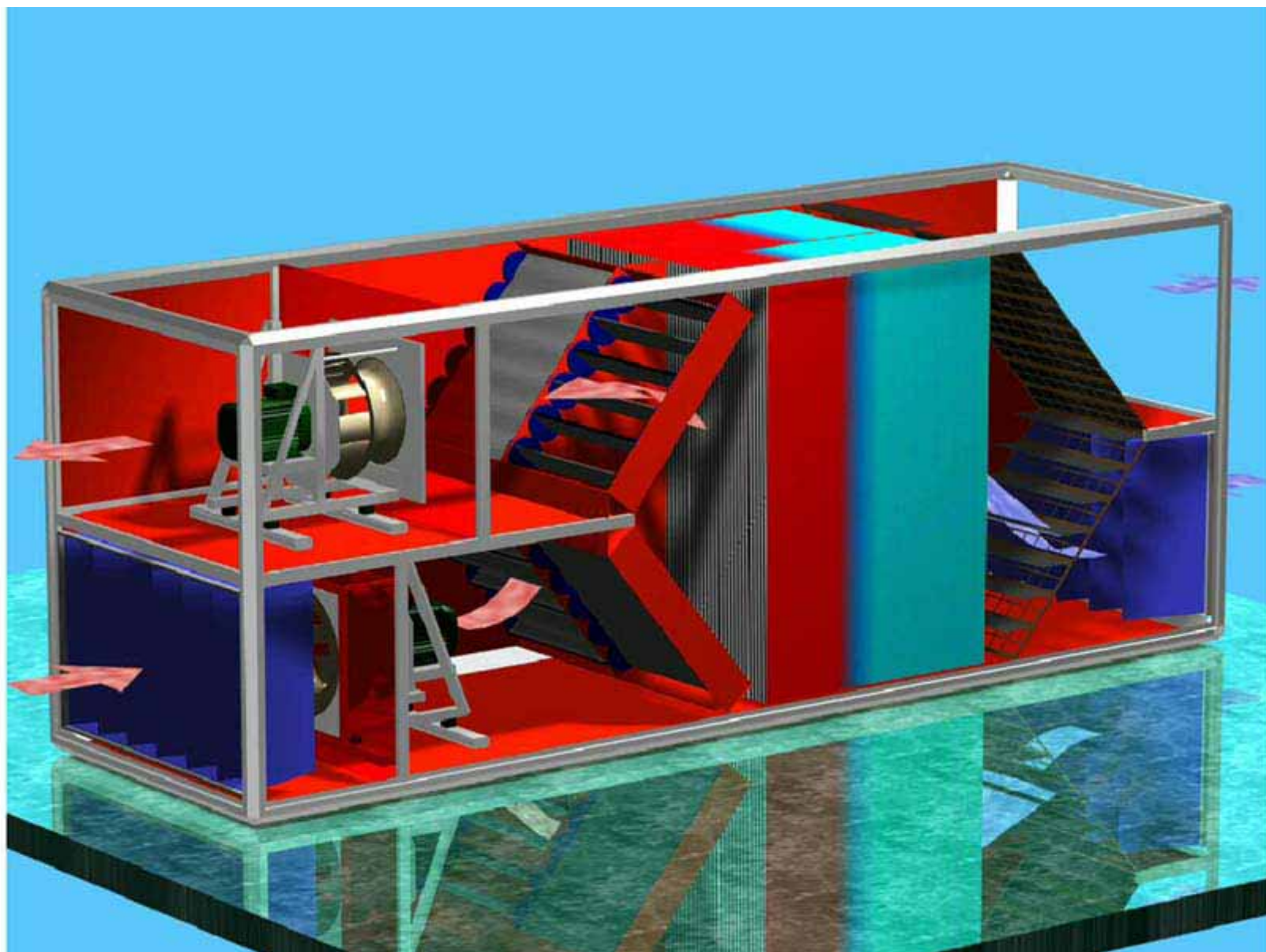


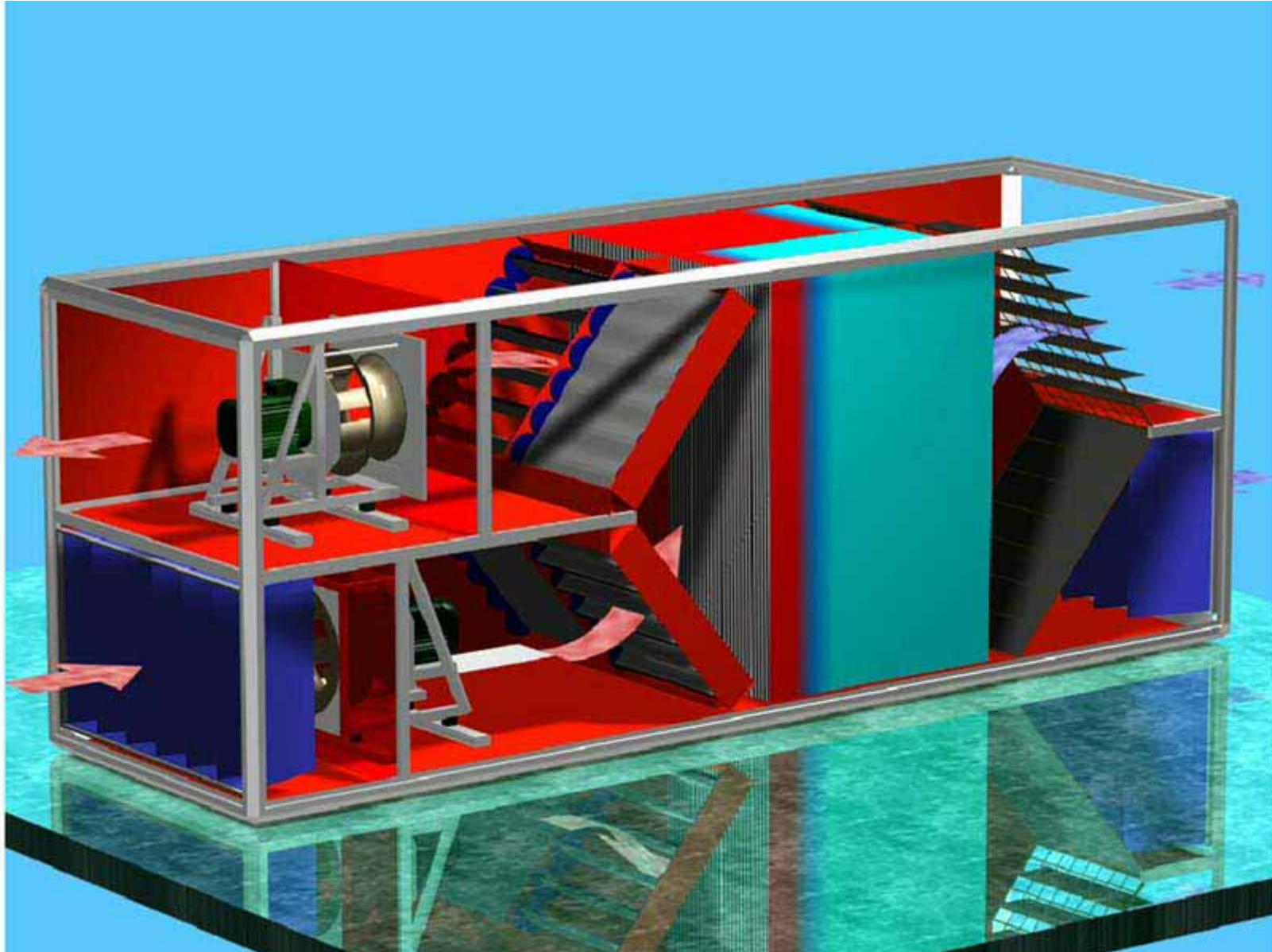


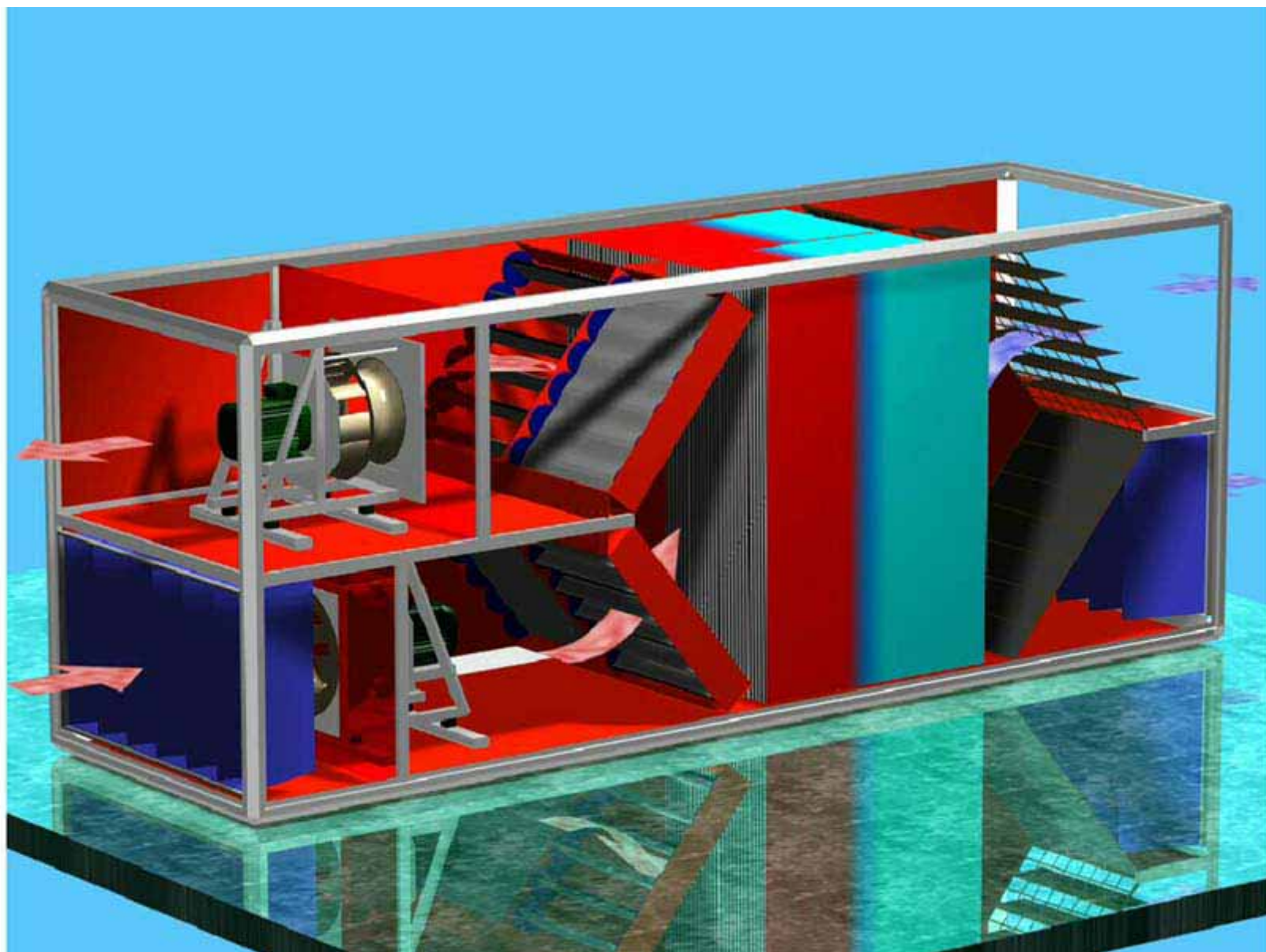


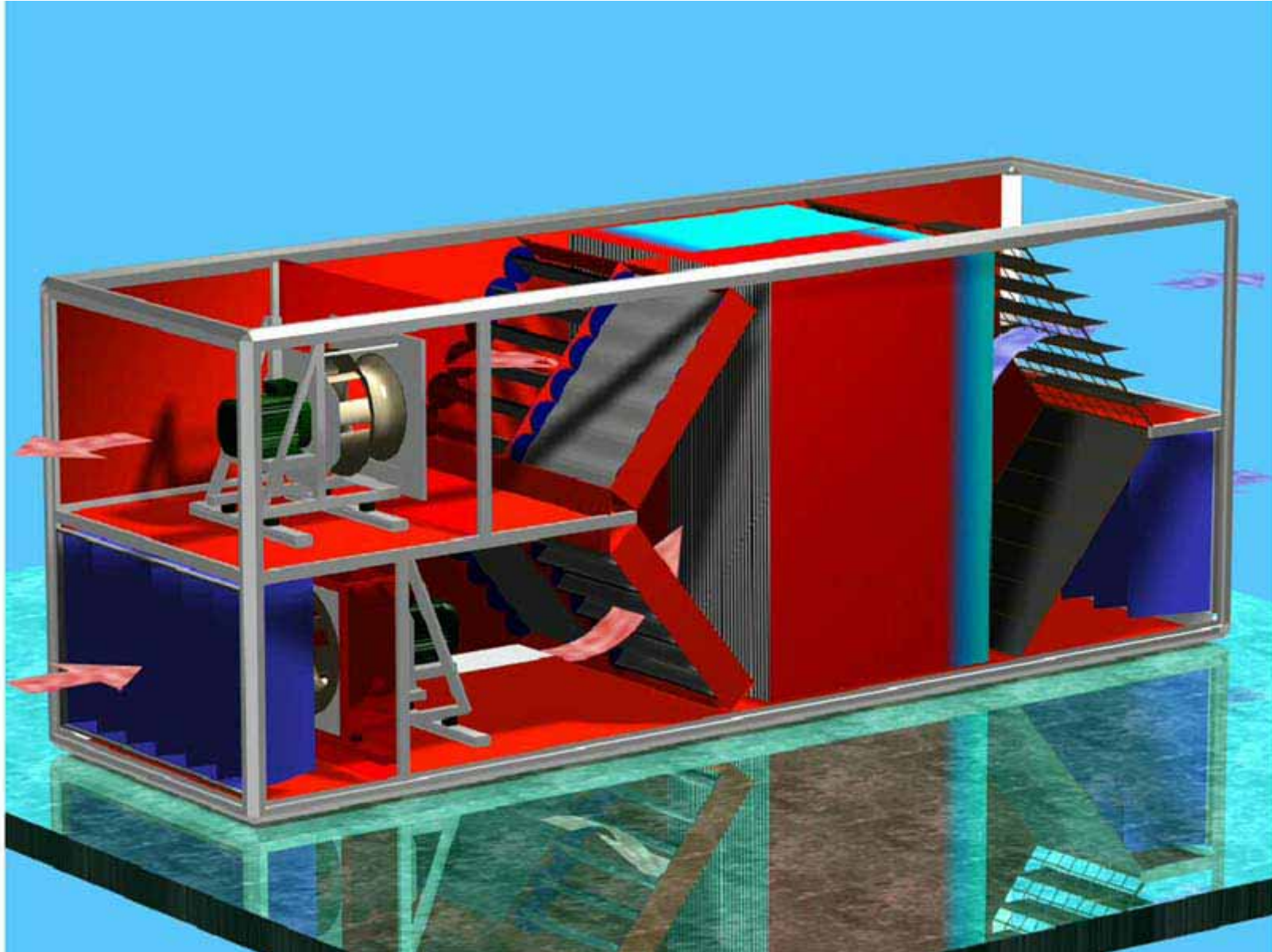


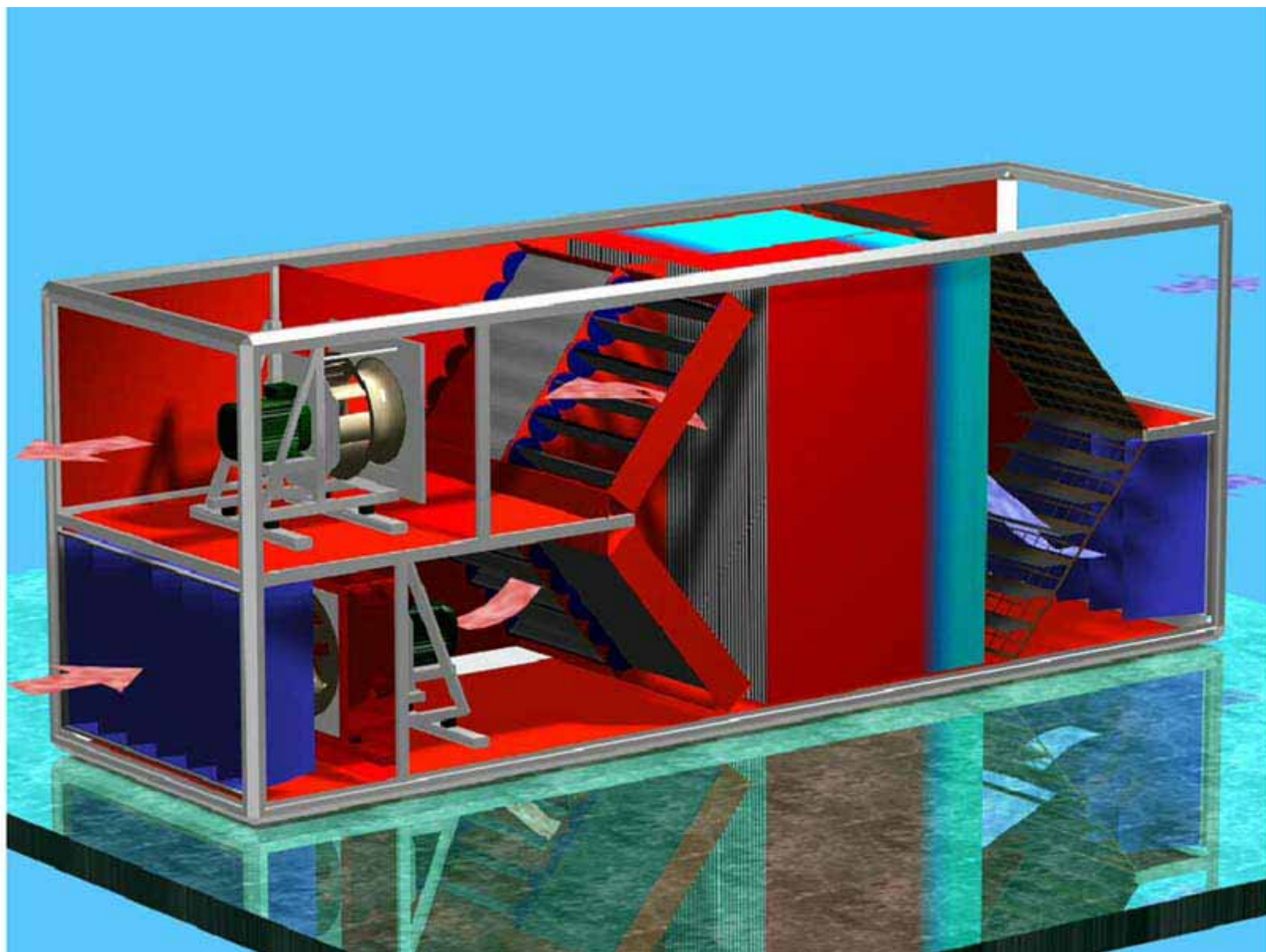


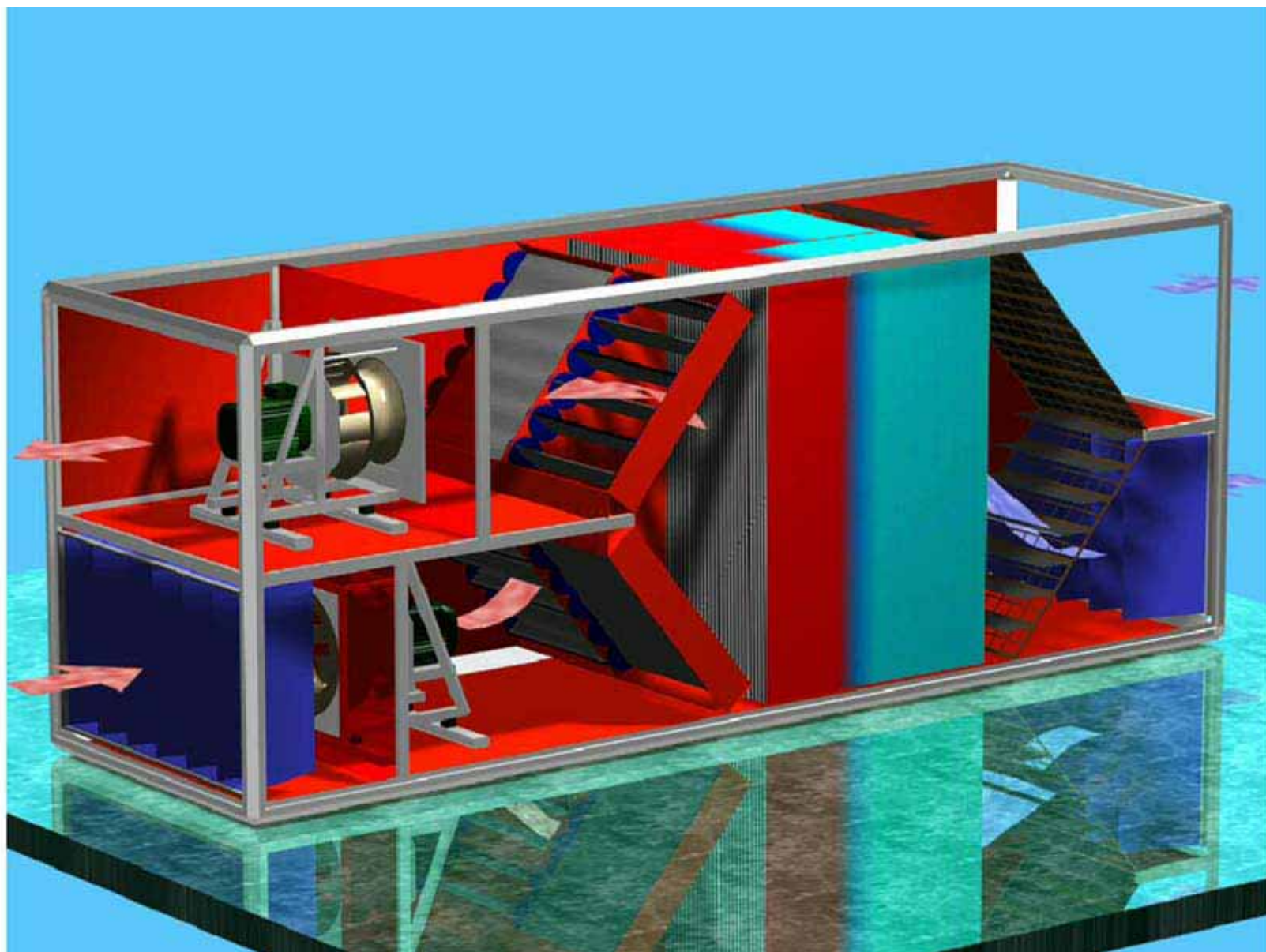


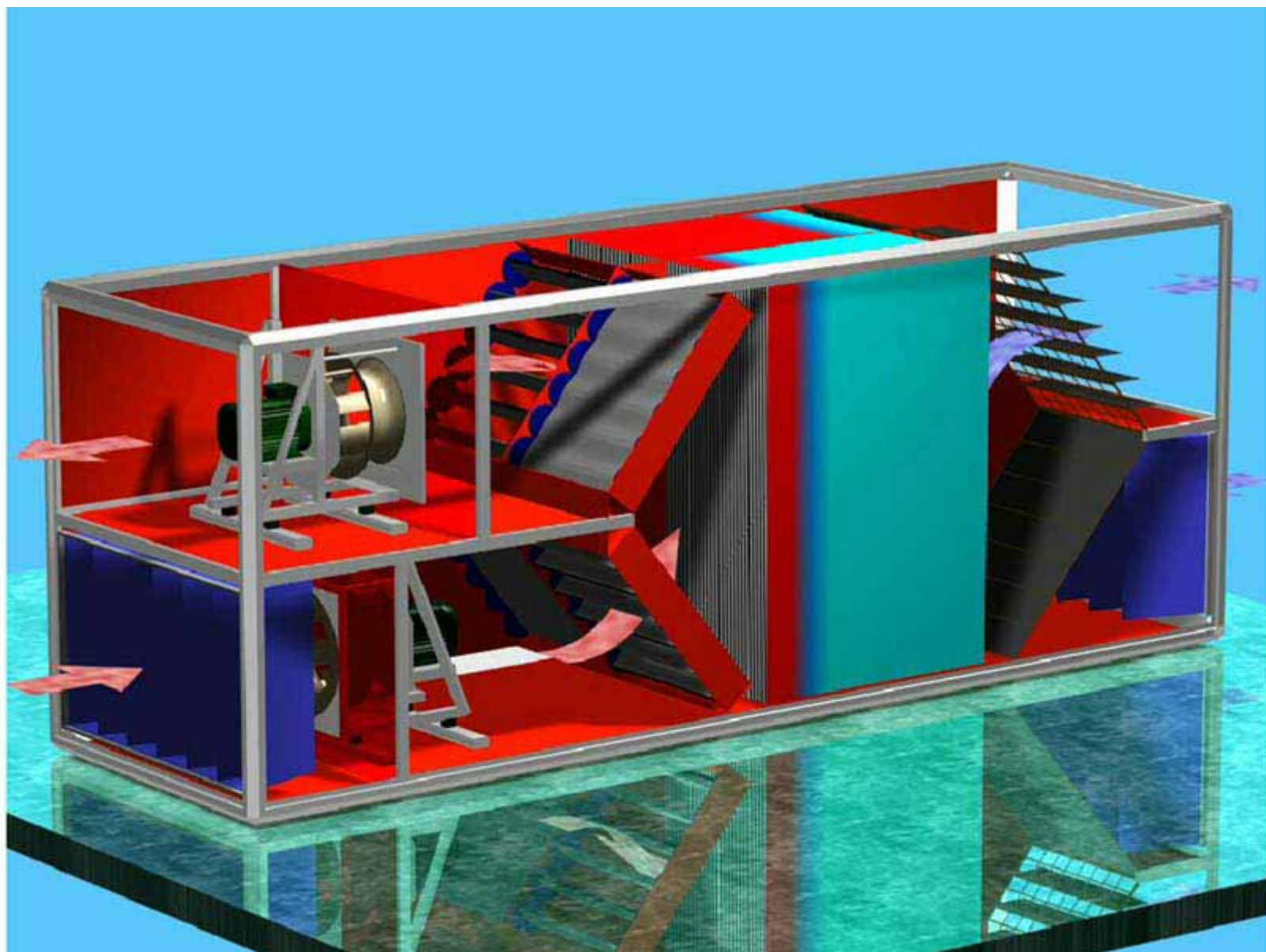




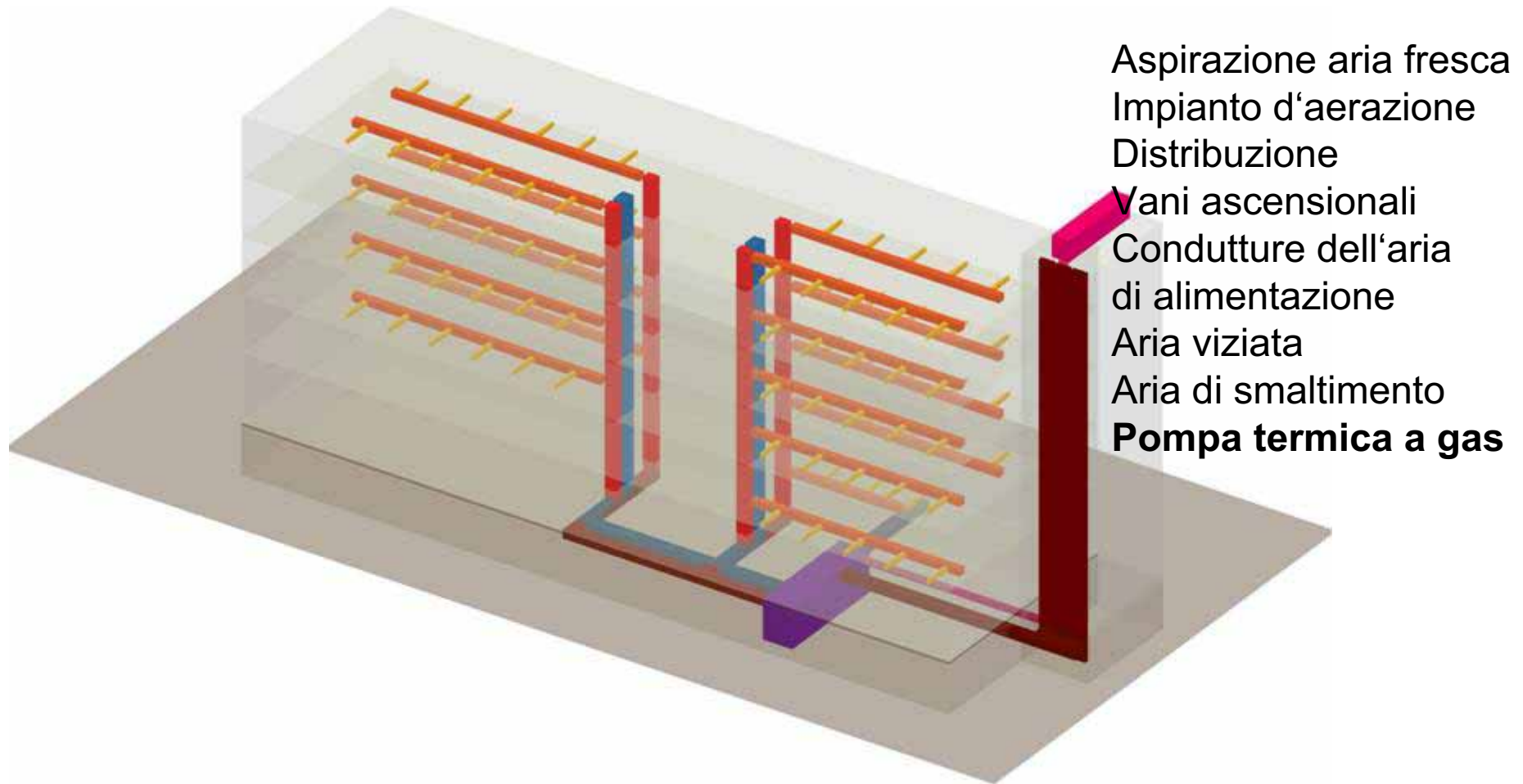


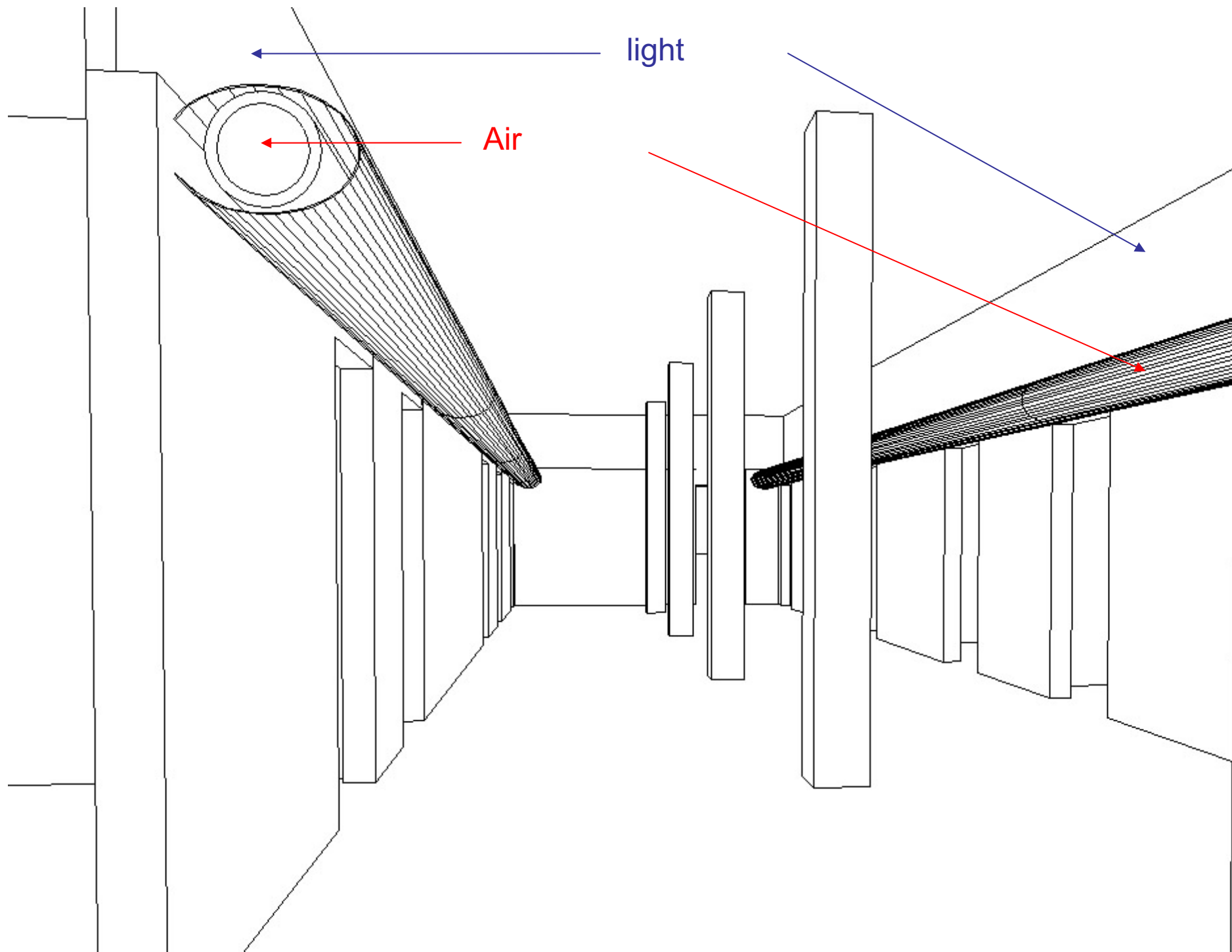






EXPOST Ventilation system









EXPOST





EXPOST



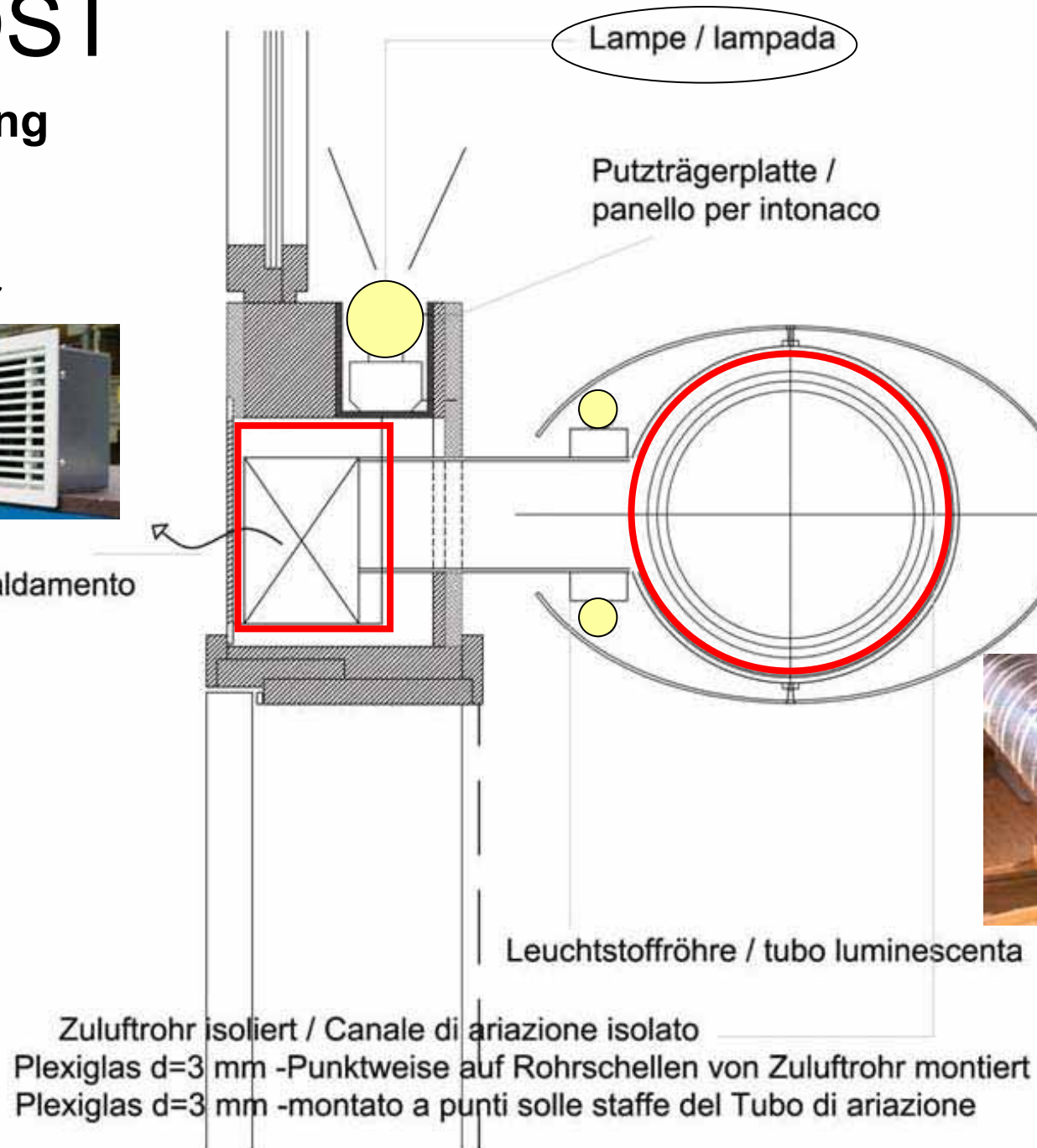
EXPOST

HLS Planung

Konvektor



Nachheizregister /
batteria di post riscaldamento



IMPIANTO DI
PRODUZIONE ACQUA
CALDA PER
POSTRISCALDAMENTO.

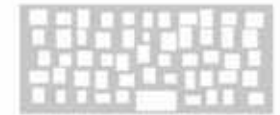
Caldaia a
condensazione a 60kW
