

Stefan Goebel

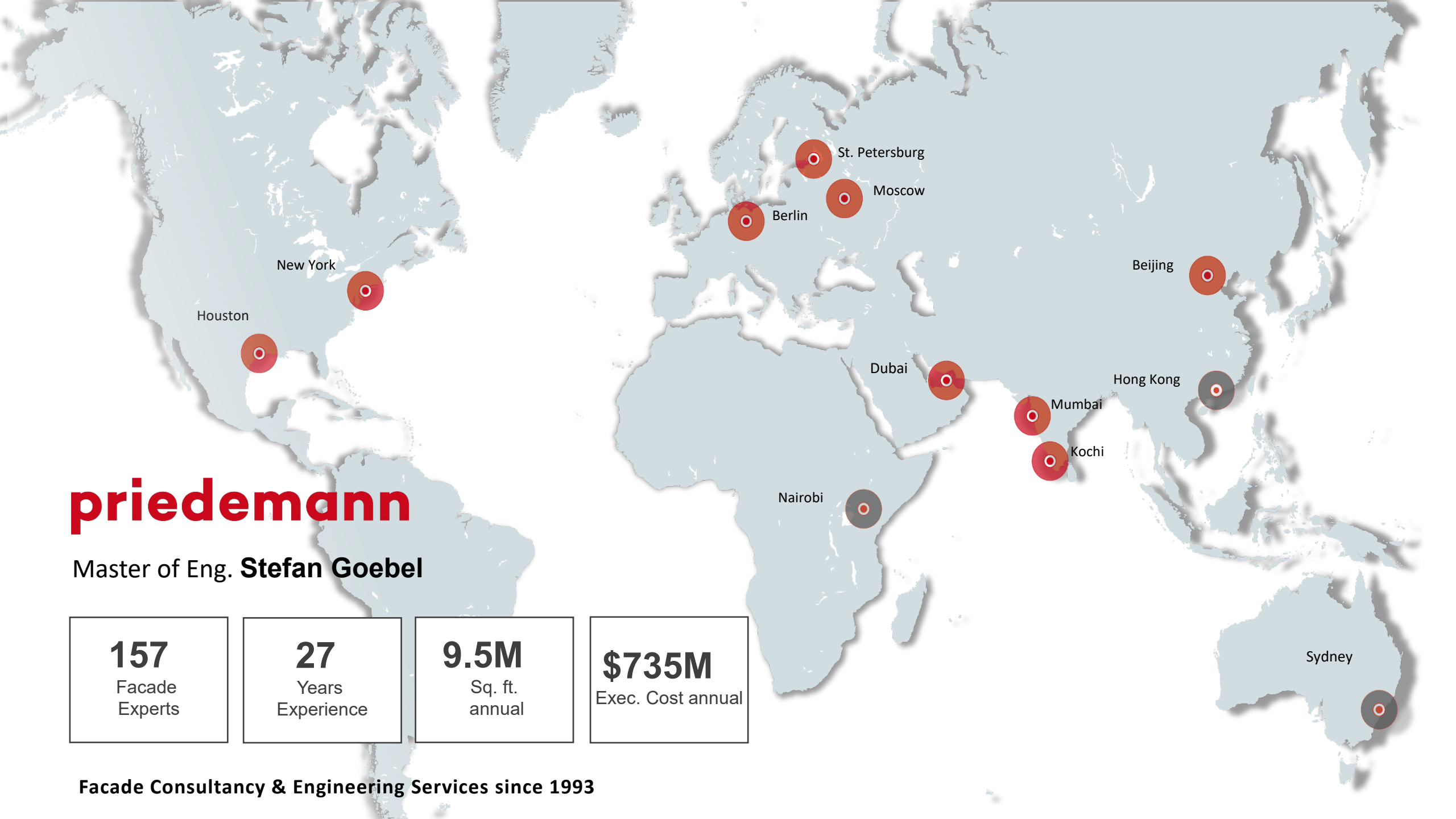
M. Eng., CPHC, LEED Green Associate

Paul Denz

Dipl.-Ing. & Architect



How the ACT Façade Contributes to Scaling up Passive House



priedemann

Master of Eng. **Stefan Goebel**

157

Facade
Experts

27

Years
Experience

9.5M

Sq. ft.
annual

\$735M

Exec. Cost annual

Facade Consultancy & Engineering Services since 1993

Projects Germany



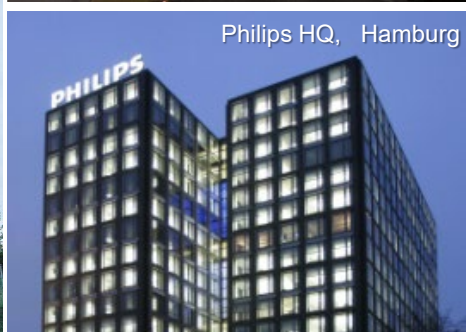
Museum for Architectural Drawings, Berlin