(modulare da 15a 60kW)



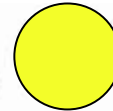
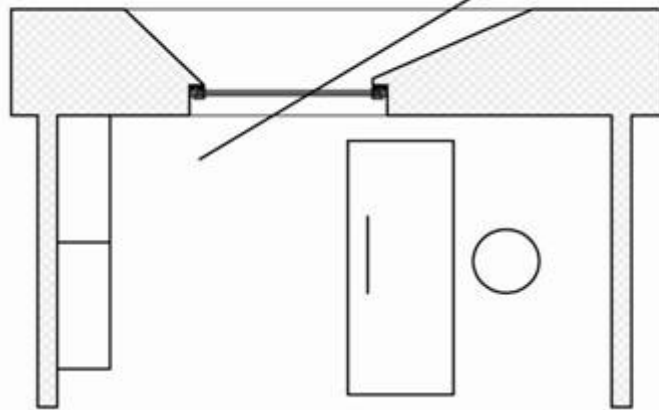
EXPOST



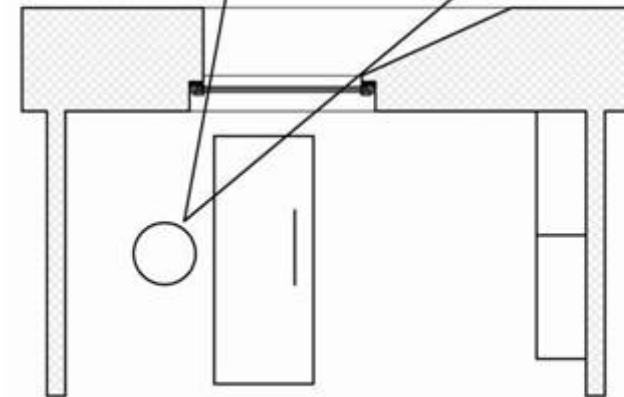
EXPOST



Maggiore infiltrazione di luce
tramite apertura orizzontale
degli sguinci



Vista individuale attraverso
le aperture degli sguinci



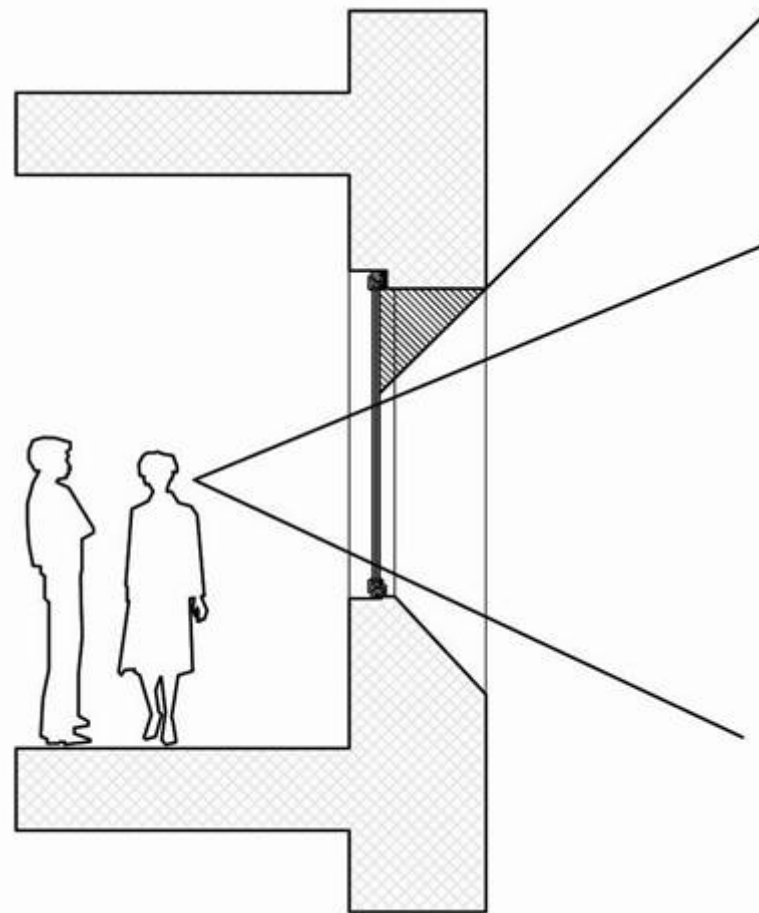
EXPOST

Maggiore infiltrazione di
luce nei piani inferiori
tramite apertura verticale
degli sguinci delle finestre

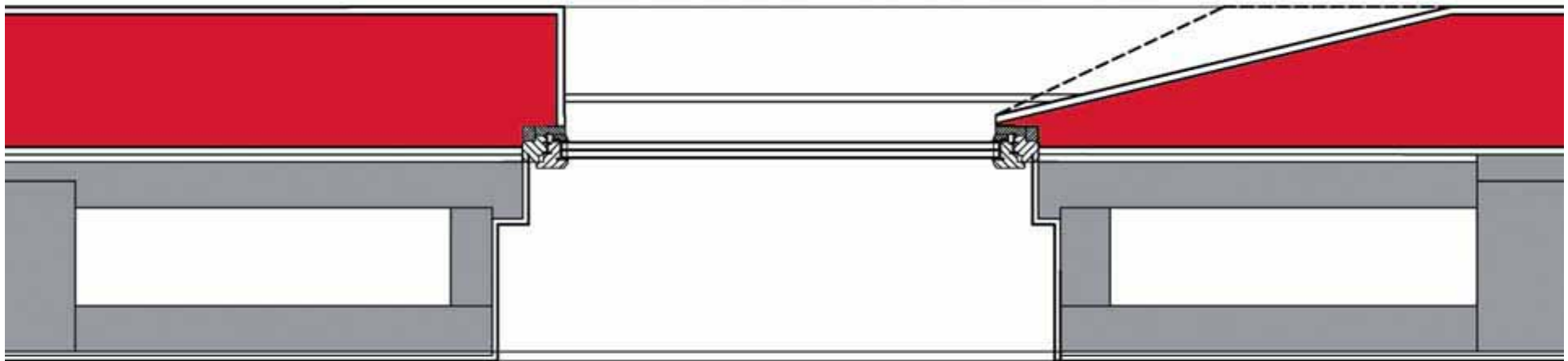
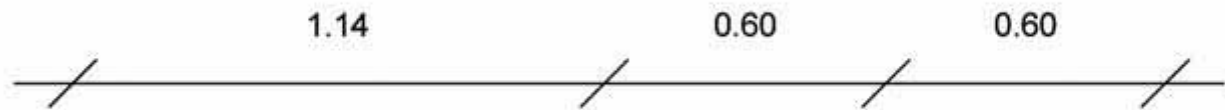
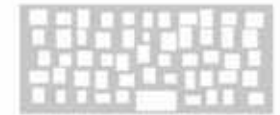


EXPOST

Ombra costruttiva nei piani superiori tramite la profondità degli sguinci. Vista confortevole attraverso il vetro a protezione solare.



EXPOST



EXPOST



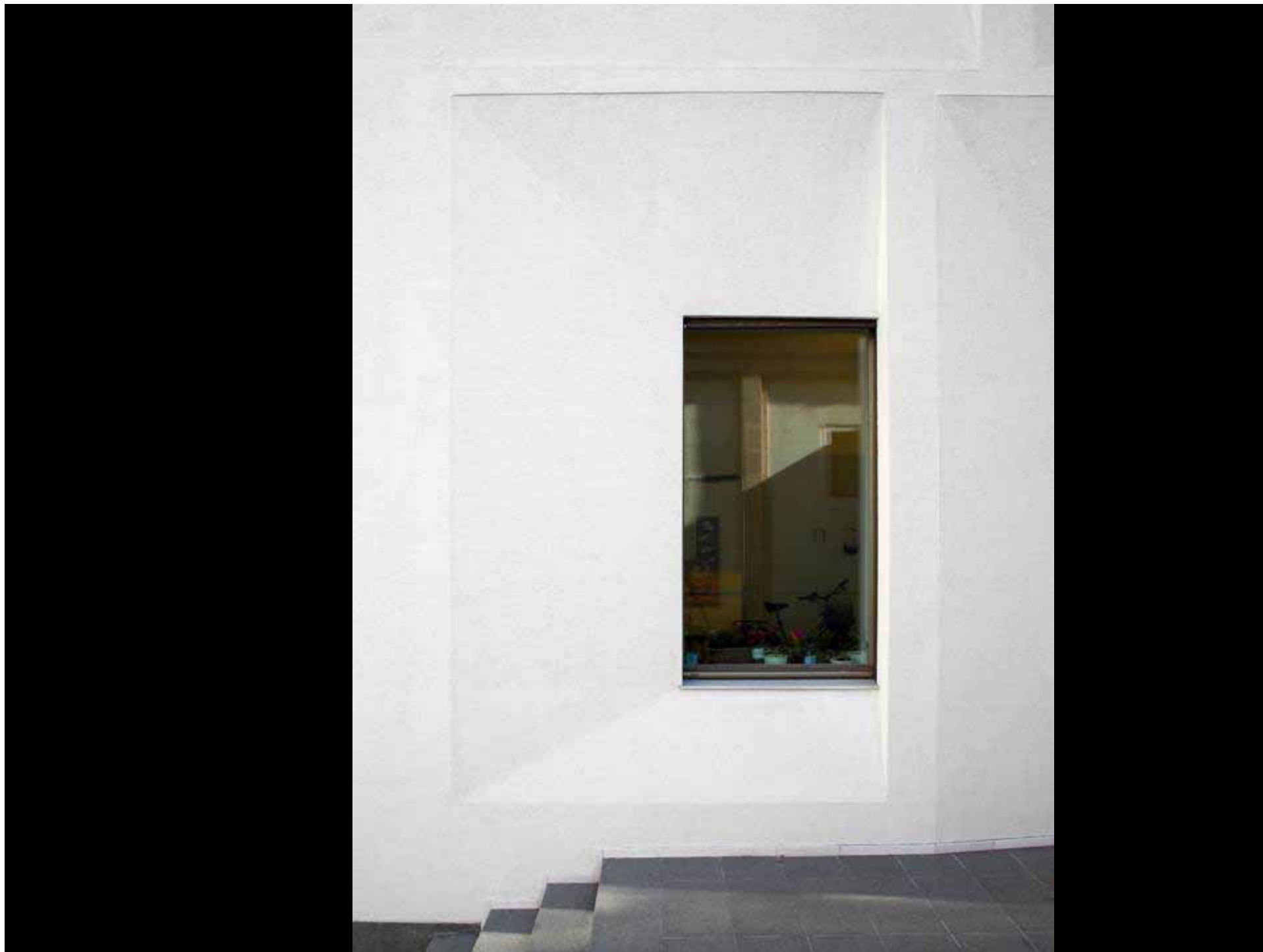


EXPOST









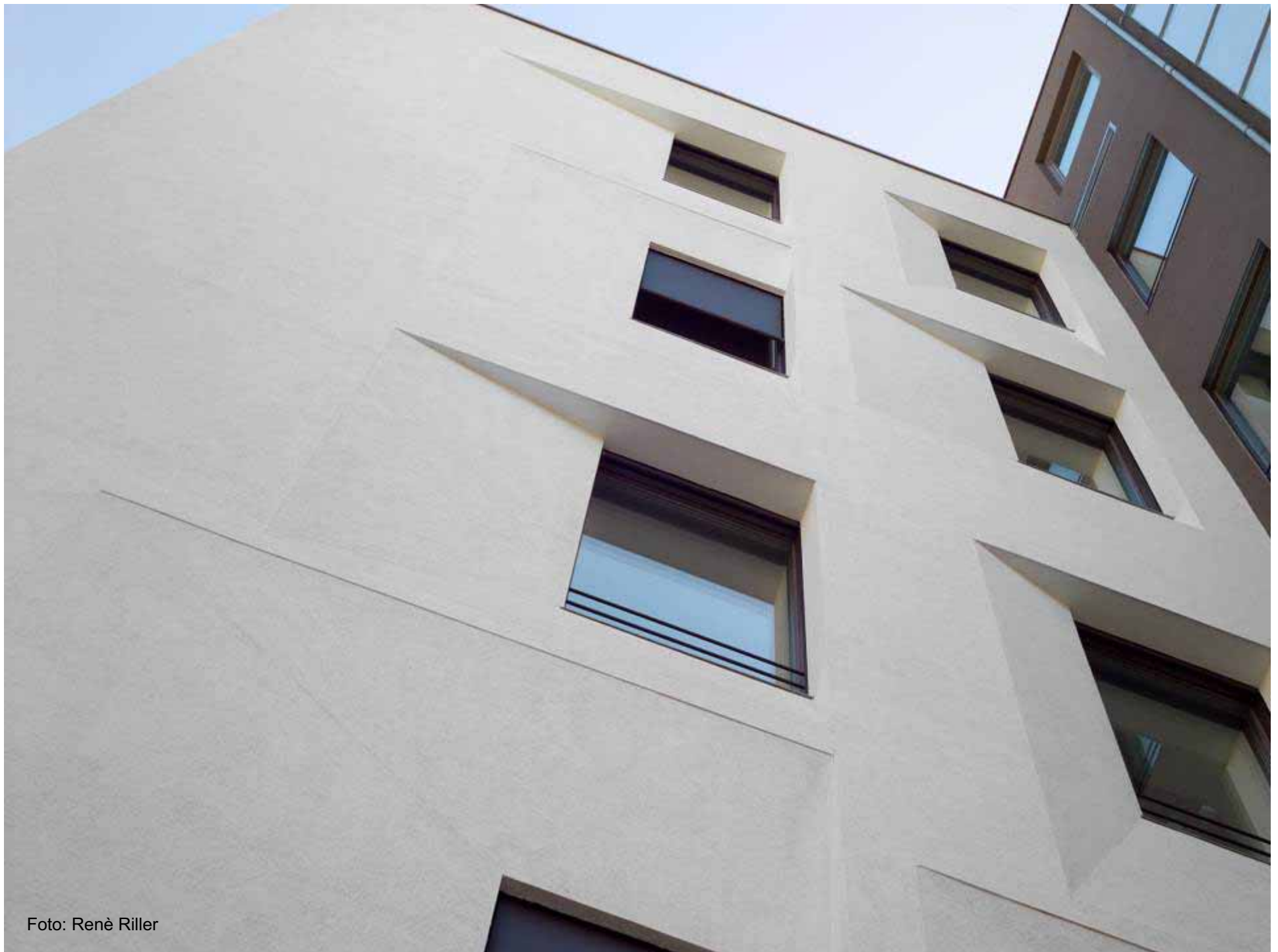


Foto: Renè Riller

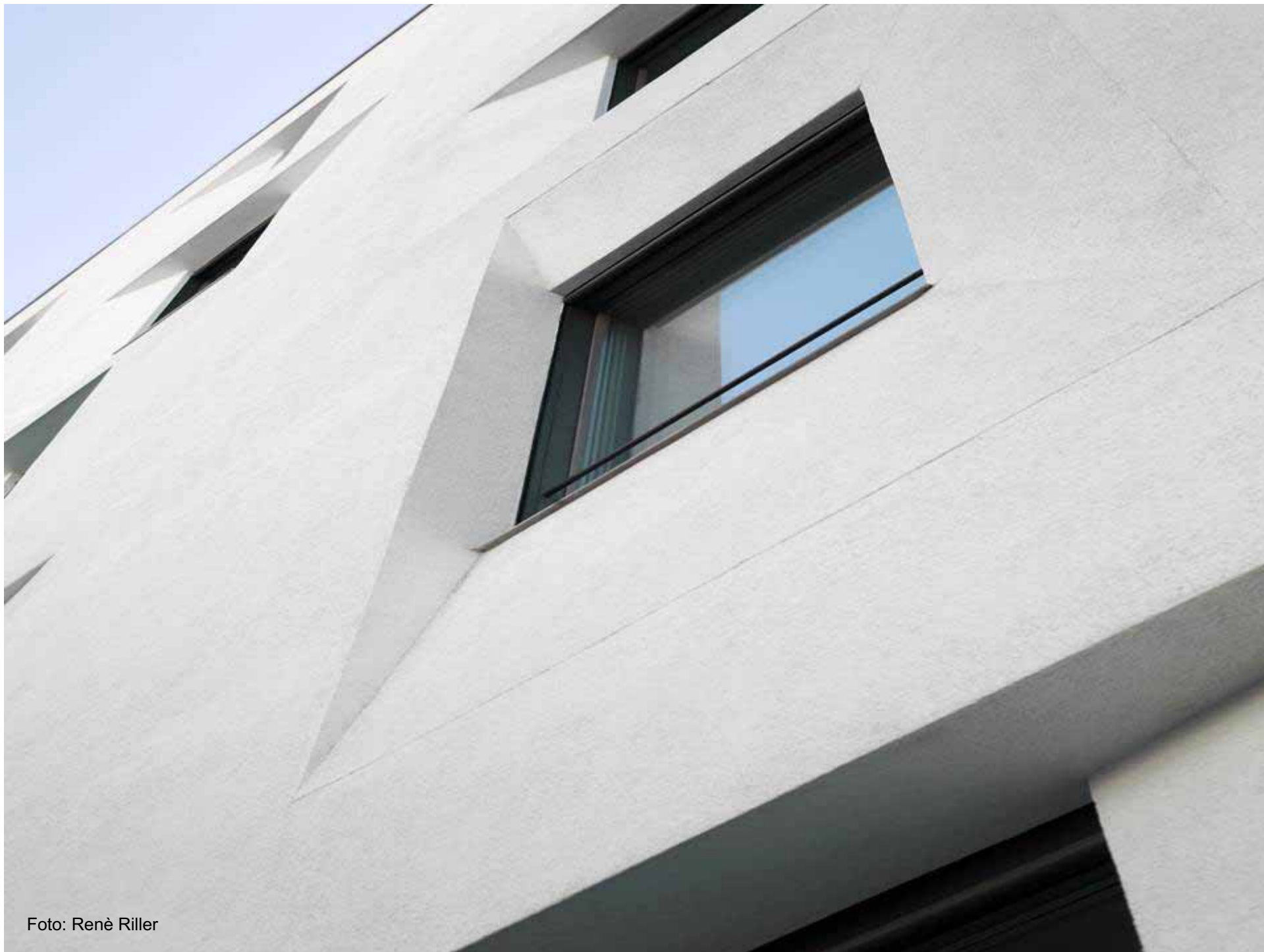


Foto: Renè Riller

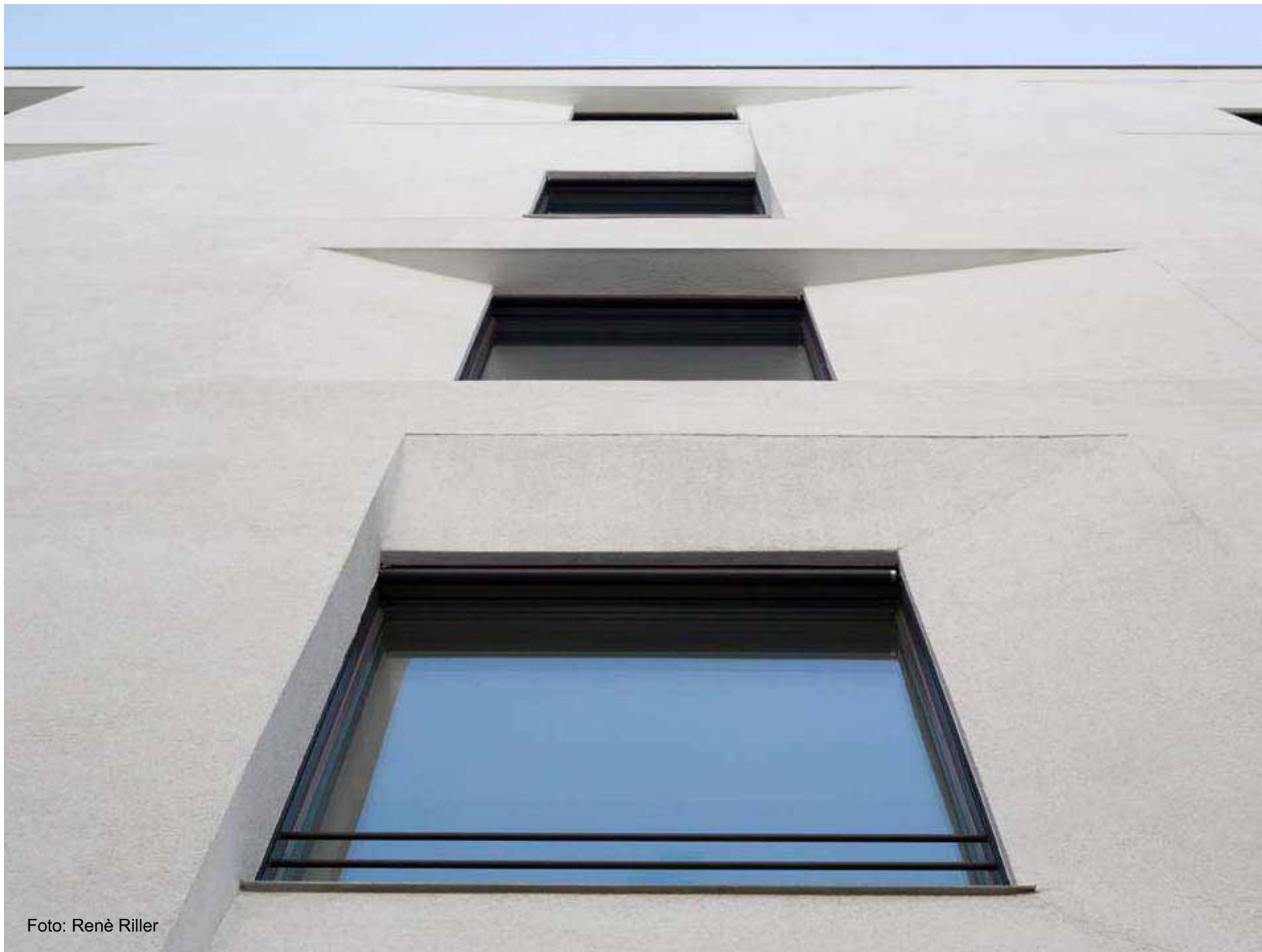


Foto: Renè Riller

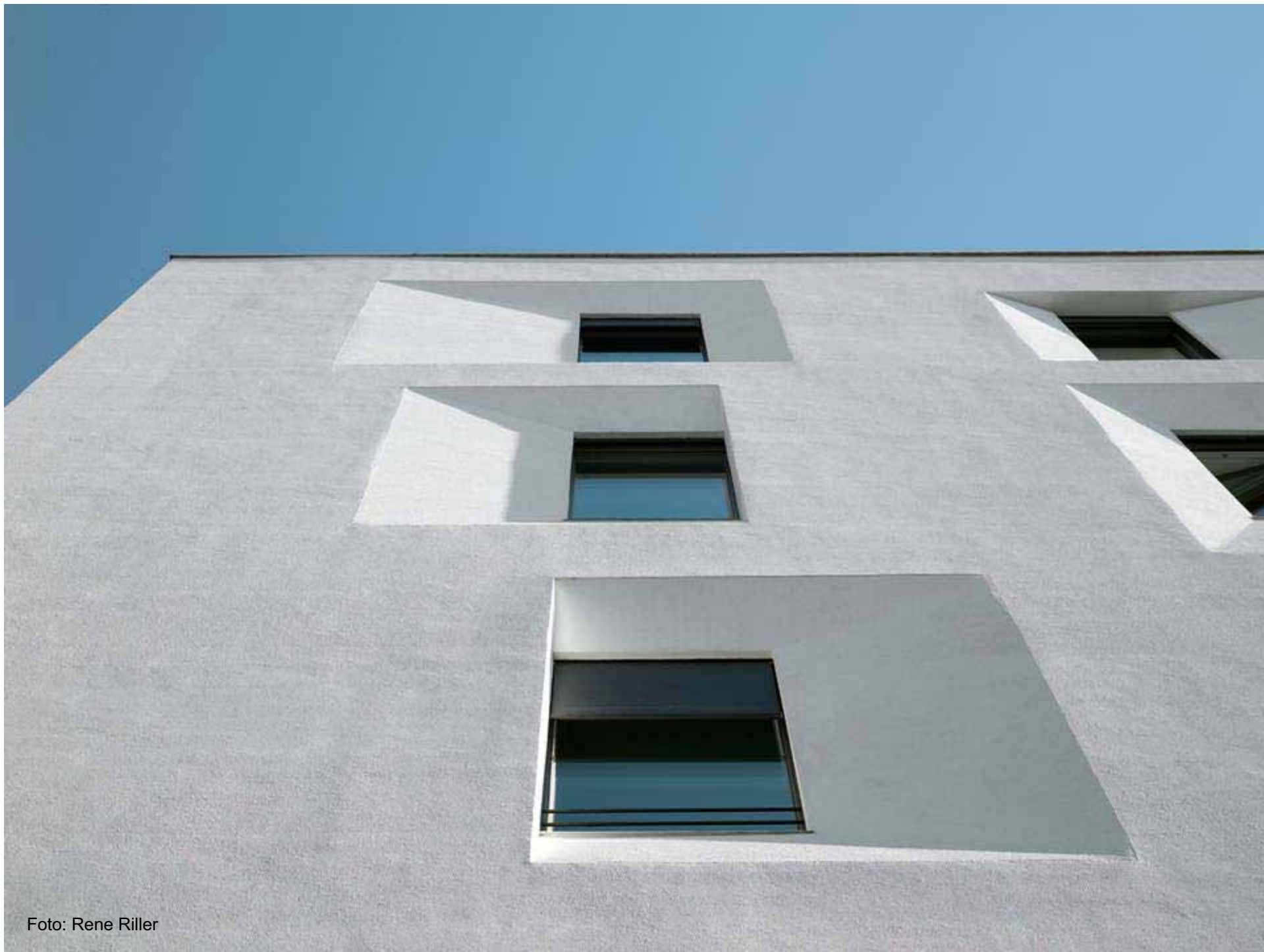


Foto: Rene Riller



Foto: Renè Riller



Foto: Ludwig Thalheimer/Lupe

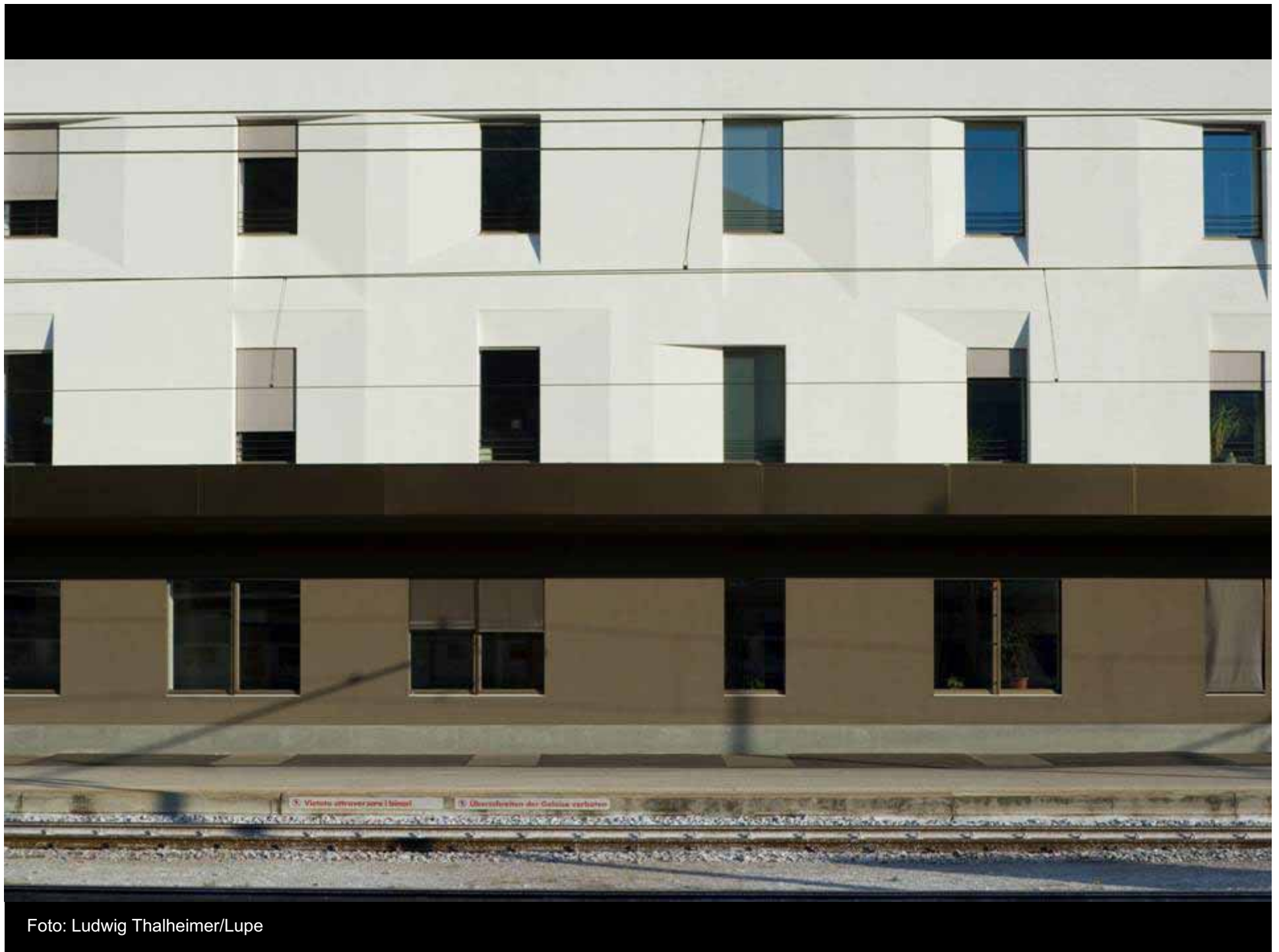


Foto: Ludwig Thalheimer/Lupe



Foto: Ludwig Thalheimer/Lupe

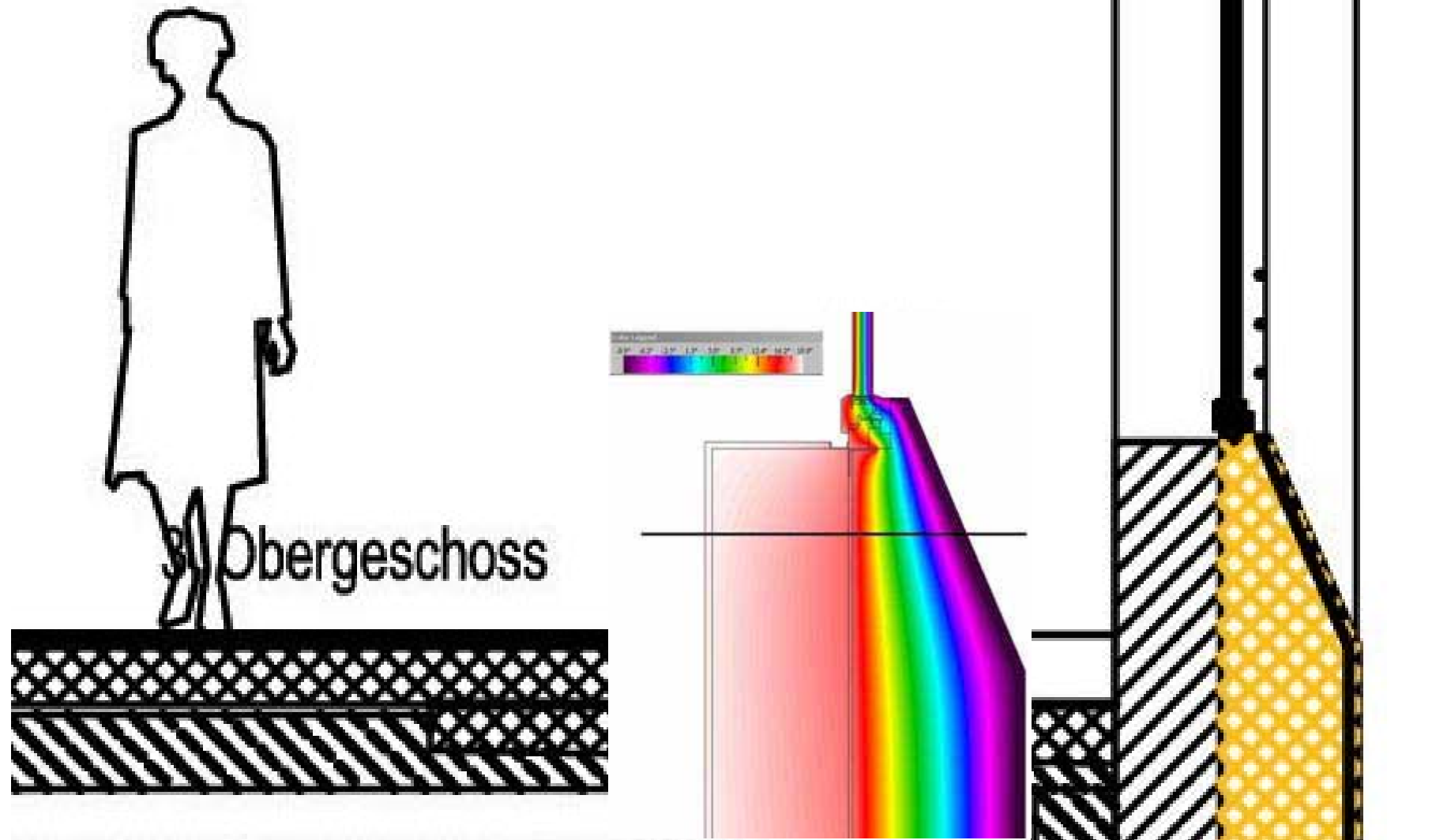


Foto: Ludwig Thalheimer/Lupe

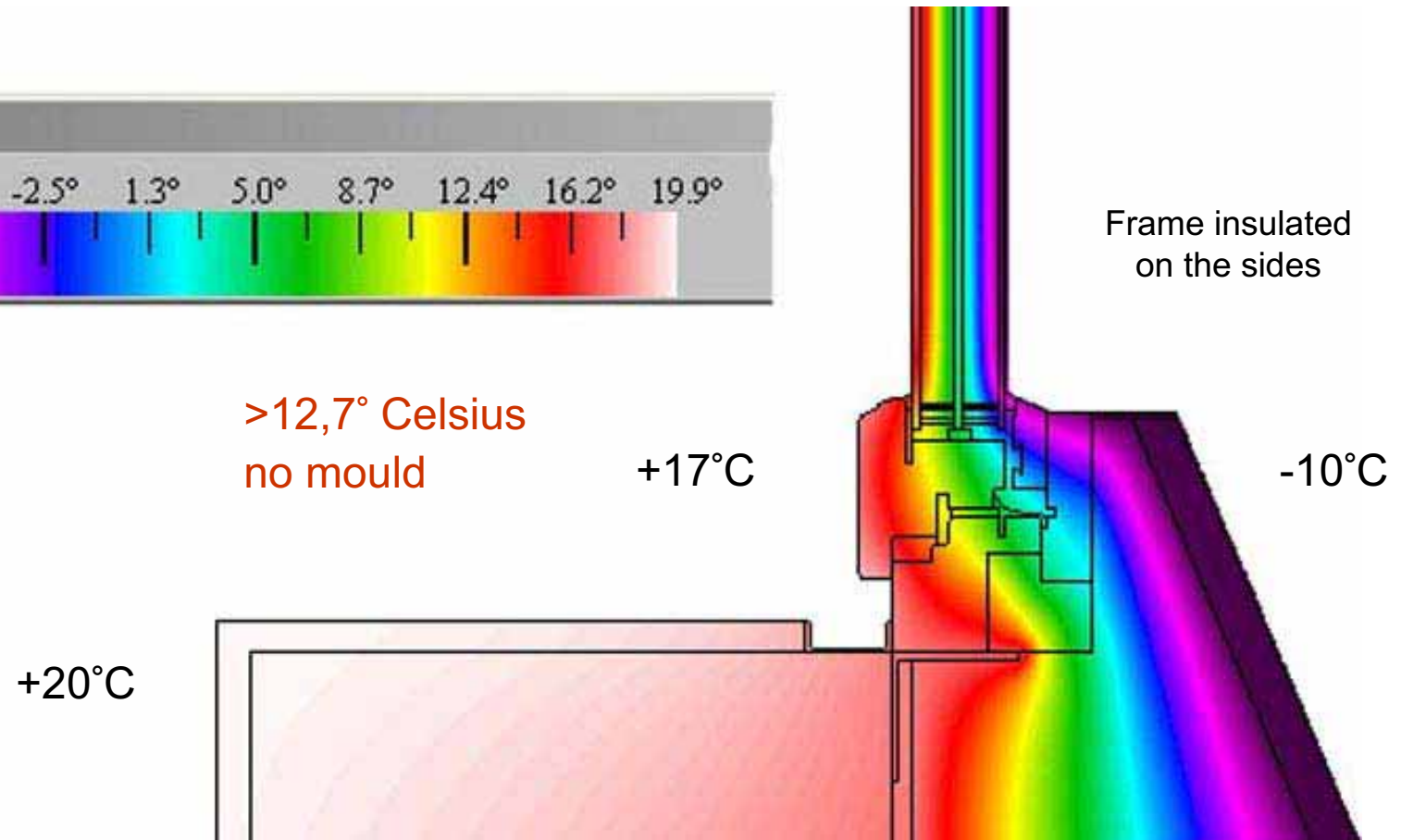
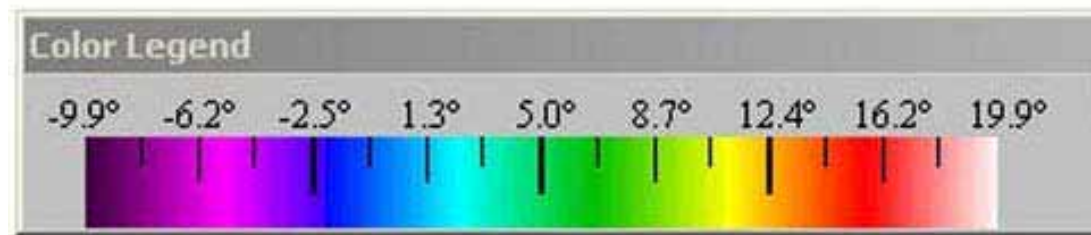
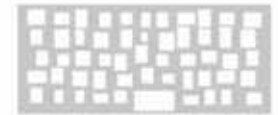


Foto: Ludwig Thalheimer/Lupe

EXPOST



EXPOST



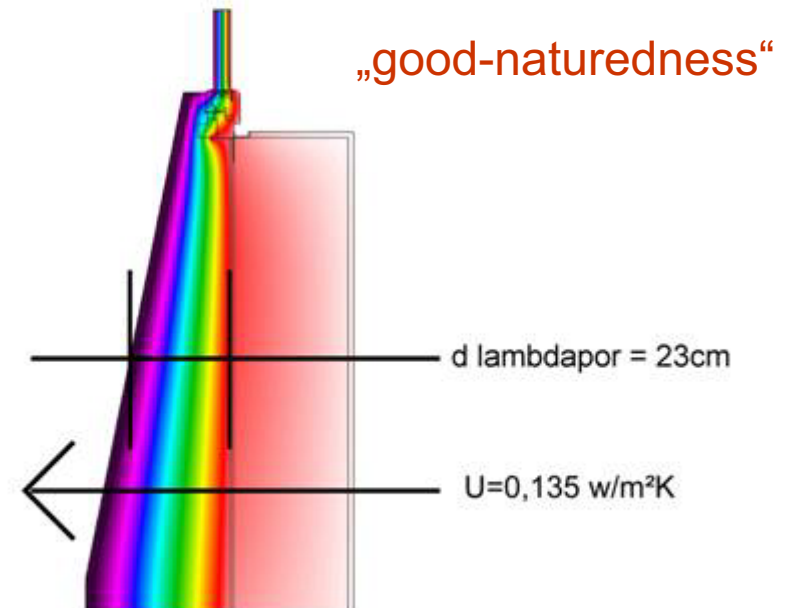
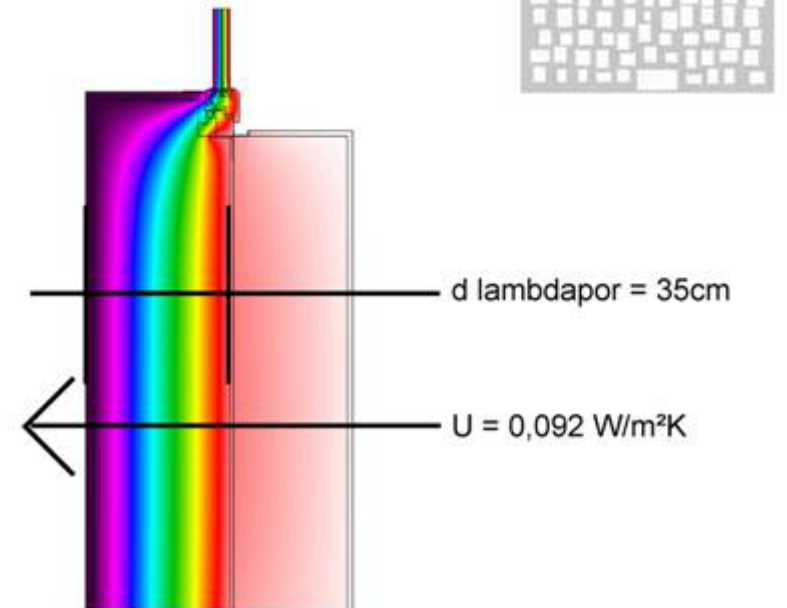
Passivhaus-Projektierung U-WERTE DER BAUTEILE

Objekt: exposit bolzano

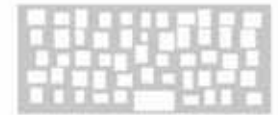
1. Bauteil: <u>Wand-Isolierung</u>						
Bauteil Nr. Bauteil-Bezeichnung						
Wärmedurchgangskoeffizient (W/m²K) Innen R _{si} / Außen R _{se}						
Teilfläche 1	λ (W/mK)	Teilfläche 2 (optional)	λ (W/mK)	Teilfläche 3 (optional)	λ (W/mK)	Summe Breite
1. Luftschicht	0,070					15
2. Mauerwerk	0,400					120
3. Erde	1,400					260
4. Mauerwerk	0,400					120
5. Isolante	0,035					20
6. Luftschicht	0,035					350
7. Luftschicht	0,070					20