Zoofenster Waldorf Astoria Hotel, Berlin



Festo AutomationCenter, Esslingen



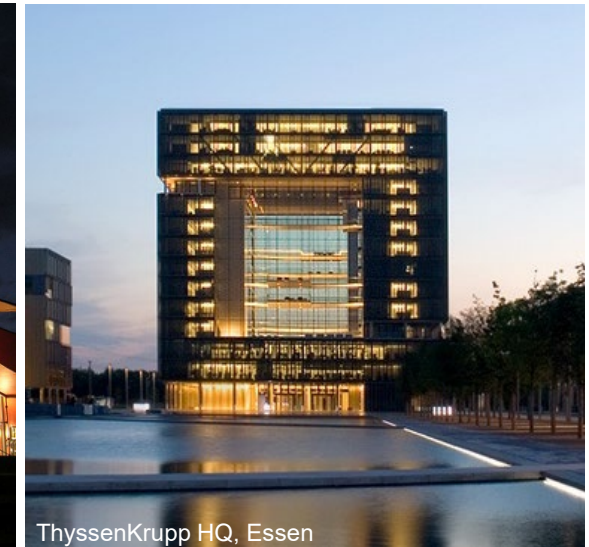
Philips HQ, Hamburg



Potsdamer Platz, Berlin



Hans Otto Theatre, Potsdam



ThyssenKrupp HQ, Essen



SAP Headquarters, Walldorf



Porsche Pavilion, Wolfsburg



Otto Bock Centre, Berlin



Grand Hotel, Heiligendamm



German Pavilion, Hannover



Dresden Castle, Dresden



Eastgate Centre, Berlin

Projects Middle East



IIB & WTC, Doha



Landmark Tower, Abu Dhabi



Grand Masjed Mosque, Al Ain



NPP Tower, Doha



Qatar Petroleum District, Doha



CBK, Kuwait



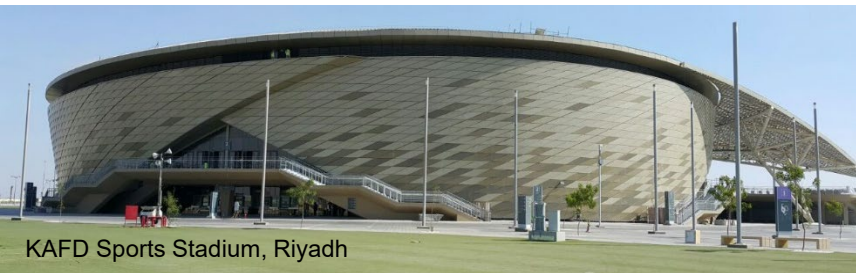
Etisalat Building, Dubai



Al Ain Hospital, Al Ain



Skygate, Beirut



KAFD Sports Stadium, Riyadh



Mall of Qatar, Doha



Al-Tijaria Tower, Kuwait

Projects America





Carbon Neutral 2050



**AR6 Climate Change
2021:
NYC: LL97**

The image features the IPCC logo in large blue letters, with 'INTERGOVERNMENTAL PANEL ON climate change' written below it. To the left of the IPCC logo is the American Forests logo, which includes a tree icon and the text 'AMERICAN FORESTS SINCE 1875'. To the right are the logos for the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP). The background of the entire block is a photograph of a lush green forest with rolling hills in the distance under a blue sky with white clouds.





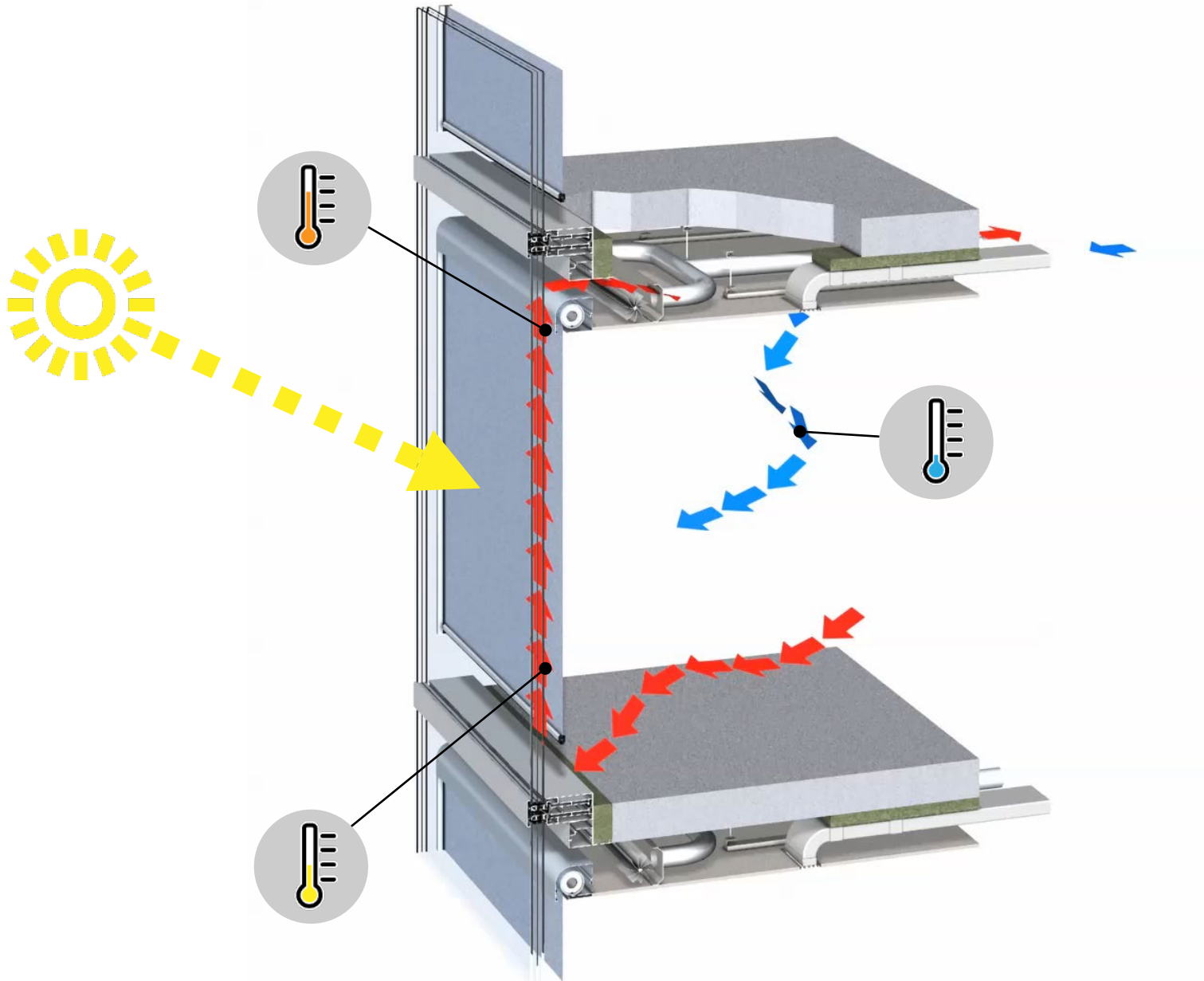
Festo AutomationCenter, Esslingen, Jaschek Architekten