8.						
Flächenanteil Teilfläche 2		Flächenanteil Teilfläche 3		Summe		90,5
				U-Wert: 0,092		(W/m²K)

2. Bauteil: <u>Wand-Isolierung</u>						
Bauteil Nr. Bauteil-Bezeichnung						
Wärmedurchgangskoeffizient (W/m²K) Innen R _{si} / Außen R _{se}						
Teilfläche 1	λ (W/mK)	Teilfläche 2 (optional)	λ (W/mK)	Teilfläche 3 (optional)	λ (W/mK)	Summe Breite
1. Luftschicht	0,070					15
2. Mauerwerk	0,400					300
3. Isolante	0,035					20
4. Luftschicht	0,035					350
5. Luftschicht	0,070					20
6.						
7.						
8.						
Flächenanteil Teilfläche 2		Flächenanteil Teilfläche 3		Summe		70,5
				U-Wert: 0,092		(W/m²K)

3. Bauteil: <u>Wand-Isolierung</u>						
Bauteil Nr. Bauteil-Bezeichnung						
Wärmedurchgangskoeffizient (W/m²K) Innen R _{si} / Außen R _{se}						
Teilfläche 1	λ (W/mK)	Teilfläche 2 (optional)	λ (W/mK)	Teilfläche 3 (optional)	λ (W/mK)	Summe Breite
1. Luftschicht	0,070					15
2. Mauerwerk	0,400					300
3. Isolante	0,035					20
4. Luftschicht	0,035					230
5. Luftschicht	0,070					20
6.						
7.						
8.						
Flächenanteil Teilfläche 2		Flächenanteil Teilfläche 3		Summe		58,5
				U-Wert: 0,135		(W/m²K)



EXPOST



EXPOST BOZEN

16

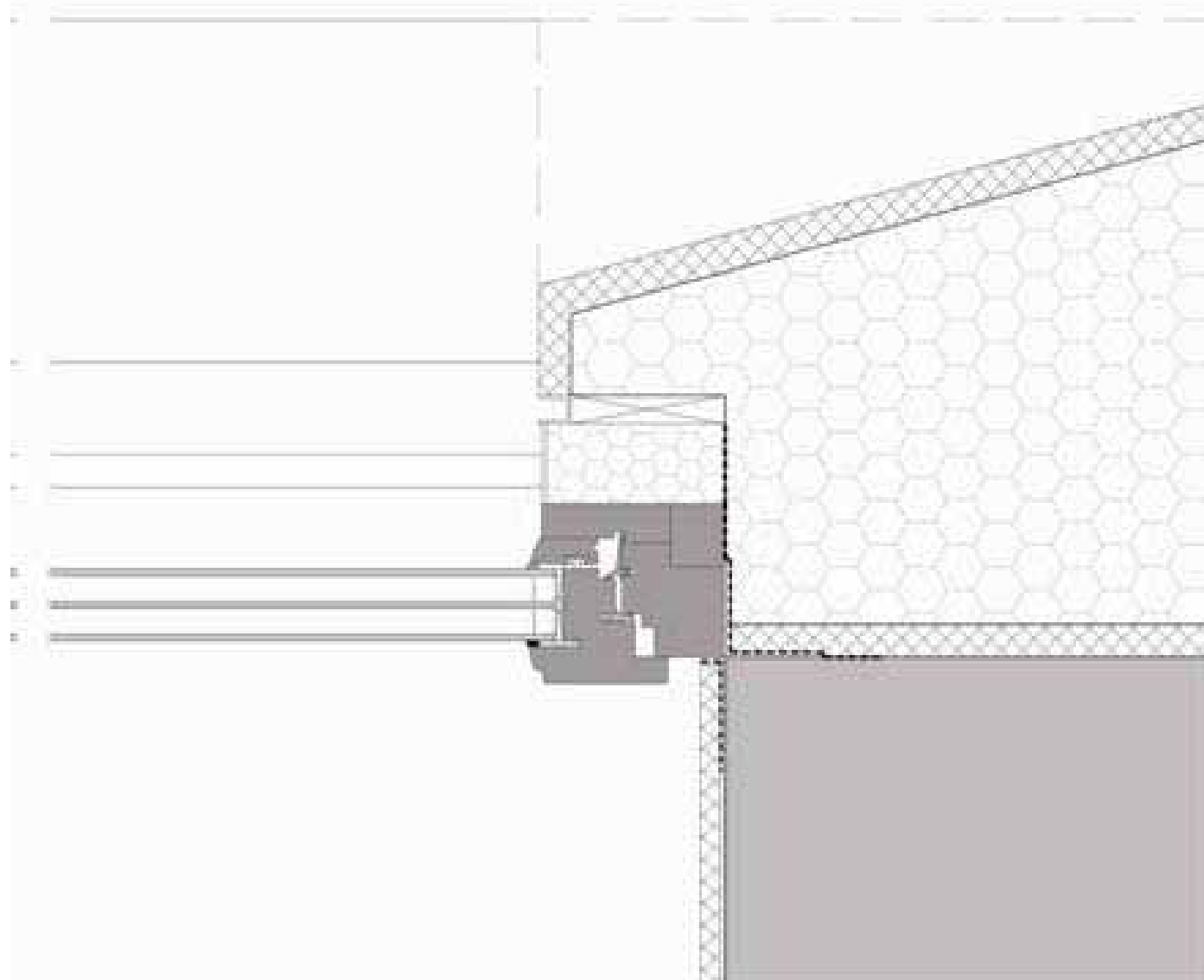
Horizontalschnitt Fenster M 1:2



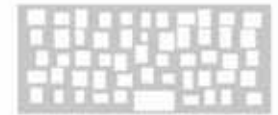
Umbau des Ehemaligen Postgebäudes in Bozen
Horizontalschnitt Fenster M 1:2

Michael Tribus Architecture
Oktober 2007



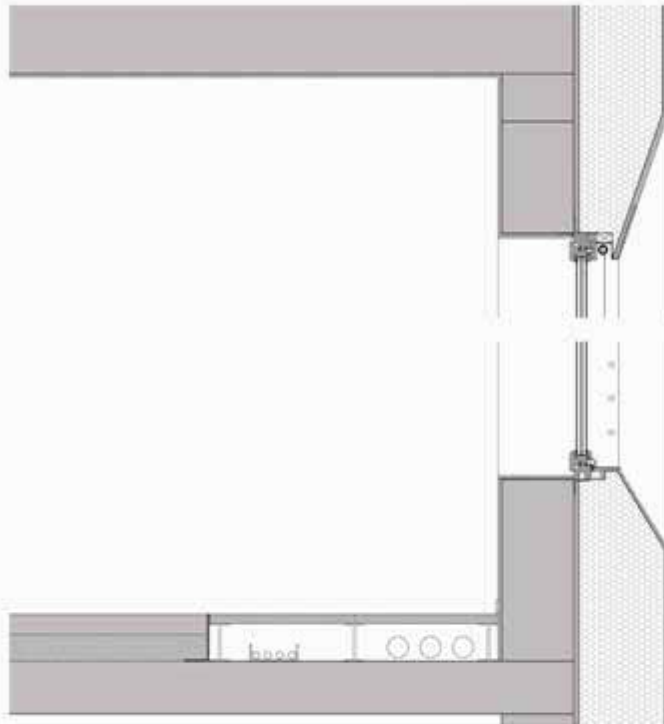


EXPOST



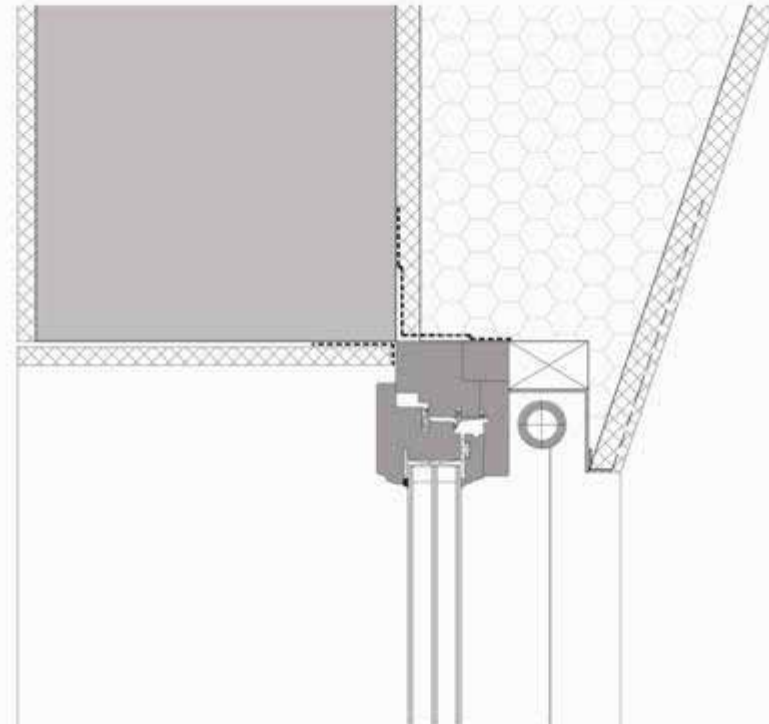
EXPOST BOZEN

Vertikalschnitt Fenster M 1:10



Umbau des Ehemaligen Postgebäudes in Bozen
Vertikalschnitt Fenster M 1:10 / 1:2

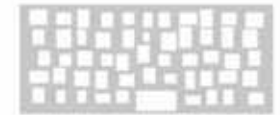
Vertikalschnitt Fenster M 1:2



Michael Tribus Architecture
Oktober 2007

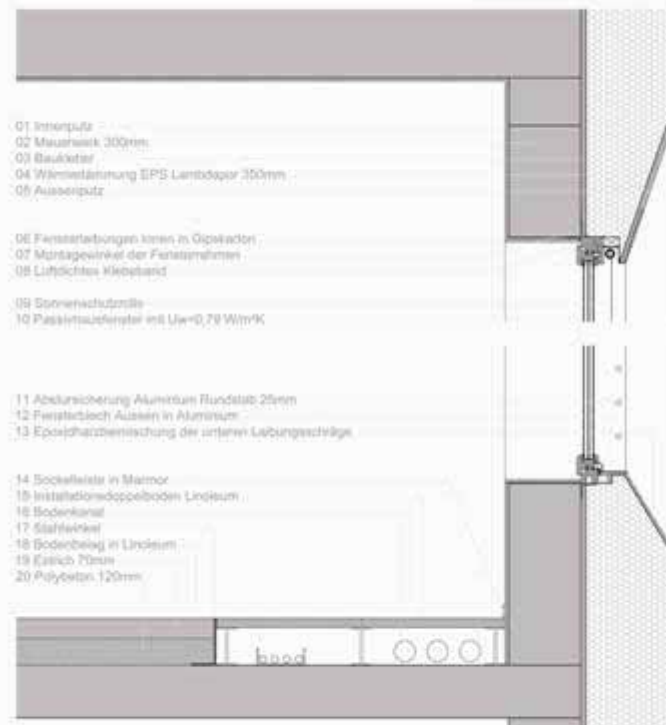


EXPOST



EXPOST BOZEN

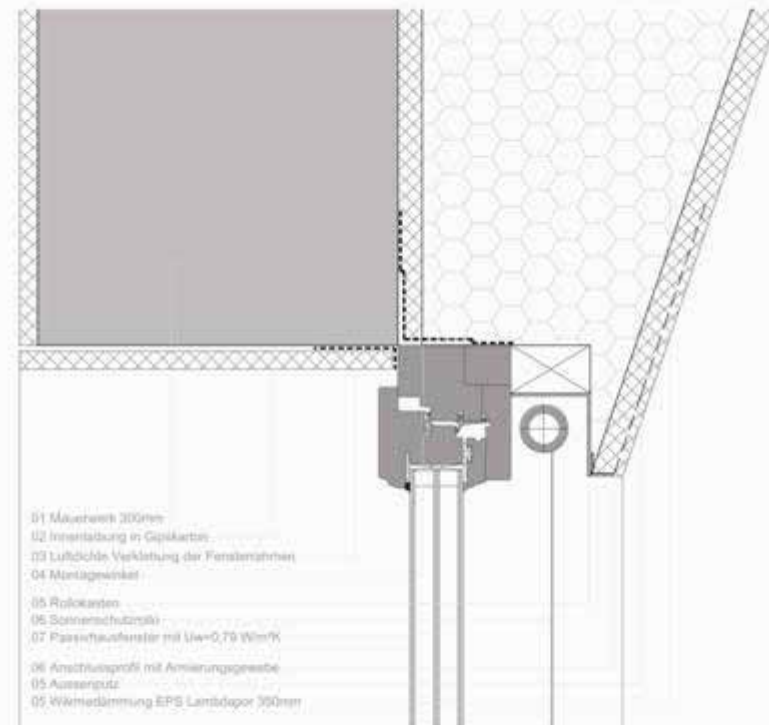
Vertikalschnitt Fenster M 1:10



Umbau des Ehemaligen Postgebäudes in Bozen
Vertikalschnitt Fenster M 1:10 / 1:2

15

Vertikalschnitt Fenster M 1:2



Michael Tribus Architecture
Oktober 2007



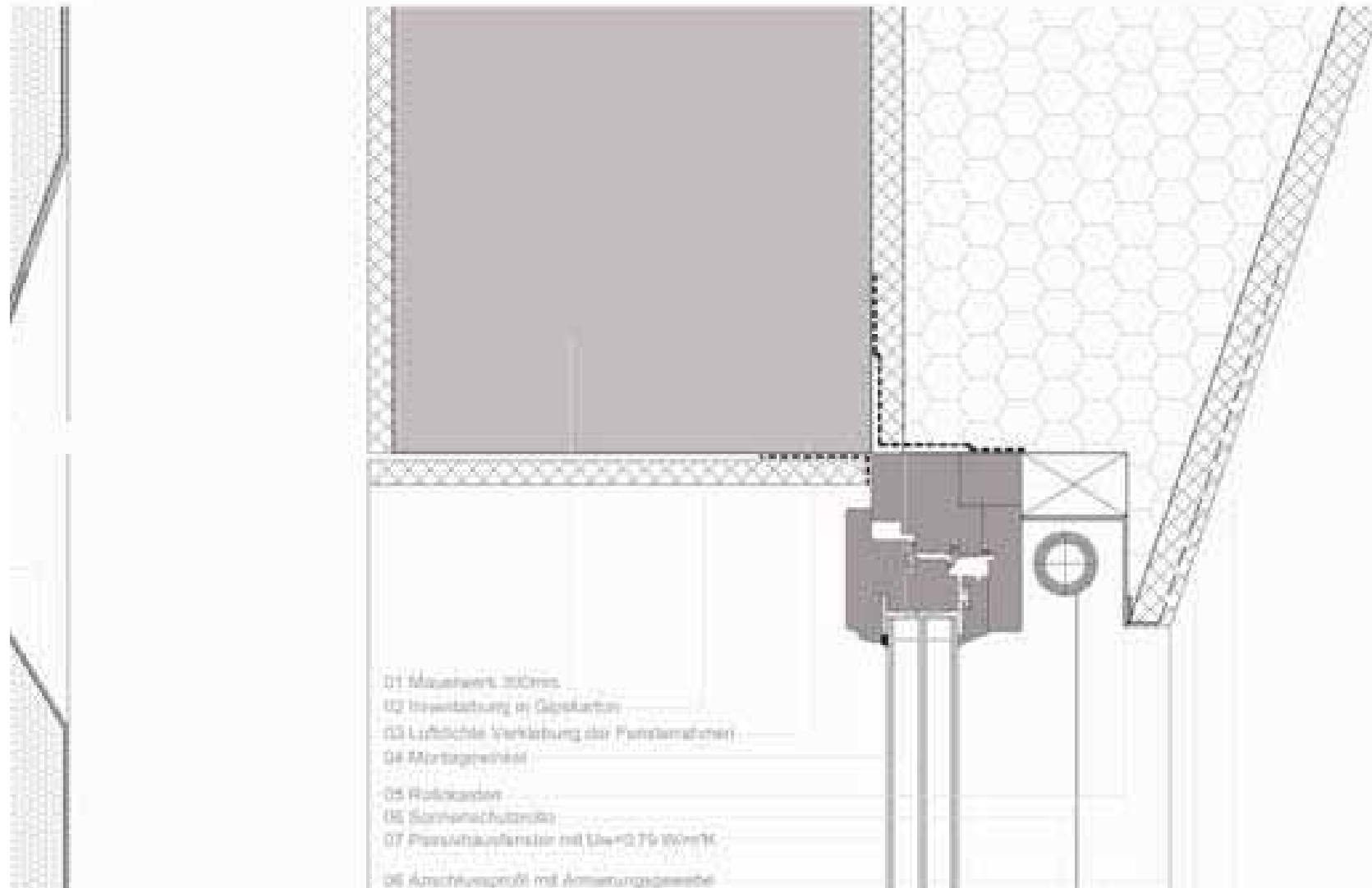
EXPOST



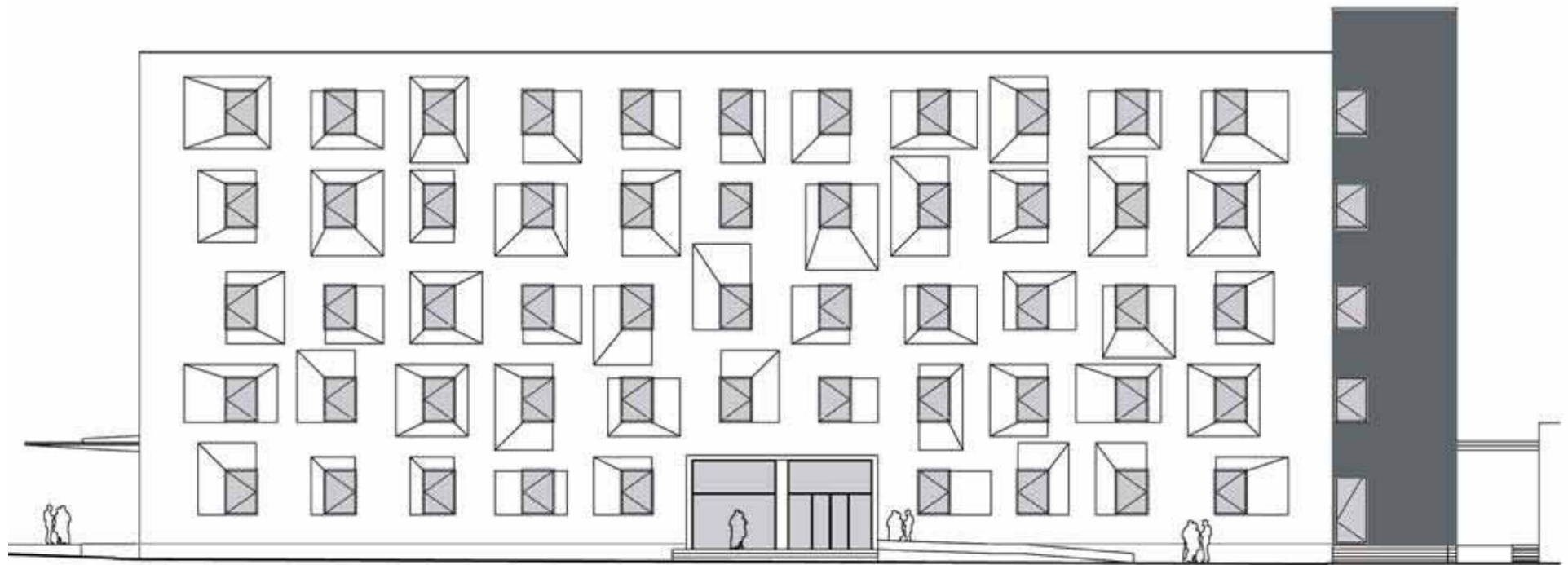
15

M 1:10

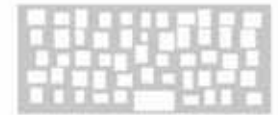
Vertikalschnitt Fenster M 1:2



EXPOST



EXPOST



aperture per le finestre

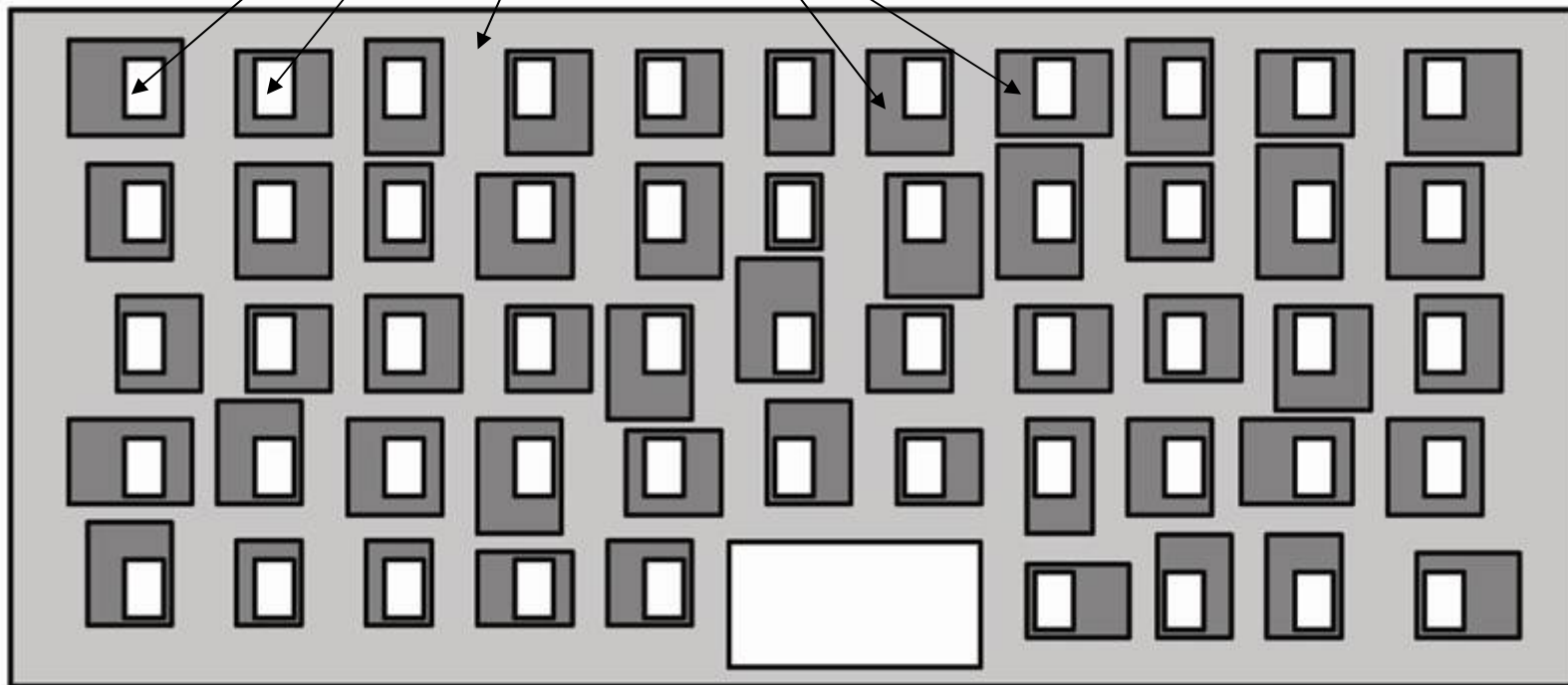
16% facciata

isolamento 35 cm

64% intonaco

sguinci

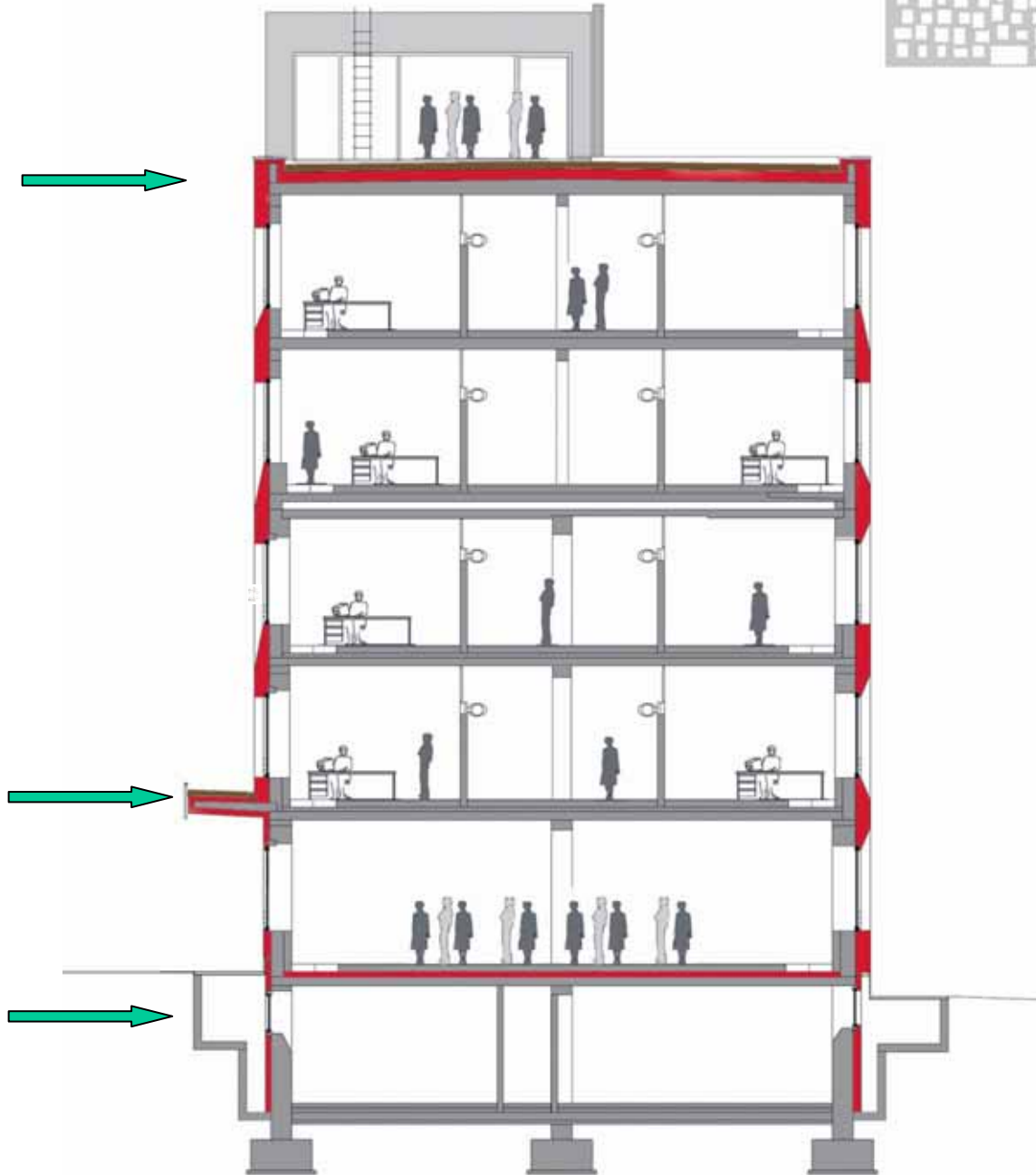
36% intonaco



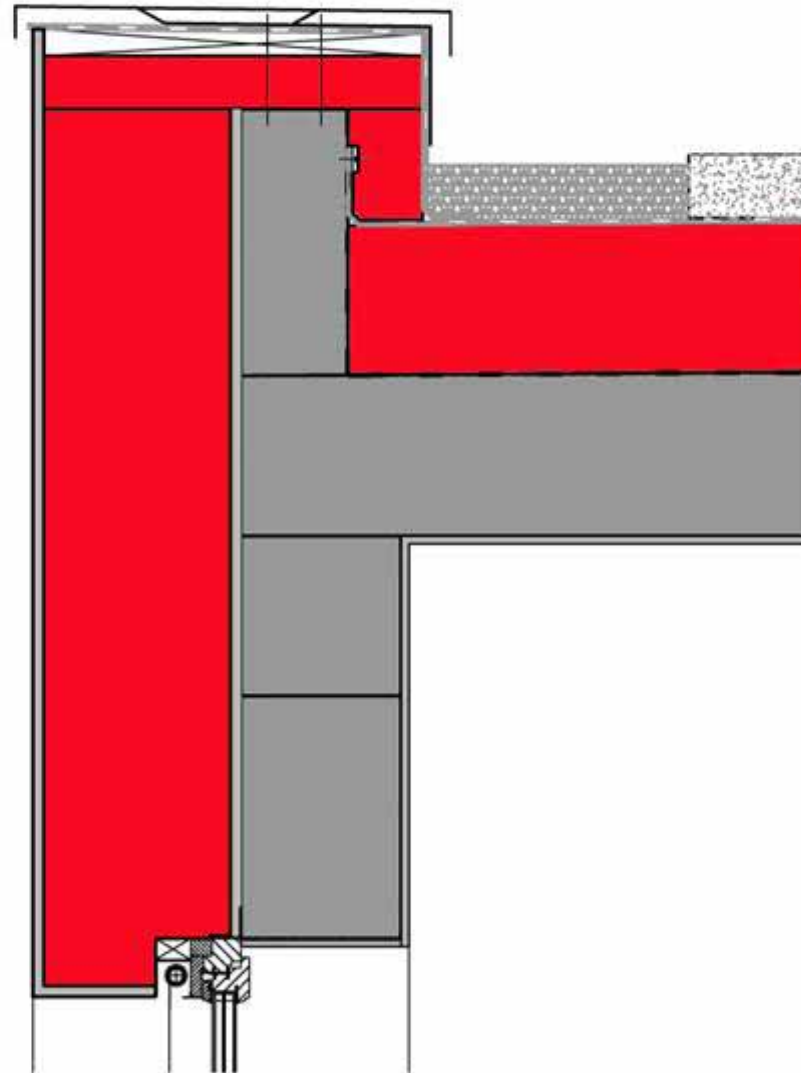
Fassadenfläche gesamt: 1106 m²

EXPOST

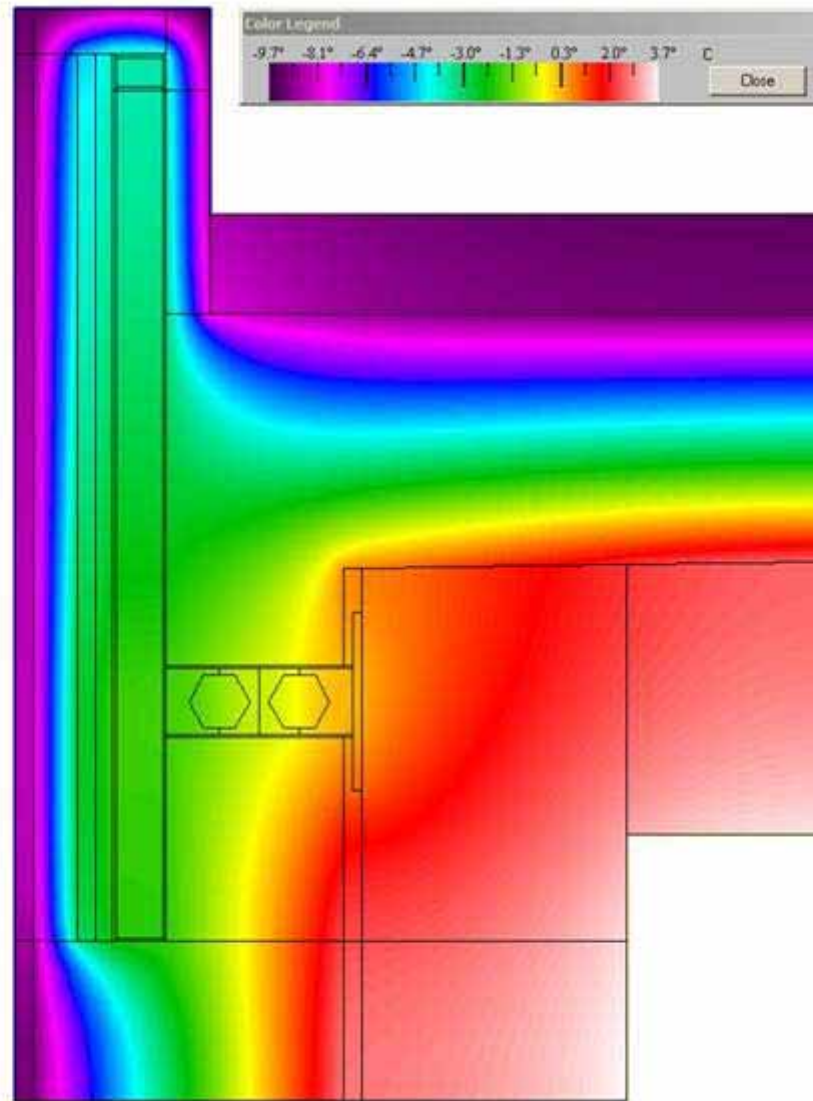
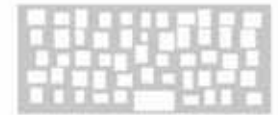
thermal bridge →