Festo AutomationCenter, Esslingen, Jaschek Architekten

ACT Facade

Active Cavity Transition



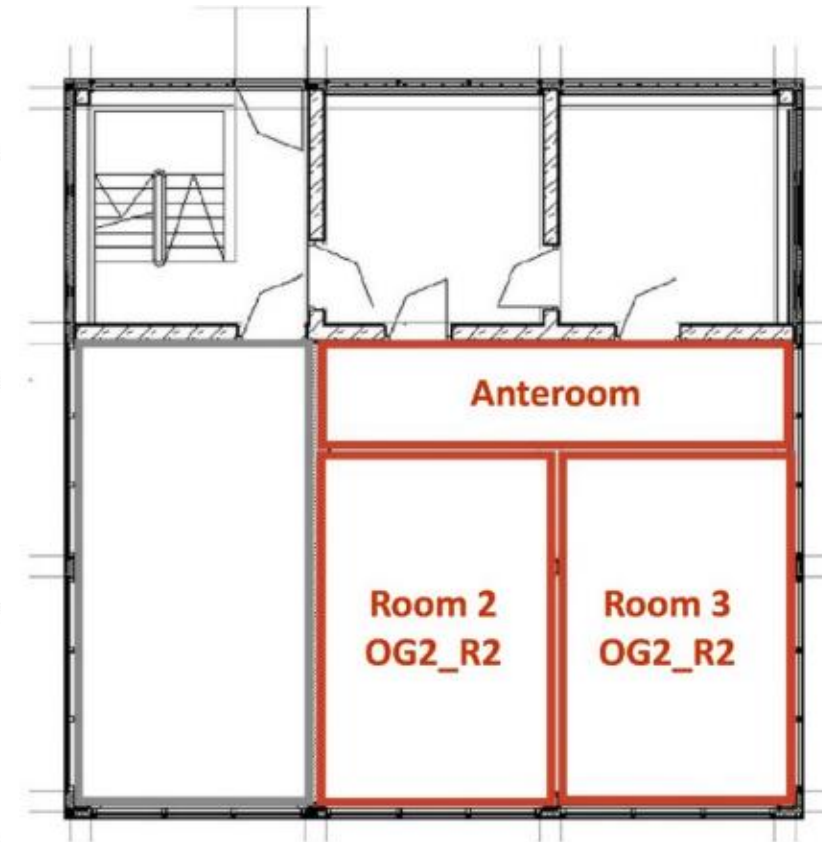
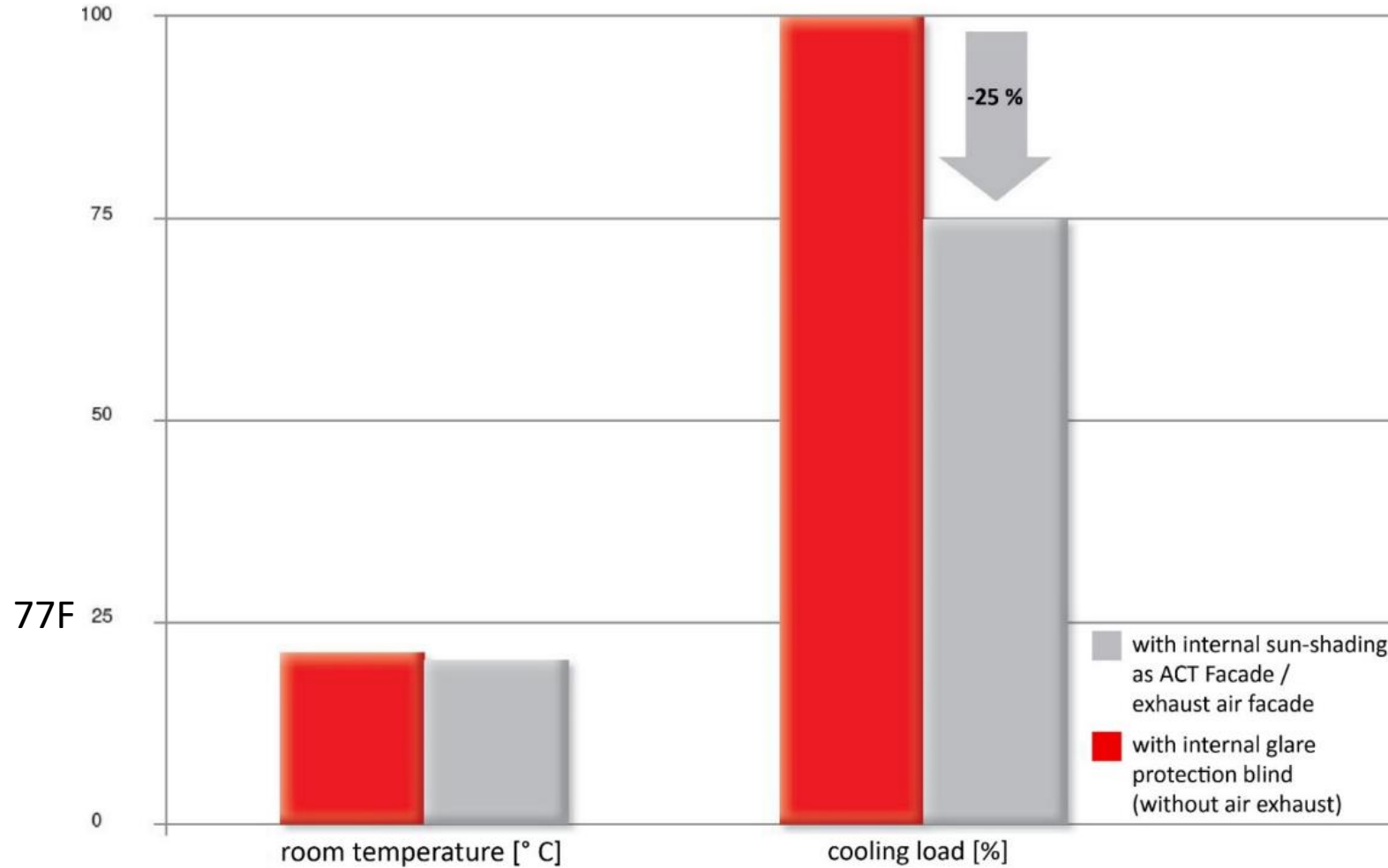


In-situ measurements, Fraunhofer IBP



Twin rooms

25% Cooling load reduction



SHGC calculation / WinSLT

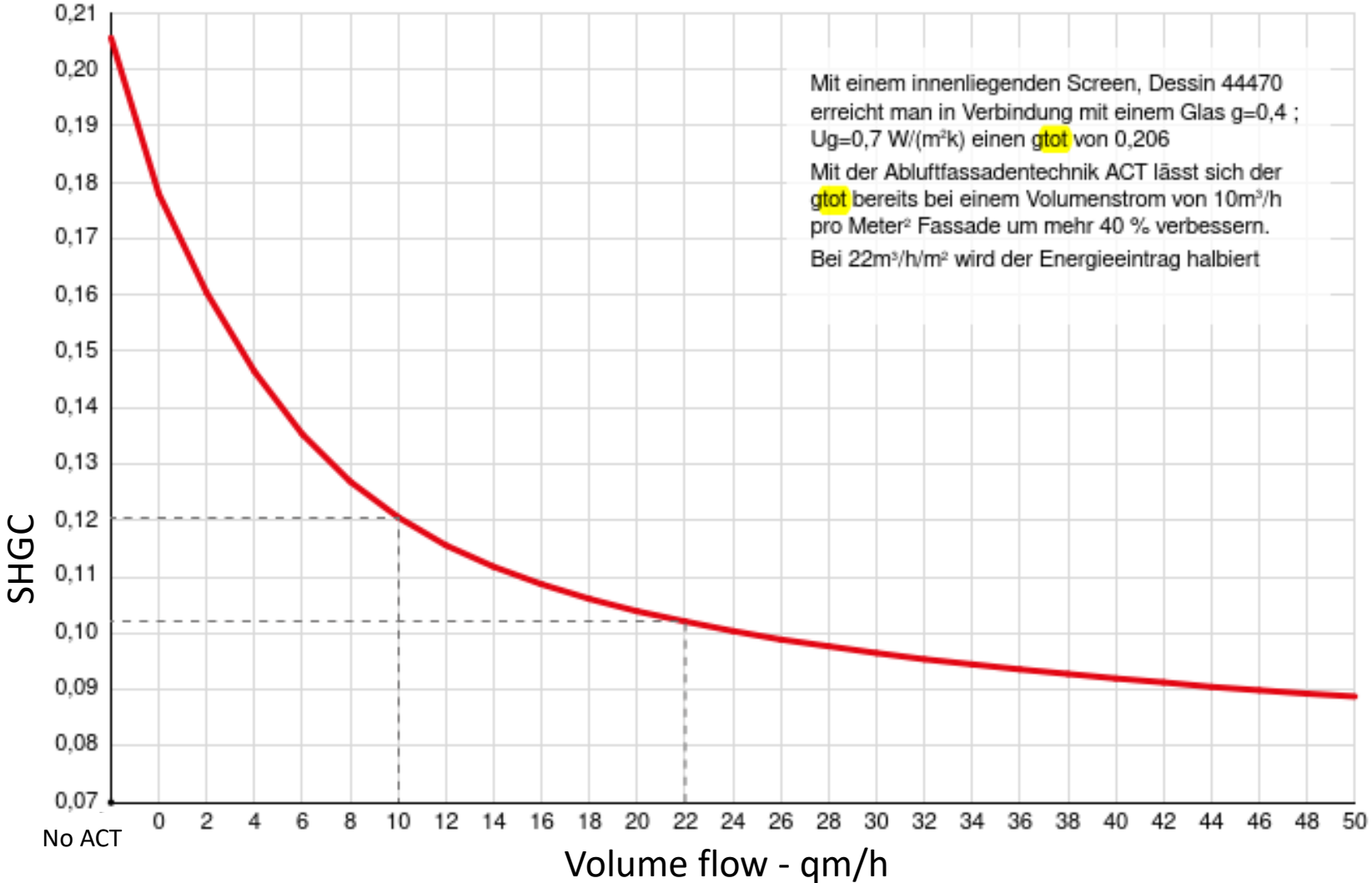


Abb x. Gesamtenergiedurchlassgrad in Abhängigkeit vom Volumenstrom in der ACT-Fassade¹

¹Innenliegender Screen Dessin 44470 mit $p_e=0,83$ und $r_e=0,04$, Verglasung $U_g=0,7 \text{ W}/(\text{m}^2\text{K})$, $g=0,4$, Spaltbreite 100 mm, Fassadenbreite 1m, Fassadenhöhe 1m