EXPOST



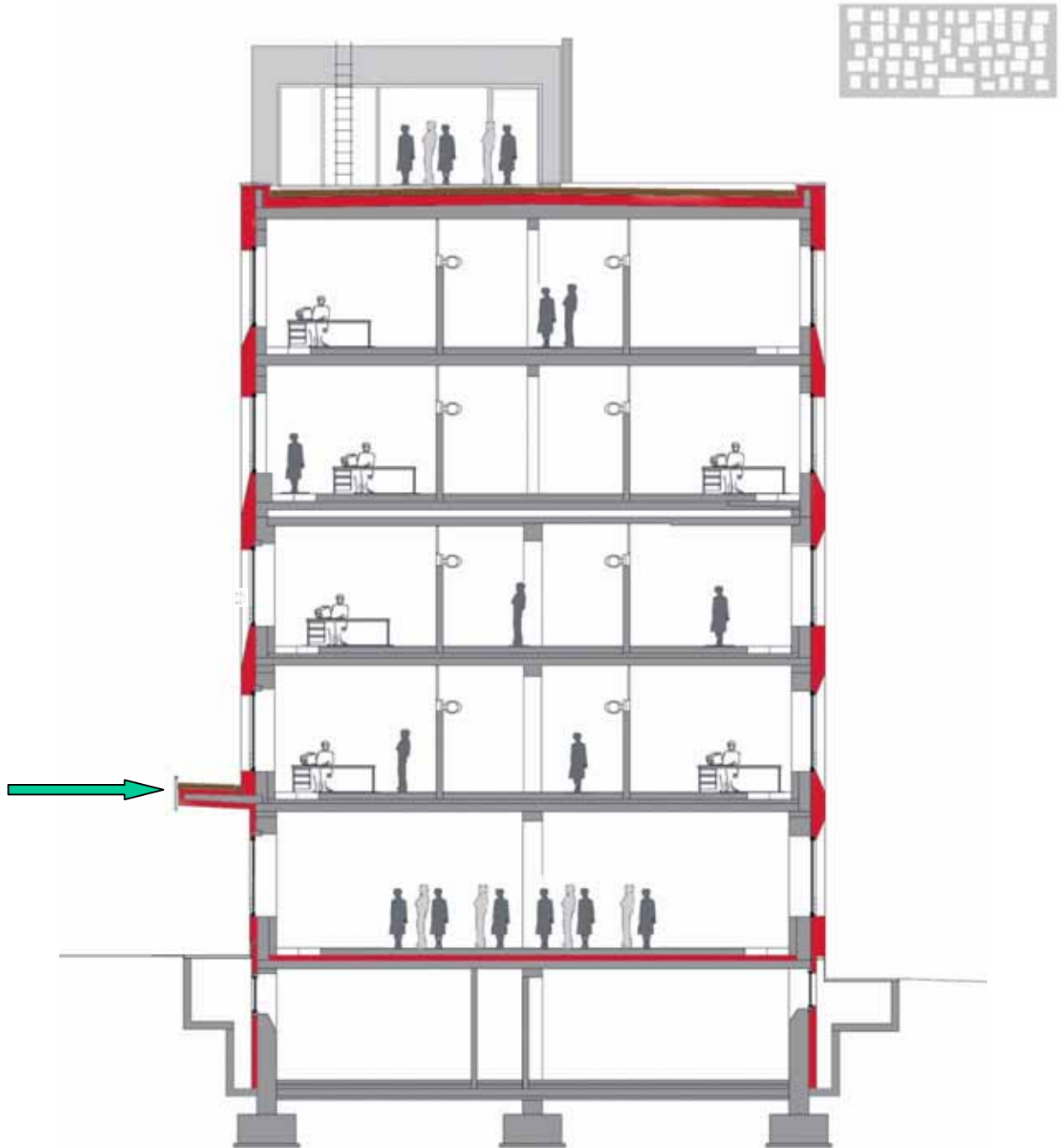
EXPOST



EXPOST

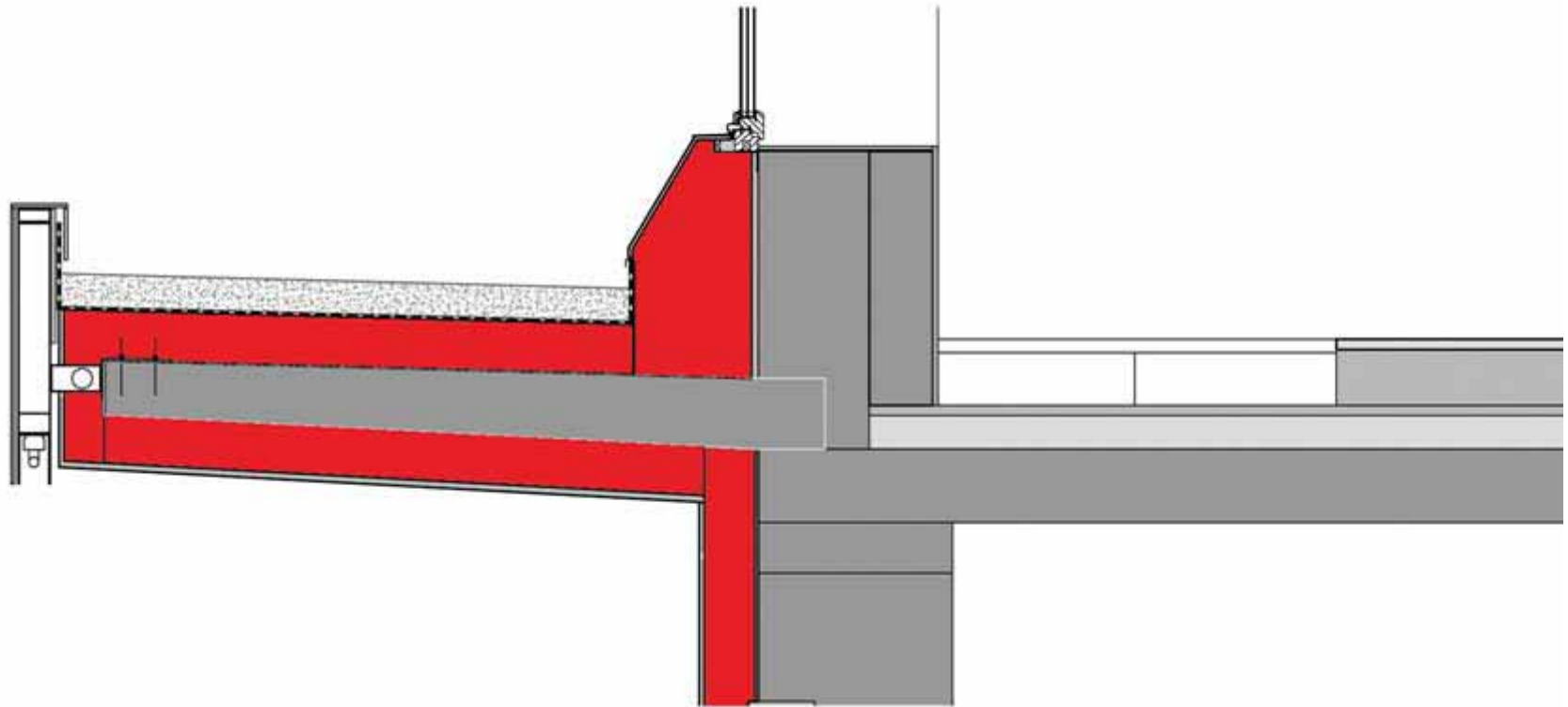
thermal bridge

canopy



EXPOST

canopy



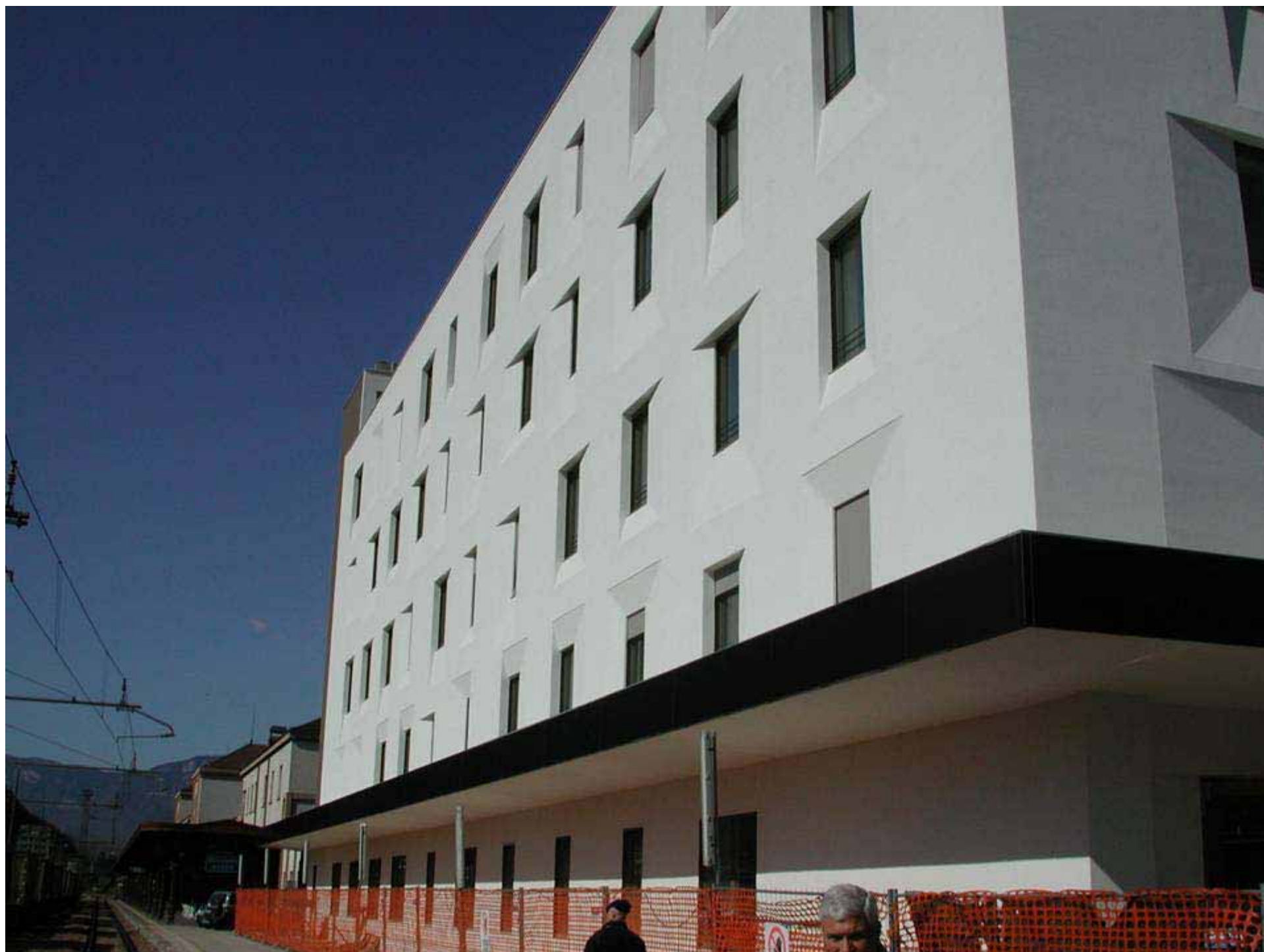
EXPOST



canopy



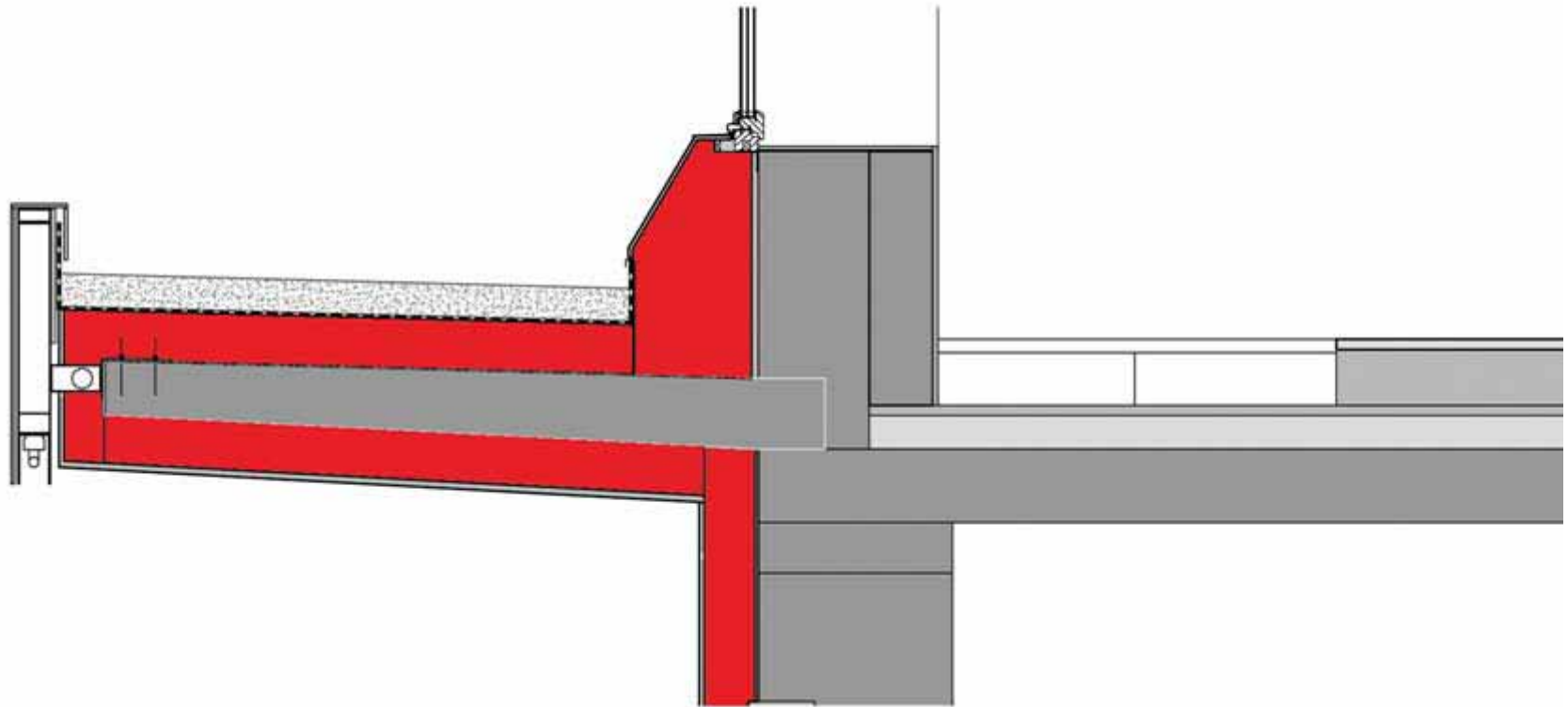






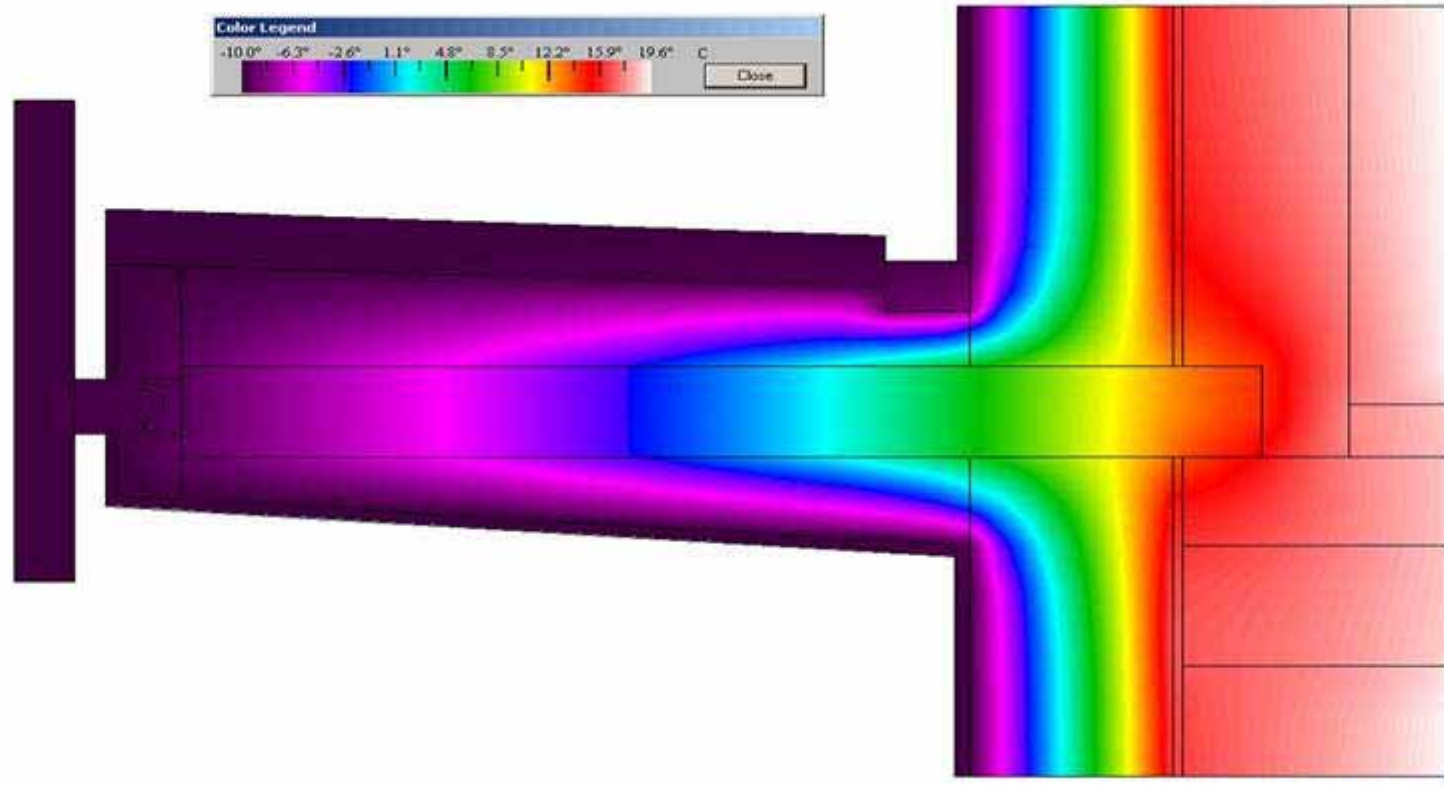
EXPOST

canopy



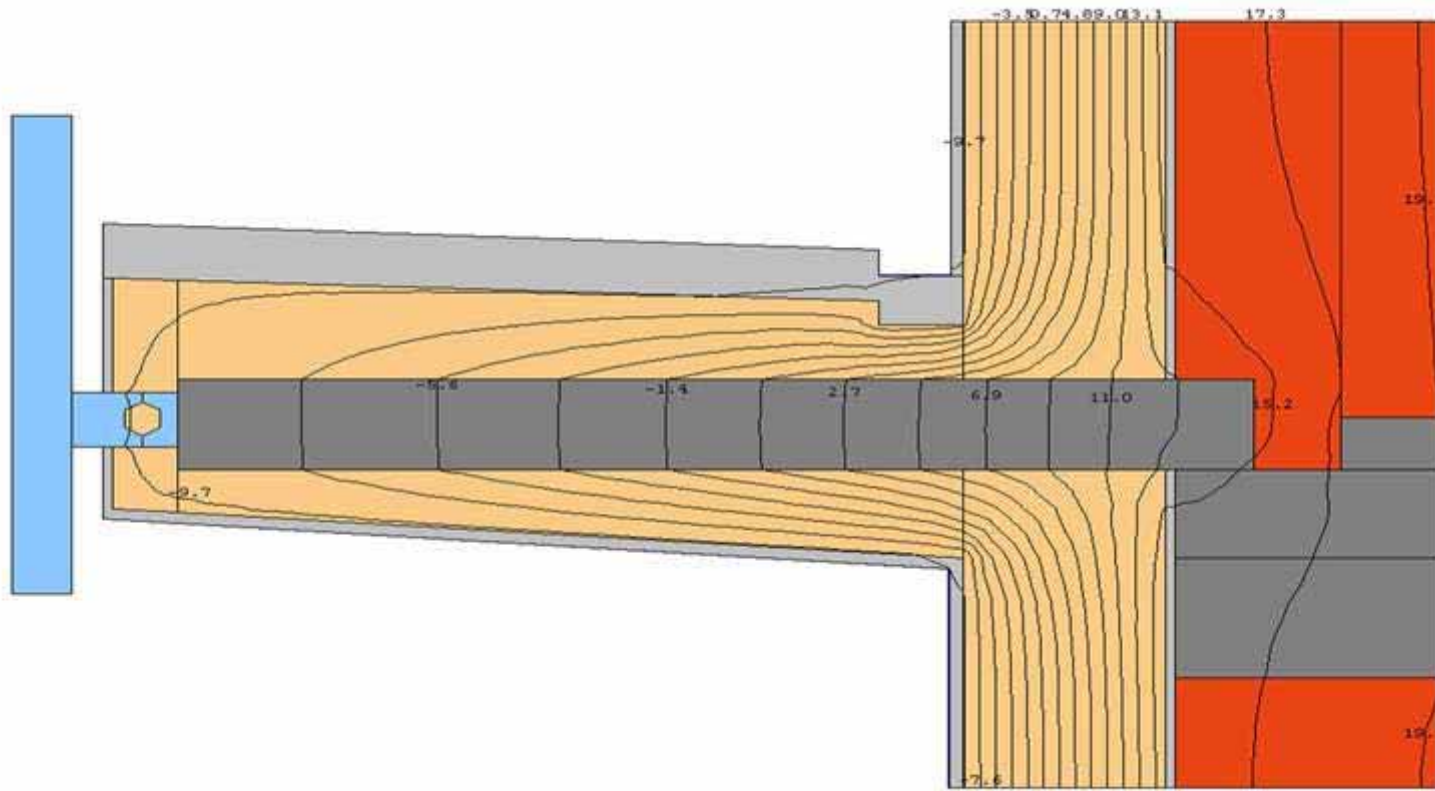
EXPOST

canopy

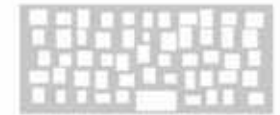


EXPOST

canopy

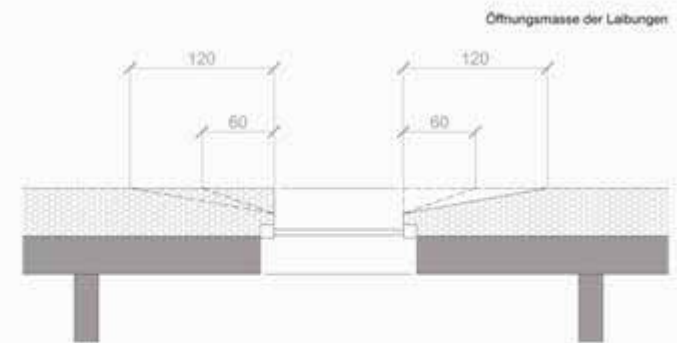
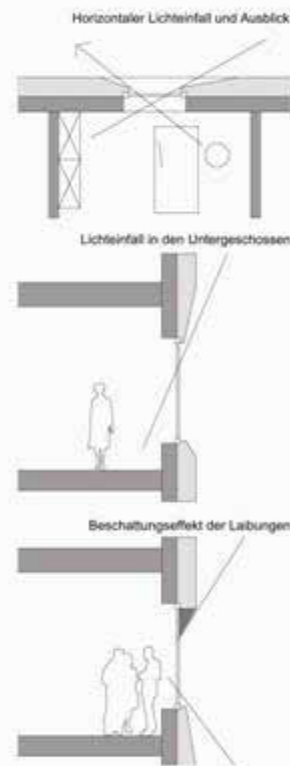
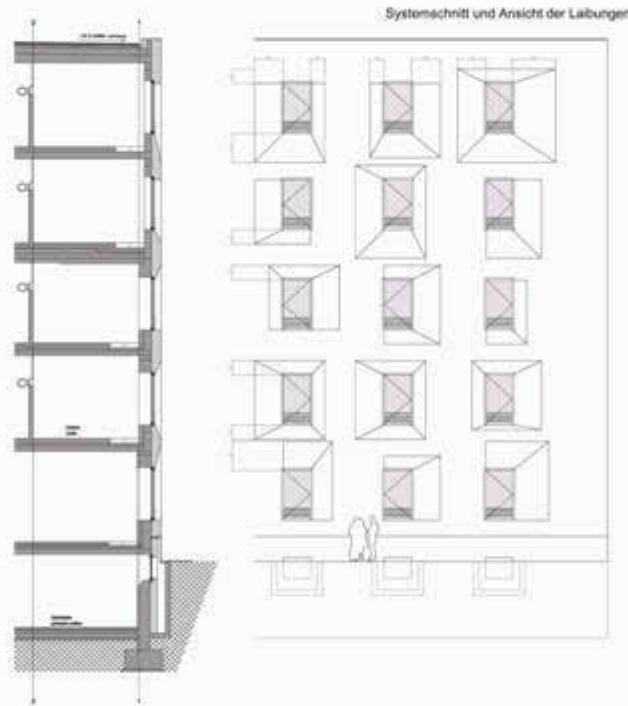


EXPOST



EXPOST BOZEN

1

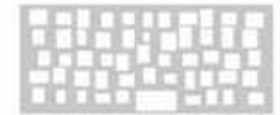


Umbau des Ehemaligen Postgebäudes in Bozen
System Fensterlaibungen

Michael Tribus Architecture
Oktober 2007

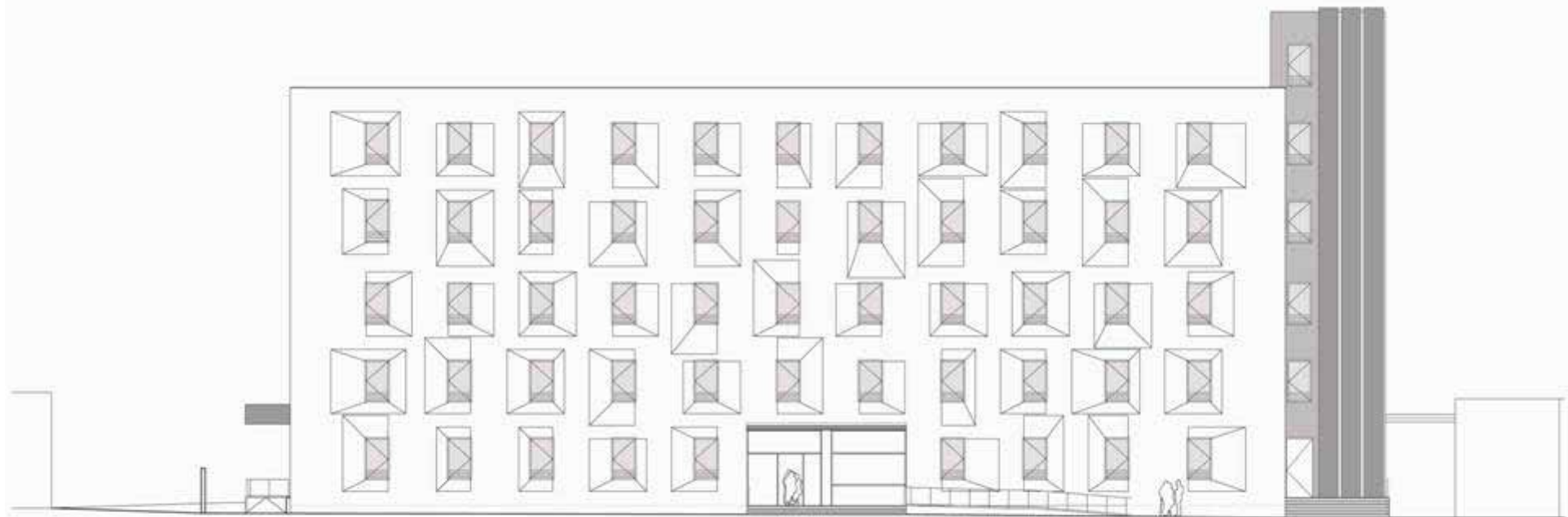


EXPOST



EXPOST BOLZANO

10

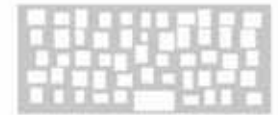


Adattamento di un ex-edificio postale per la sistemazione di Uffici Provinciali
Facciata Nord-Ovest M 1:100