Monitoring / DGNB Platinum

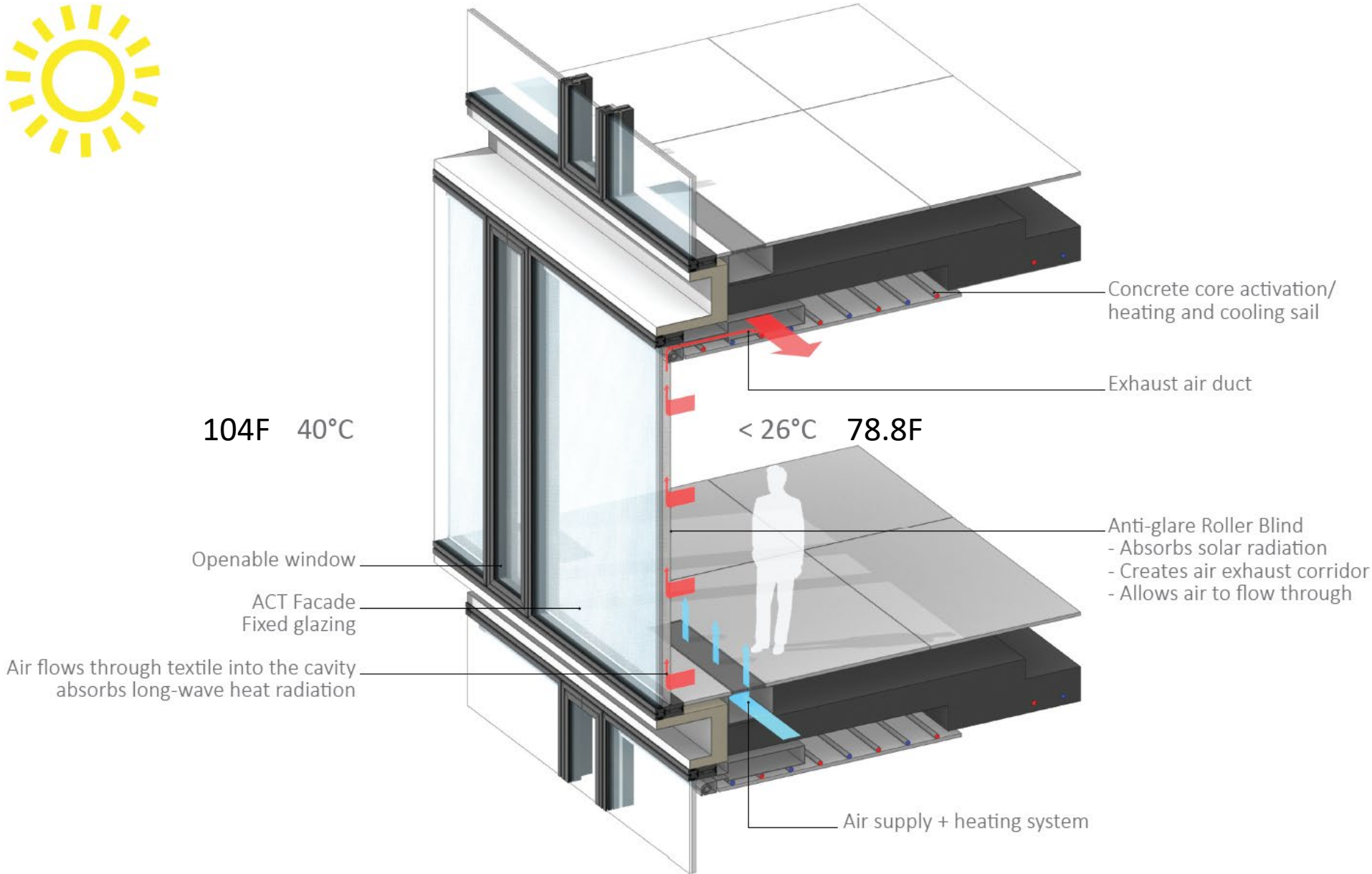


Continental Headquarter, Hannover



Continental

Continental HQ

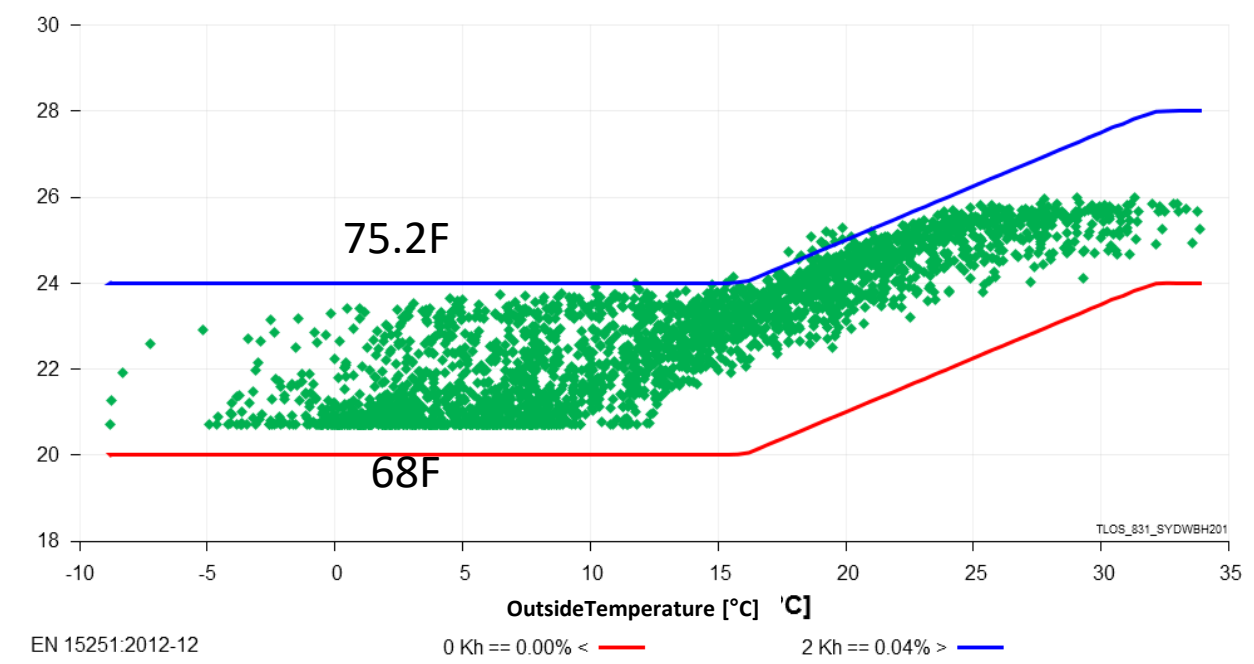


In-situ measurements, Fraunhofer IBP

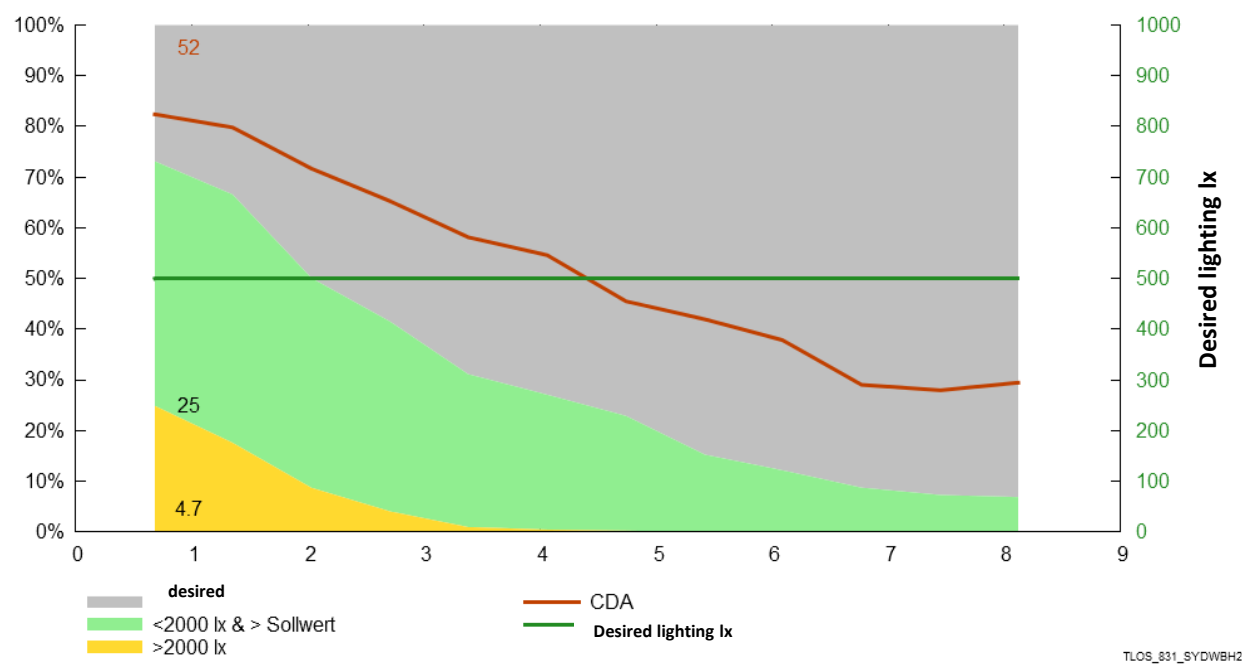


Verified Simulation

Operational Room Temperature [°C/F]

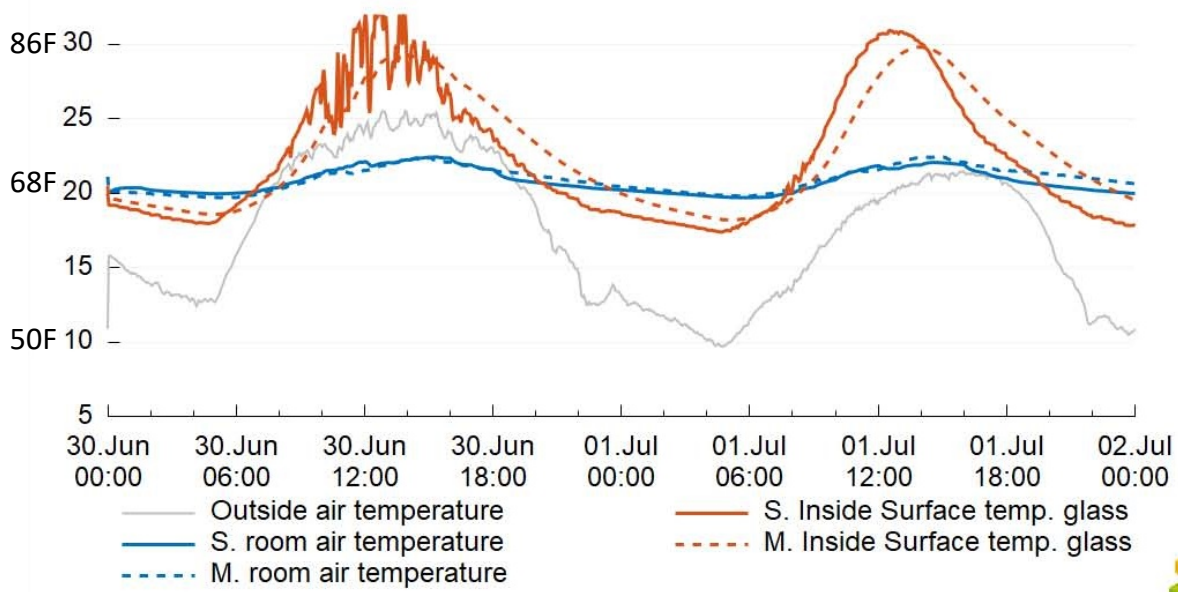


Useful Daylight Illuminance / Continous Daylight Autonomy [%]