Michael Tribus Architecture
Ottobre 2006

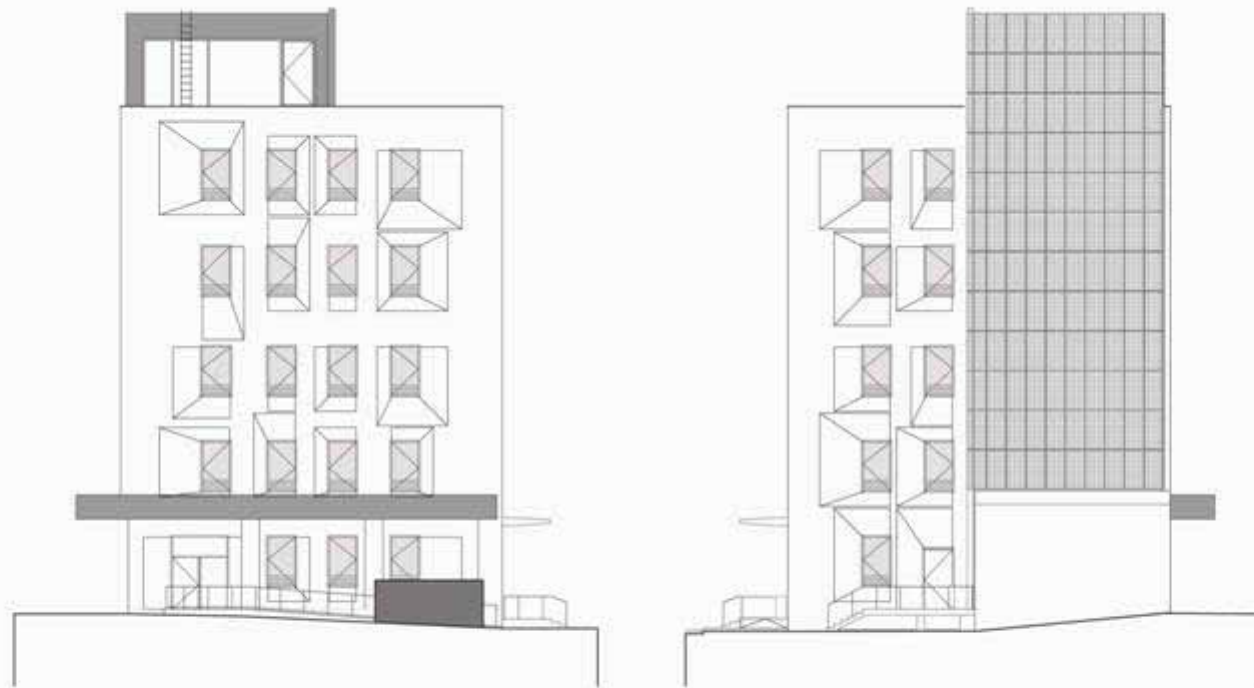


EXPOST



EXPOST BOLZANO

11

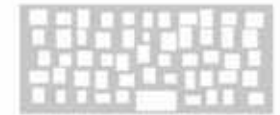


Adattamento di un ex-edificio postale per la sistemazione di Uffici Provinciali
Facciata Nord-Est / Sud-Ovest M 1:100

Michael Tribus Architecture
Ottobre 2006



EXPOST



EXPOST BOLZANO

12



Adattamento di un ex-edificio postale per la sistemazione di Uffici Provinciali
Facciata Sud-Est M 1:100

Michael Tribus Architecture
Ottobre 2006















Impianto fotovoltaico

- Superficie 212m²
- 162 moduli fotovoltaici
in tecnologia policristallina
- Potenza nominale del
modulo: 165Wp
- Potenza totale erogata: 26,73kWp
- Costo complessivo: 320.000€
- Periodo di ammortamento:
ciclo vitale del pannello

GUADAGNO:

**OLTRE 20 anni di
energia PULITA**

Monitoring





AMT FÜR BAU- UND
KUNSTDENKMÄLER
UFFICIO BENI
ARCHITETTONICI
E ARTISTICI

- Premio per ristrutturazione

2006 PREMIO DI ARCHITETTURA CITTA' DI ODERZO

- Progetto selezionato "Expost Bolzano"
- 2006 "Ottimizzazione energetica nelle ristrutturazioni: possibilità e soluzioni razionali"
- Premiazione del progetto "Expost Bolzano" in collaborazione con l'Ufficio pubblico di risparmio energetico e l'Agenzia provinciale per l'ambiente sotto la protezione della camera degli architetti.

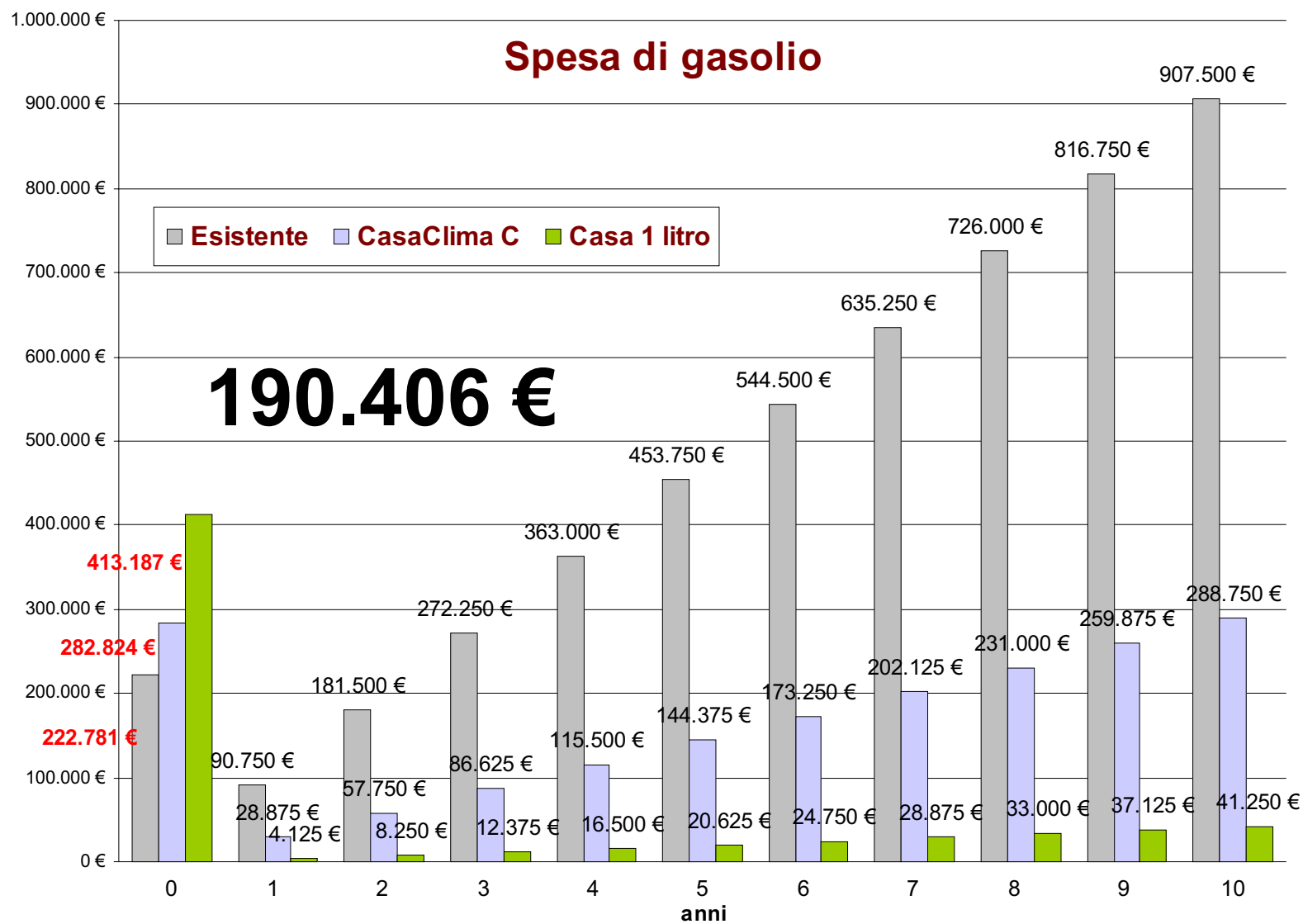


EXPOST

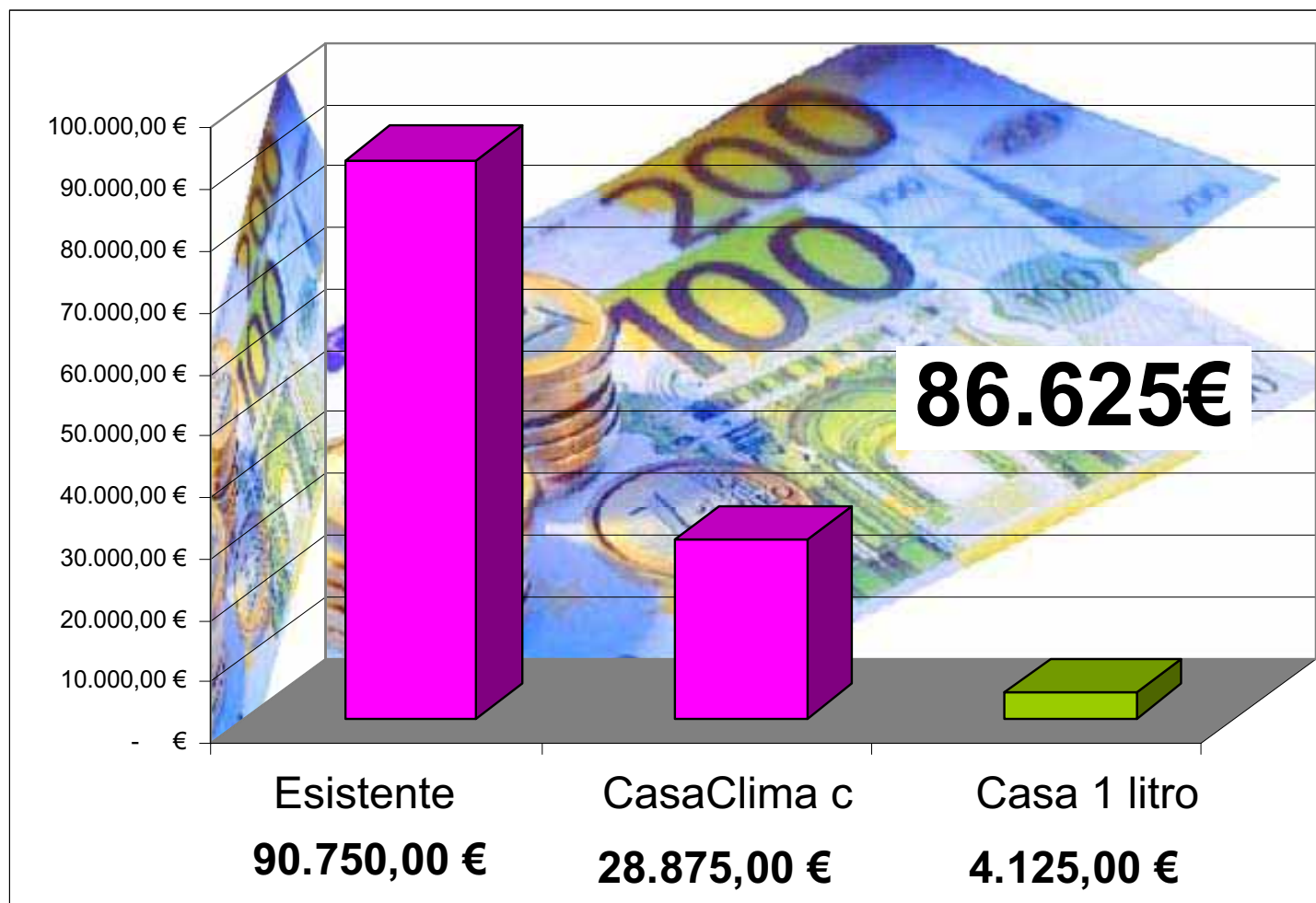
Costs

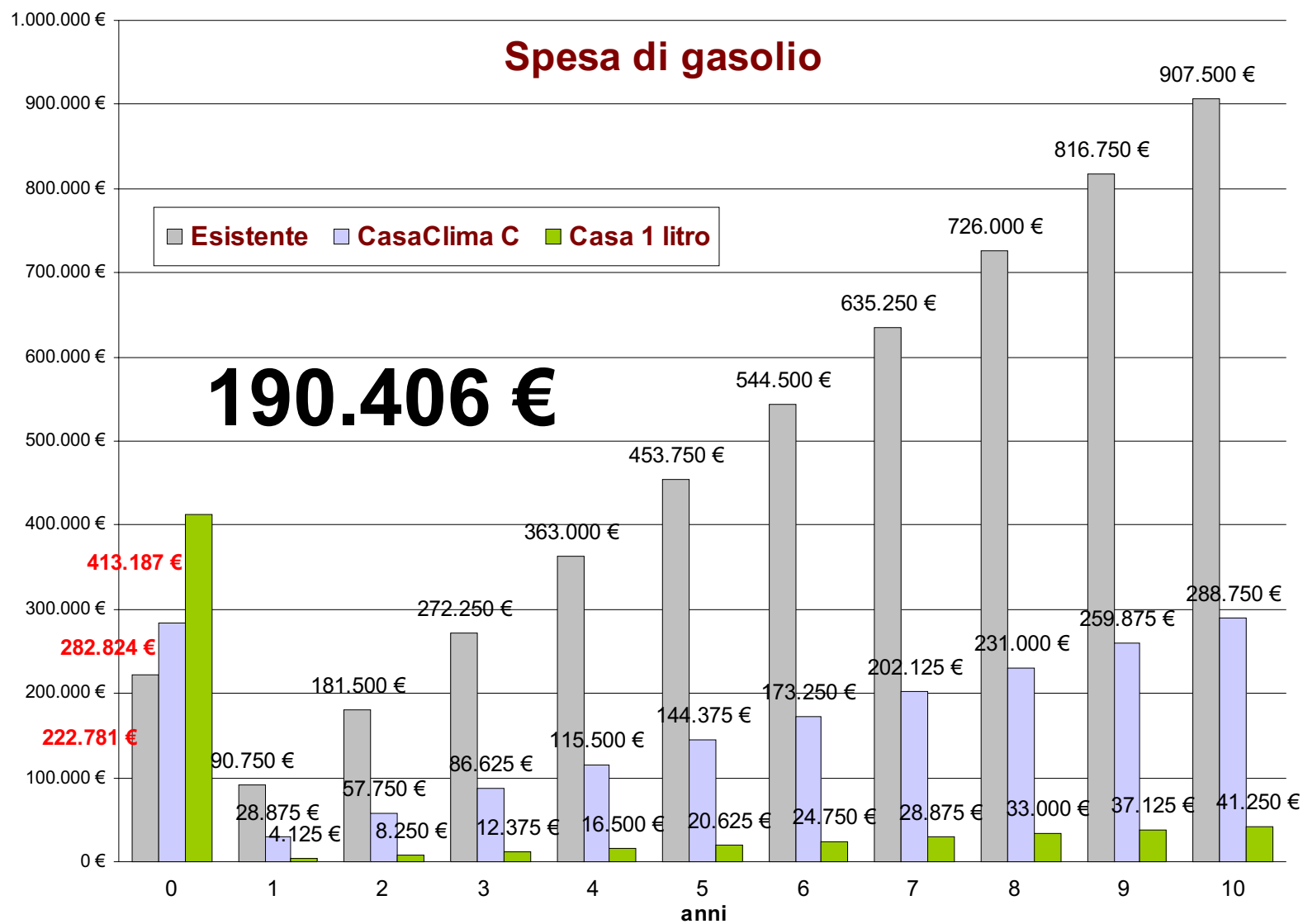
241€/m³ < 280€/m³
(=average costs of the
public buildings in the
last 10years)