Verified Simulation

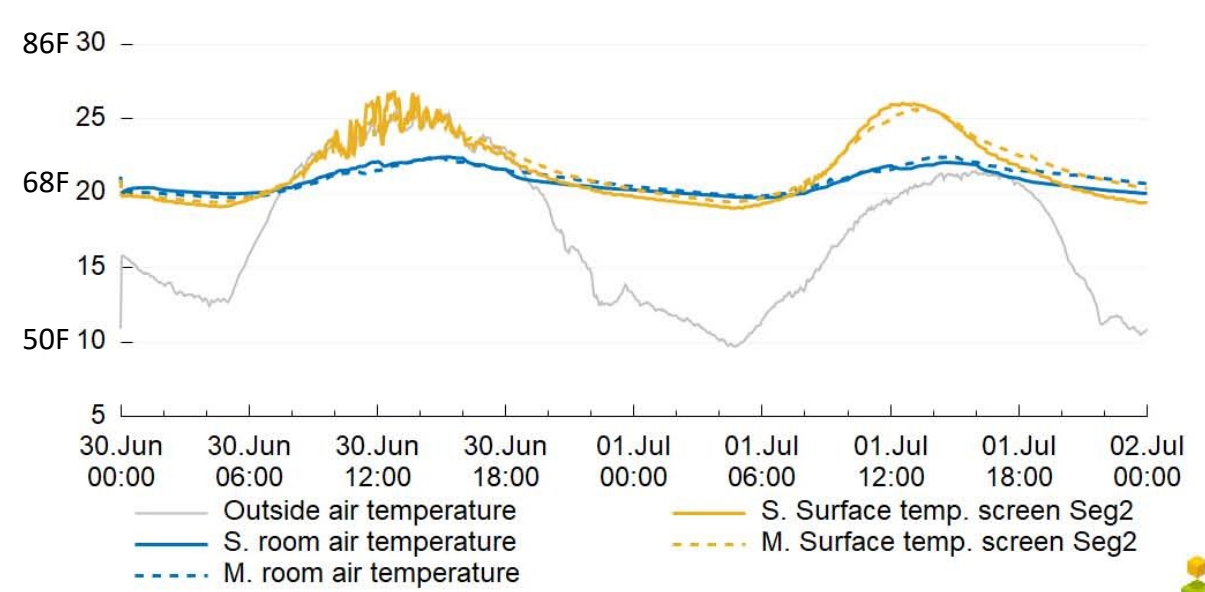
Surface Temperature Glass [°C] & F Detailed Window Model



S. – Simulation M. - Measurement



Surface Temperature Screen [°C] & F Detailed Window Model



S. – Simulation M. - Measurement

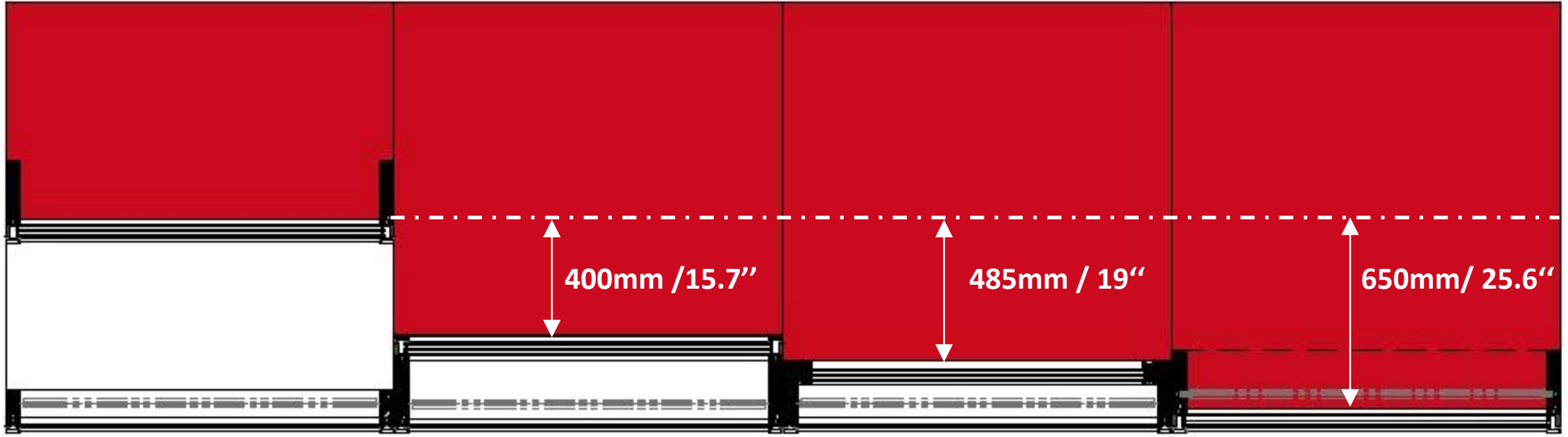


Façade comparison



Façade comparison

Usable floor area



Double Skin Facade

Closed Cavity Facade

Box Type Window

ACT Facade

400mm / 15.7"

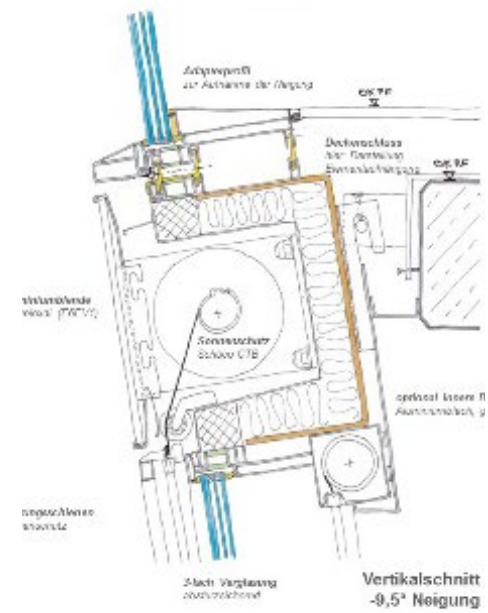
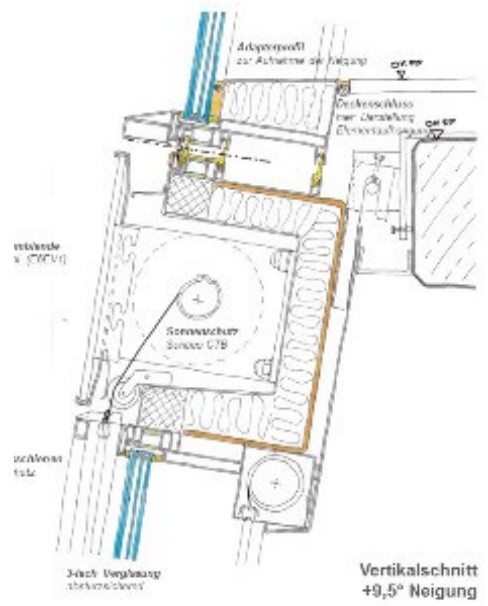
485mm / 19"

650mm / 25.6"