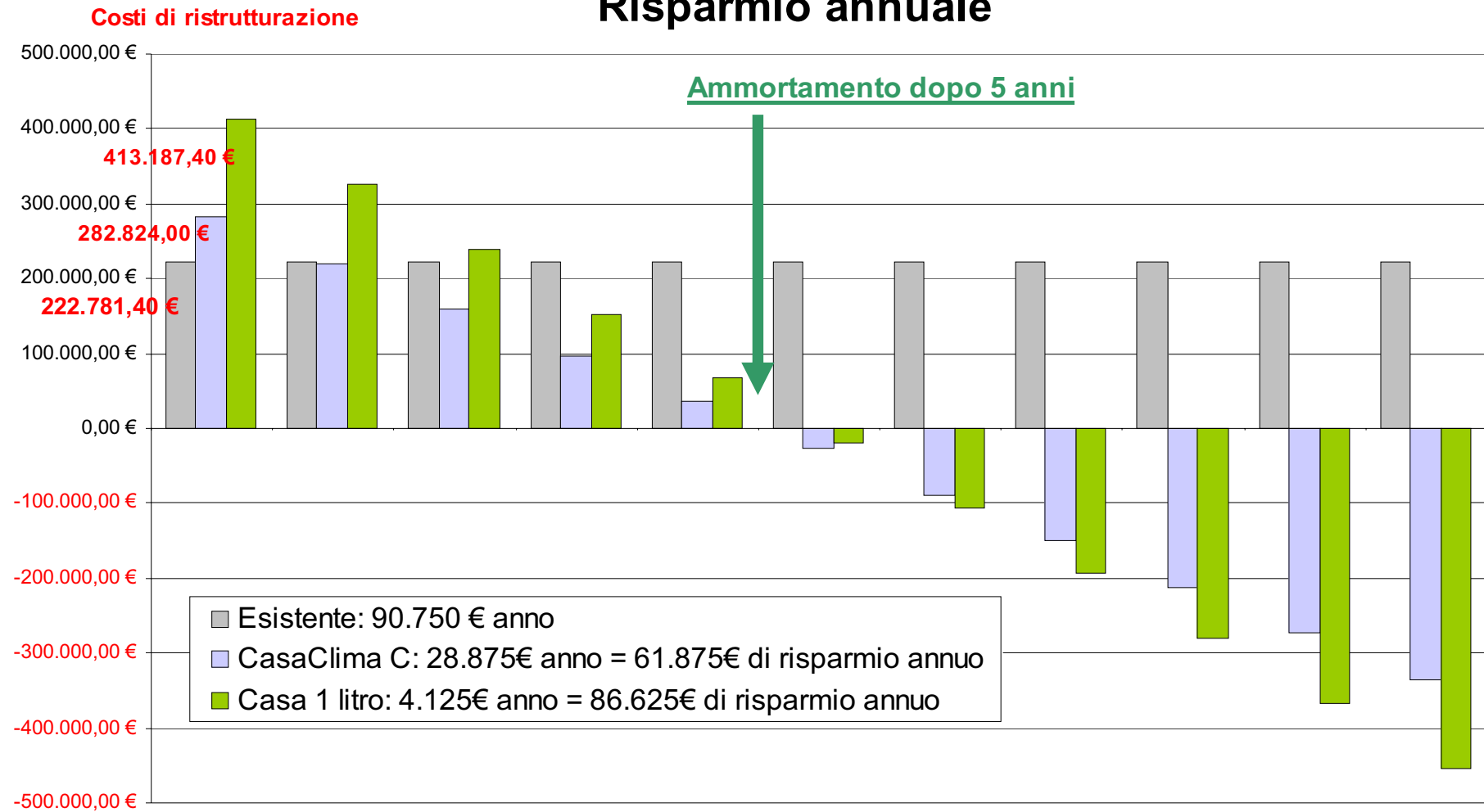


Spese annuali di gasolio

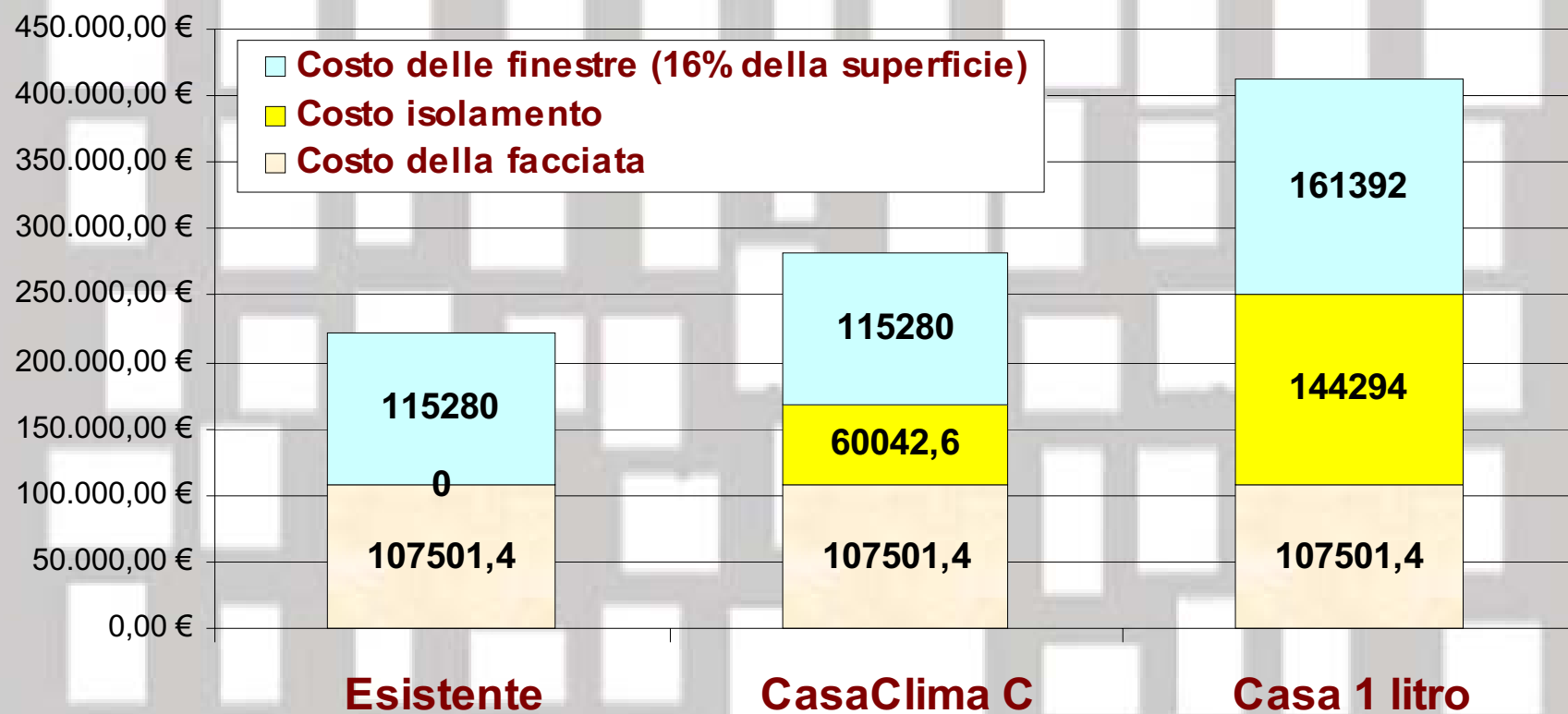




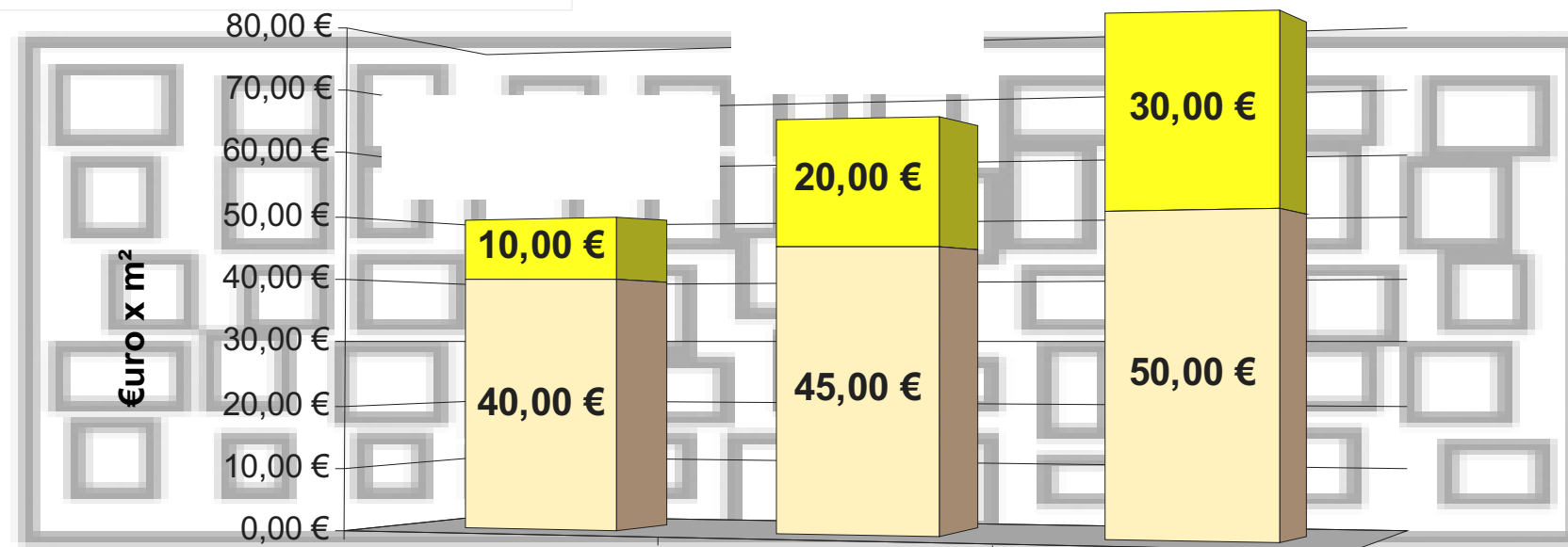
Risparmio annuale



Costi di ristrutturazione Expост



- Costo materiale (eps)
- Ponteggio + messa in opera



Spessore cappotto

10cm

20cm

30cm

50,00€

65,00€

80,00€

7 litri

4 litri

1 litro

100%

130%

160%



AMT FÜR BAU- UND
KUNSTDENKMÄLER
UFFICIO BENI
ARCHITETTONICI
E ARTISTICI

- Premio per ristrutturazione

2006 PREMIO DI ARCHITETTURA CITTA' DI ODERZO

- Progetto selezionato "Expost Bolzano"
- 2006 "Ottimizzazione energetica nelle ristrutturazioni: possibilità e soluzioni razionali"
- Premiazione del progetto "Expost Bolzano" in collaborazione con l'Ufficio pubblico di risparmio energetico e l'Agenzia provinciale per l'ambiente sotto la protezione della camera degli architetti.



www.expost.it



Building monitoring

Alexandra Troy - EURAC

•**Goal: provide reliable data on energy patterns and consumption under daily utilisation.**

→heat & cold demand

→gas & electricity demand

→electricity for

→ building services (ventilations & pumps)

→ lightning

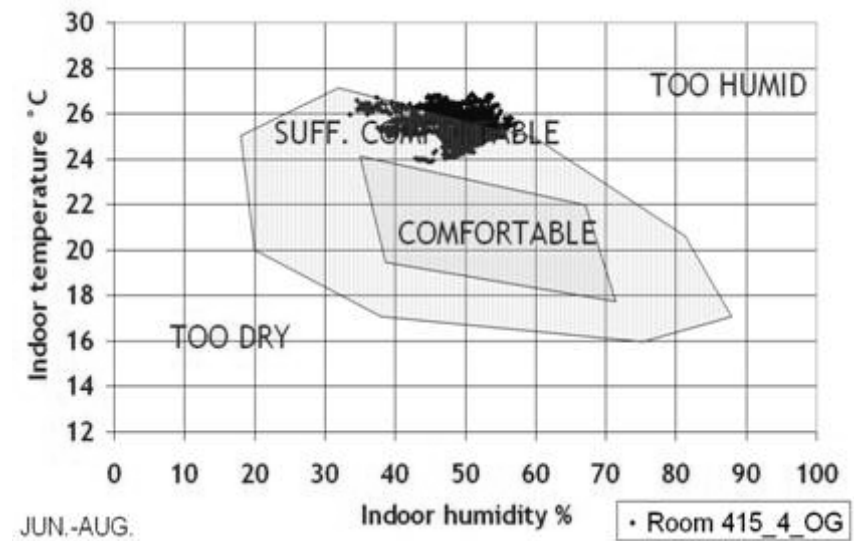
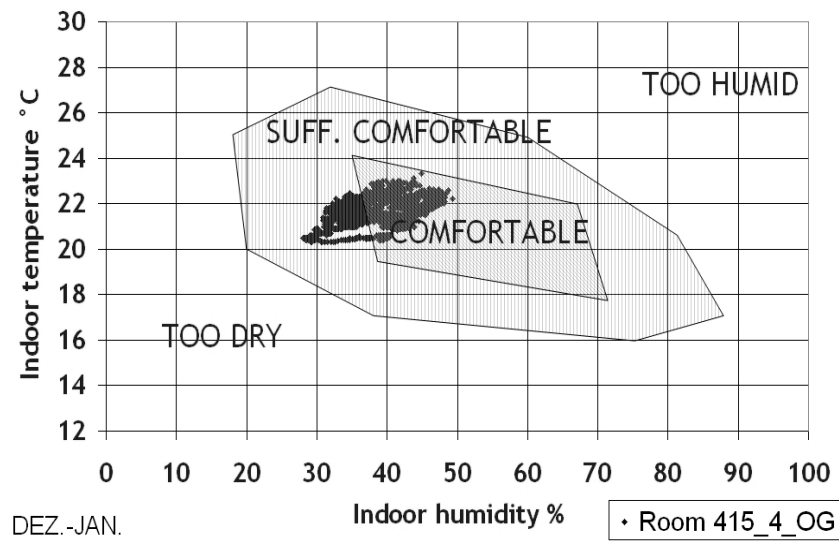
→ I&CT

→ domestic hot water

→two energy flows per floor measured (S/W-wing, N/E-wing)

→temperature, humidity & CO₂ (for last floor in single rooms)

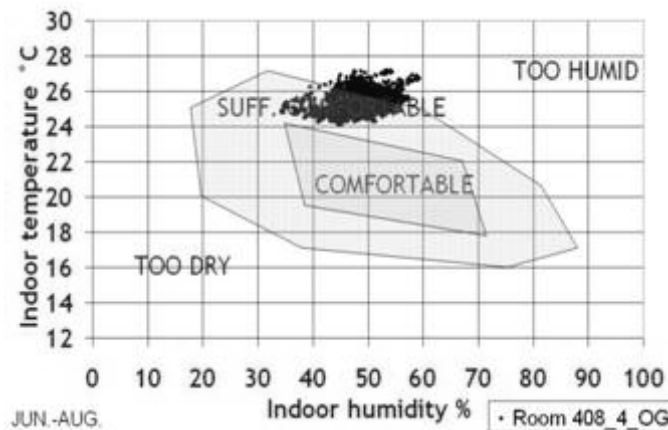
Indoor comfort



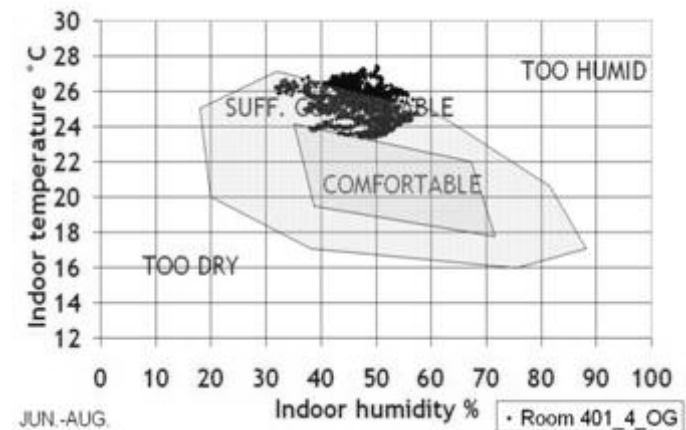
Indoor comfort

2-3 people
(9 resp.
11 m²/person)

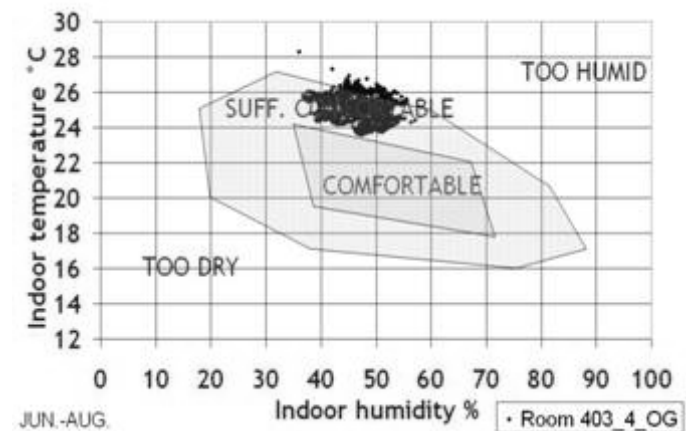
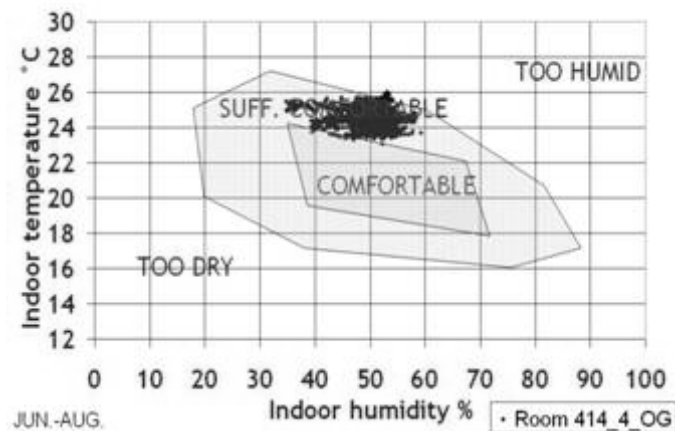
North-East



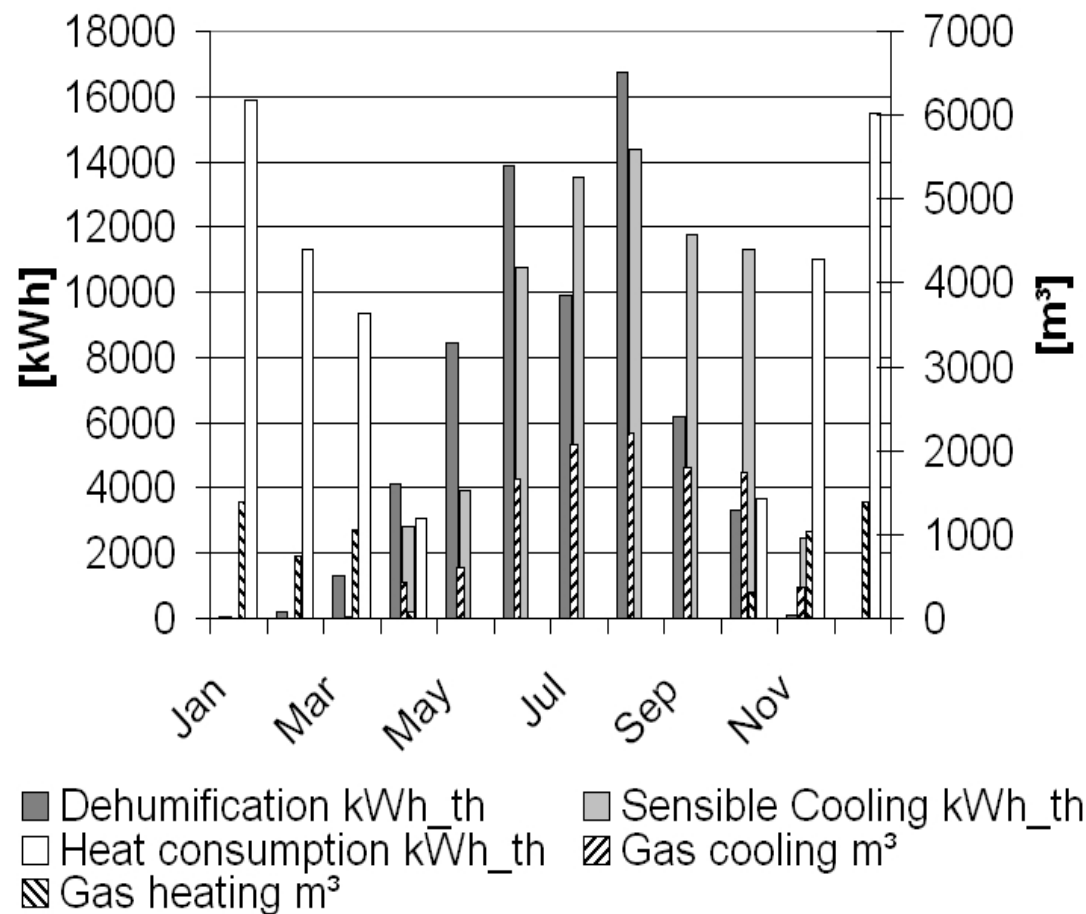
South-West



1 person
(17 m²/person)

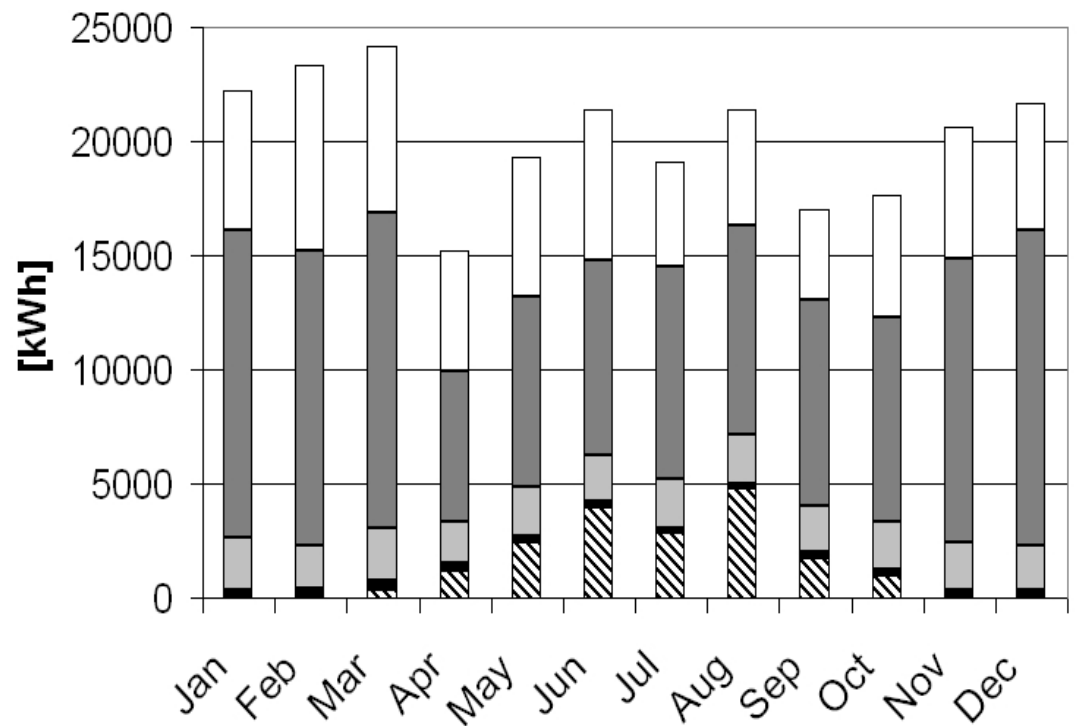


Energy Demand for Heating & Cooling



- Heating:
69'851 kWh
24.6
kWh/m²a
- Cooling:
135'232 kWh
64'258 kWh
latent
70'974 kWh
sensible
47.6
kWh/m²a

Electricity consumption



Dehumidification kWh_el
 ICT kWh_el
 Lighting kWh_el
 DHW kWh_el
 Building services kWh_el

- Heating: 69'851 kWh
24.6 kWh/m²a
- Cooling: 135'232 kWh
64'258 kWh latent
70'974 kWh sensible
47.6 kWh/m²a
- Electricity: 225'779 kWh
126'441 kWh building serv.
69'881 kWh lightning
24'710 kWh I&CT
3'817 kWh DHW
85.6 kWh/m²a

Primary energy demand

- Gas consumption for heating and sensible cooling
~17'000 m³
- → 185'000 kWh non-renewable primary energy consumption
- Electricity consumption for latent cooling, building services, lightning, ICT & DHW ~ 225'000 kWh
- → 400'000 kWh non-renewable primary energy consumption
- = 585'000 kWh non-renewable primary energy consumption
- → 205 kWh/m²a

Primary energy demand

Gas consumption for heating and sensible cooling $\sim 17'000 \text{ m}^3$

→ 185'000 kWh non-renewable primary energy consumption

185'000 kWh primary energy consumption

Electricity consumption for latent cooling, building services, lightning, ICT & DHW $\sim 225'000 \text{ kWh}$

→ 400'000 kWh non-renewable primary energy consumption

505'000 kWh primary energy consumption

= 585'000 kWh non-renewable primary energy consumption

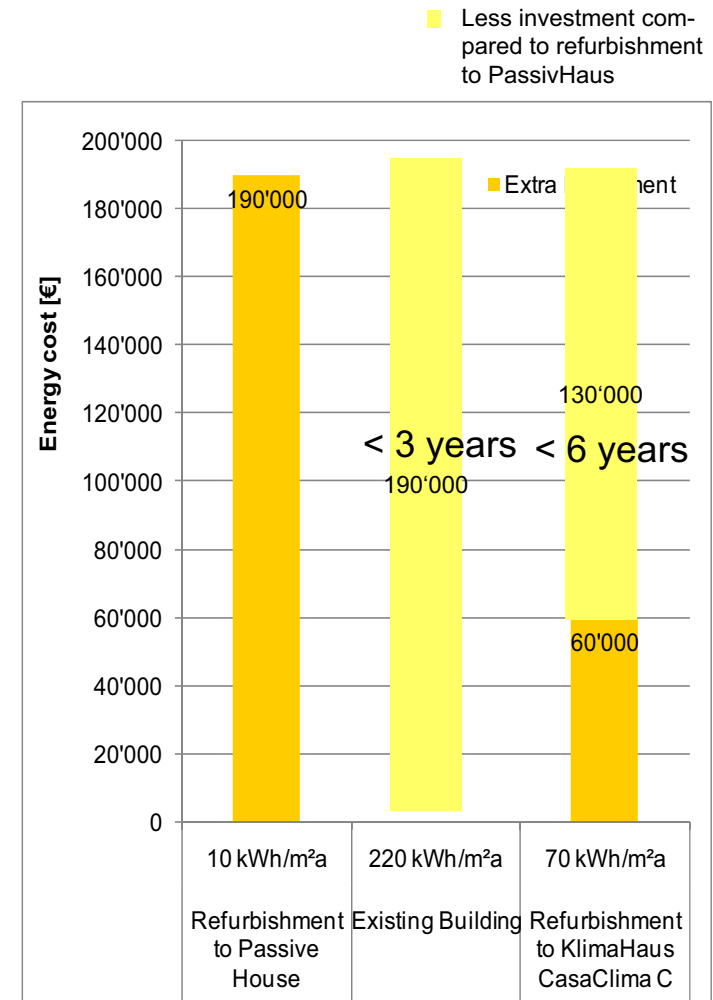
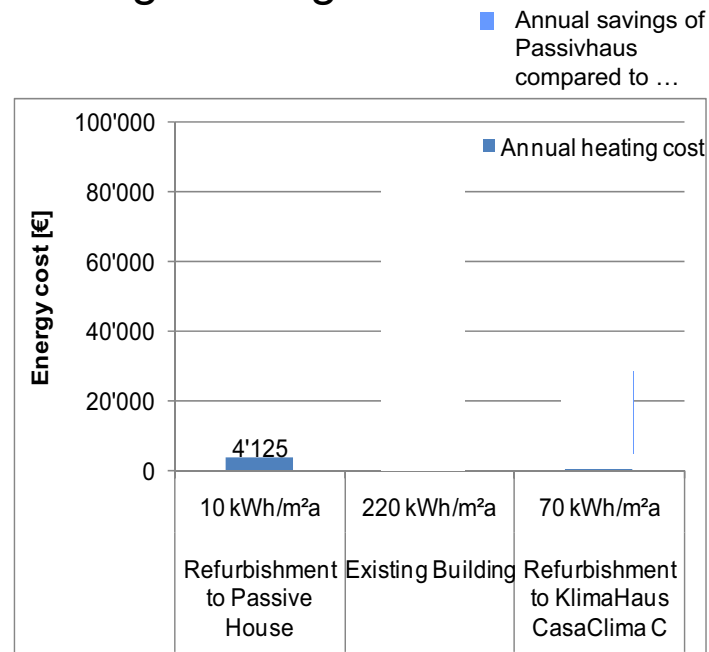
→ 205 kWh/m²a

690'000 kWh primary energy
consumption
240 kWh/m²a

Construction cost

- Net construction cost of the renovation – including monitoring, green roof and PV unit (assessed by the architect): 241 €/m³

- Additional cost for high-grade building envelope +3% compared to a renovation according building code



Conclusions

- Good indoor air quality has been confirmed
- Successful shading implementation → equal temperatures N/E and S/W
- Heating demand higher than calculated, but nevertheless nearly factor 8 compared to existing building
- Cooling demand with 47.6 kWh/m²a rather “conventional”, BUT uncertainty in data reliability - cross check with consumption sum of single fan-coils leads to potentially better performance up to factor 3
- Primary energy consumption > limit for Passivhaus
 - Optimisation potential regarding primary energy demand!
- Control optimisation, building automation, internal load reduction, passive cooling → 120 kWh might be reached