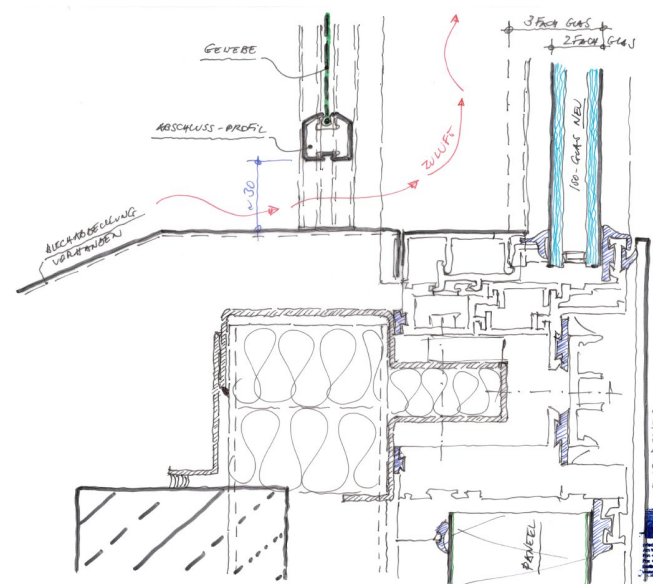
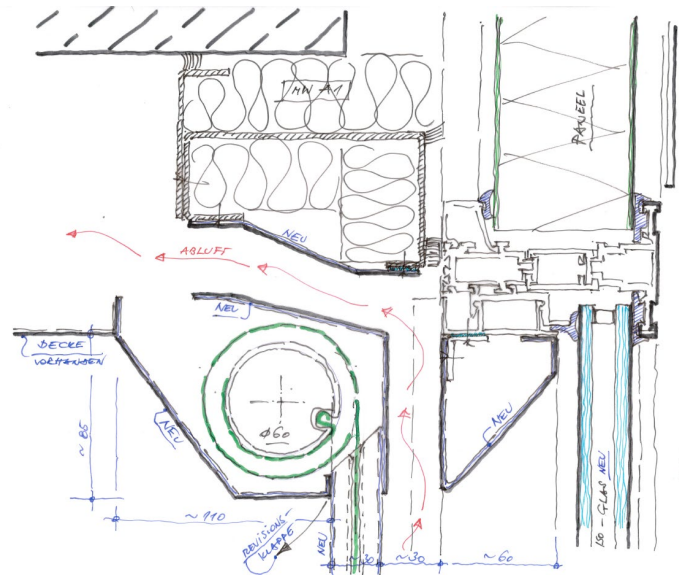
Façade comparison

	ACT Facade	'Corridor Type' Double-Skin Facade	Closed Cavity Facade	Box Type Window	Electrochromic Glazing	External Shading Screen
						
U-Value (W/m²K)	★★★★☆	★★★★☆	★★★★★	★★★★☆	★★★☆☆	★★★★☆
	0.90	0.90 – 1.80	0.50 - 0.90 <small>blind down</small> 1.20 <small>blind up</small>	0.90 – 1.80	1.50	0.90
SHGC	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★☆☆	★★★★★
	0.10 <small>blind down</small> 0.27 <small>blind up</small>	0.10 <small>blind down</small> 0.25 – 0.50 <small>Without blind</small>	0.06 <small>blind down</small> 0.44 <small>blind up</small>	0.10 <small>blind down</small> 0.25 – 0.50 <small>Without blind</small>	0.09 – 0.10 <small>Tinted</small> 0.27 – 0.41 <small>Clear</small>	0.05 <small>External high-reflective blind</small>
Surface Temperature facing inside under solar impact	★★★★★	★★★☆☆	★★☆☆☆	★★☆☆☆	☆☆☆☆	★★★★★
	Textile Surface	Glass Surface	Glass Surface	Glass Surface	Glass Surface	Glass Surface
Material Usage* In comparison with ACT Facade (/XXm²)	-	144%	121%	128%	98%	Similar
	481 kg	694 kg	580 kg	619 kg	472 kg	Similar

Ardex Tower, Witten



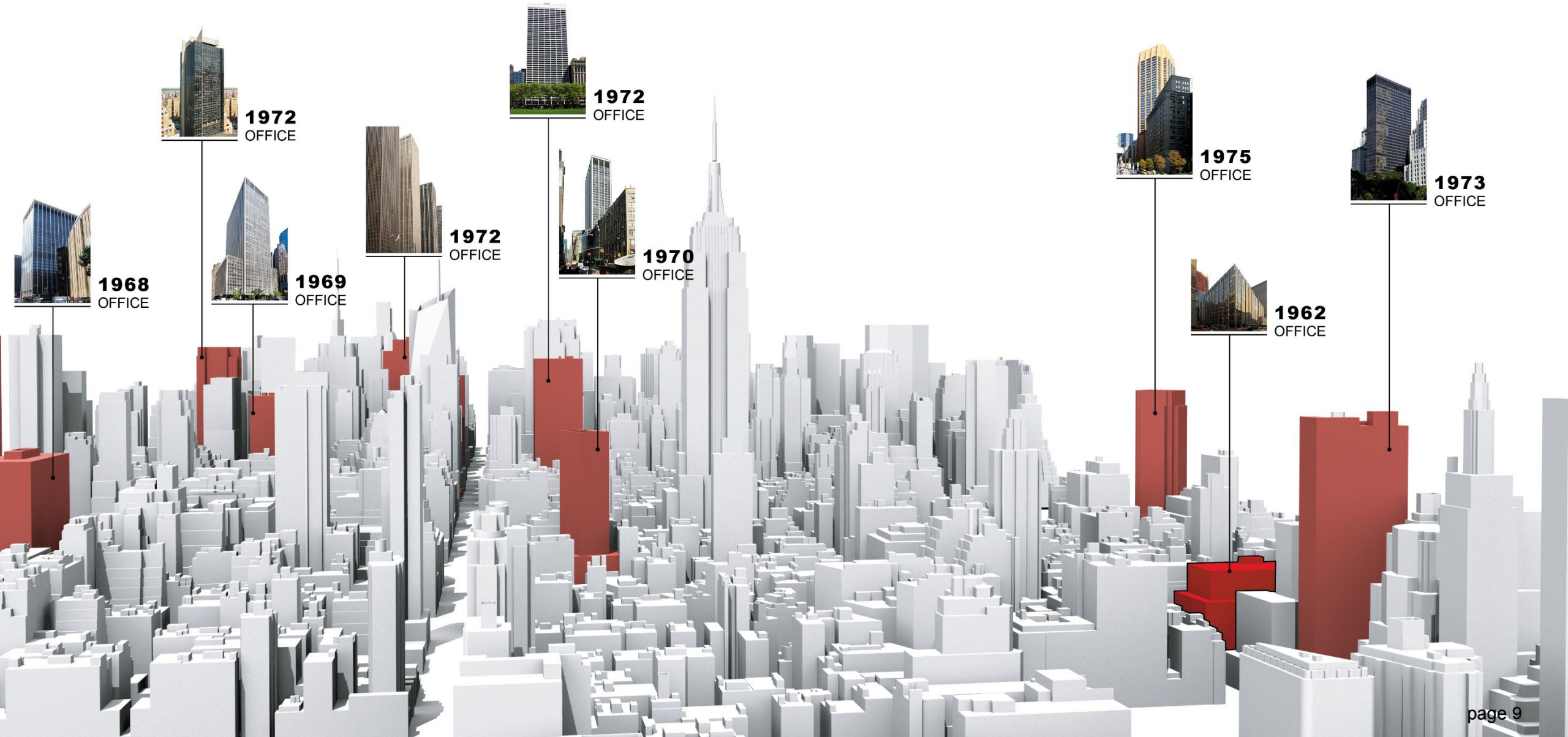
EuroTower, Frankfurt



EuroTower
KONZERT-FASSBETRIEBWEISE
DARSTELLUNGSSCHLÜSSEL - ABLUFFFASSUNG
A - 1:1
SCATT 4 · 11.04.08 - NE

Metals in Construction Design Challenge 2020





1972
OFFICE



1972
OFFICE



1975
OFFICE



1973
OFFICE



1968
OFFICE



1969
OFFICE



1972
OFFICE



1970
OFFICE



1962
OFFICE

Joint R&D project

Synergiefassaden

priedemann
facade lab



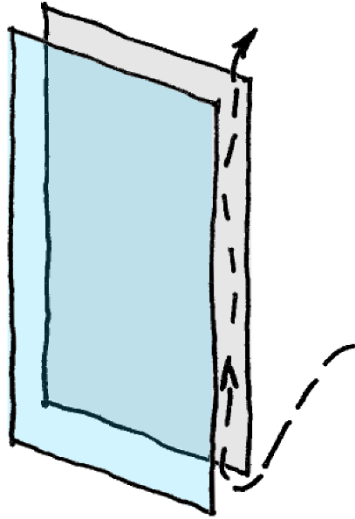
SCHÜCO

 **Fraunhofer**
ISE

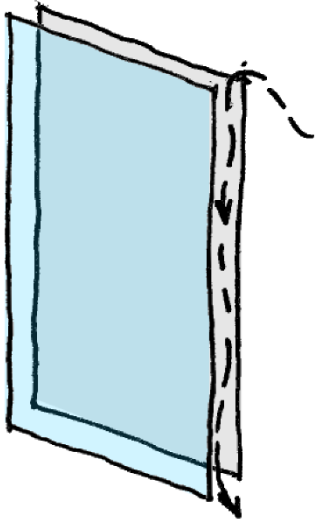
 **Fraunhofer**
IBP

ACT Facade

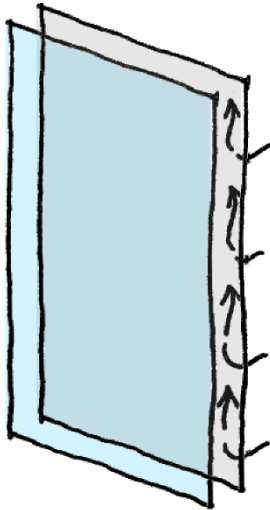
Variations



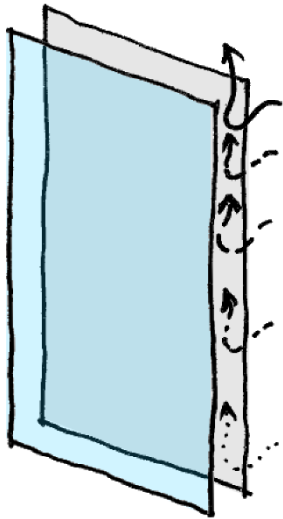
UPWARDS



DOWNWARDS



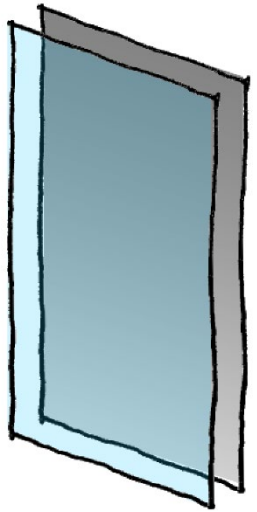
THROUGH
SCREEN



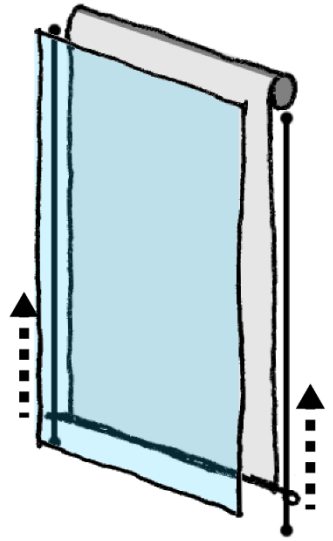
THROUGH
GRADIENT
SCREEN

ACT Facade

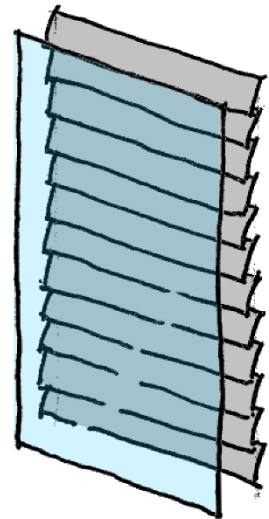
Further options



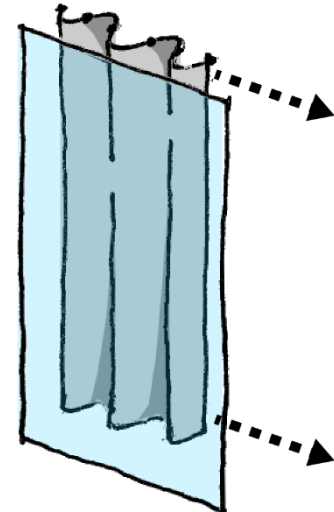
TEXTILE
VARIATIONS



ROPE
GUIDANCE



VENETIAN
BLIND

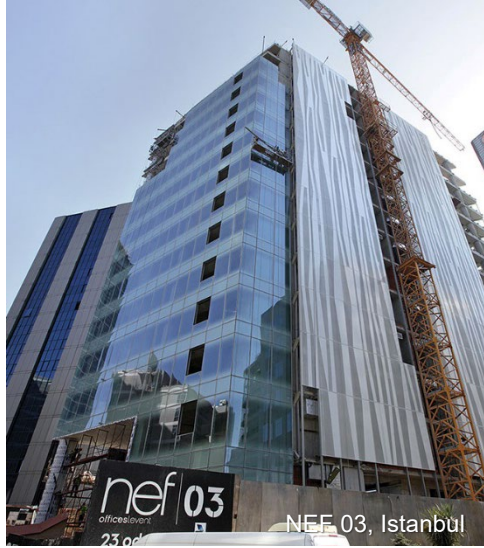


CURTAIN

Thank you!



NEF 163, Istanbul



NEF 03, Istanbul



Türk Telekom, Ankara



Küçükçekmece Municipality, Izmir – Images by Cemal Emden



Ferko Signautre, Istanbul



Folkart Bayrakli Towers, Izmir



AND Plaza, Istanbul



HighSpeed Train Station, Ankara



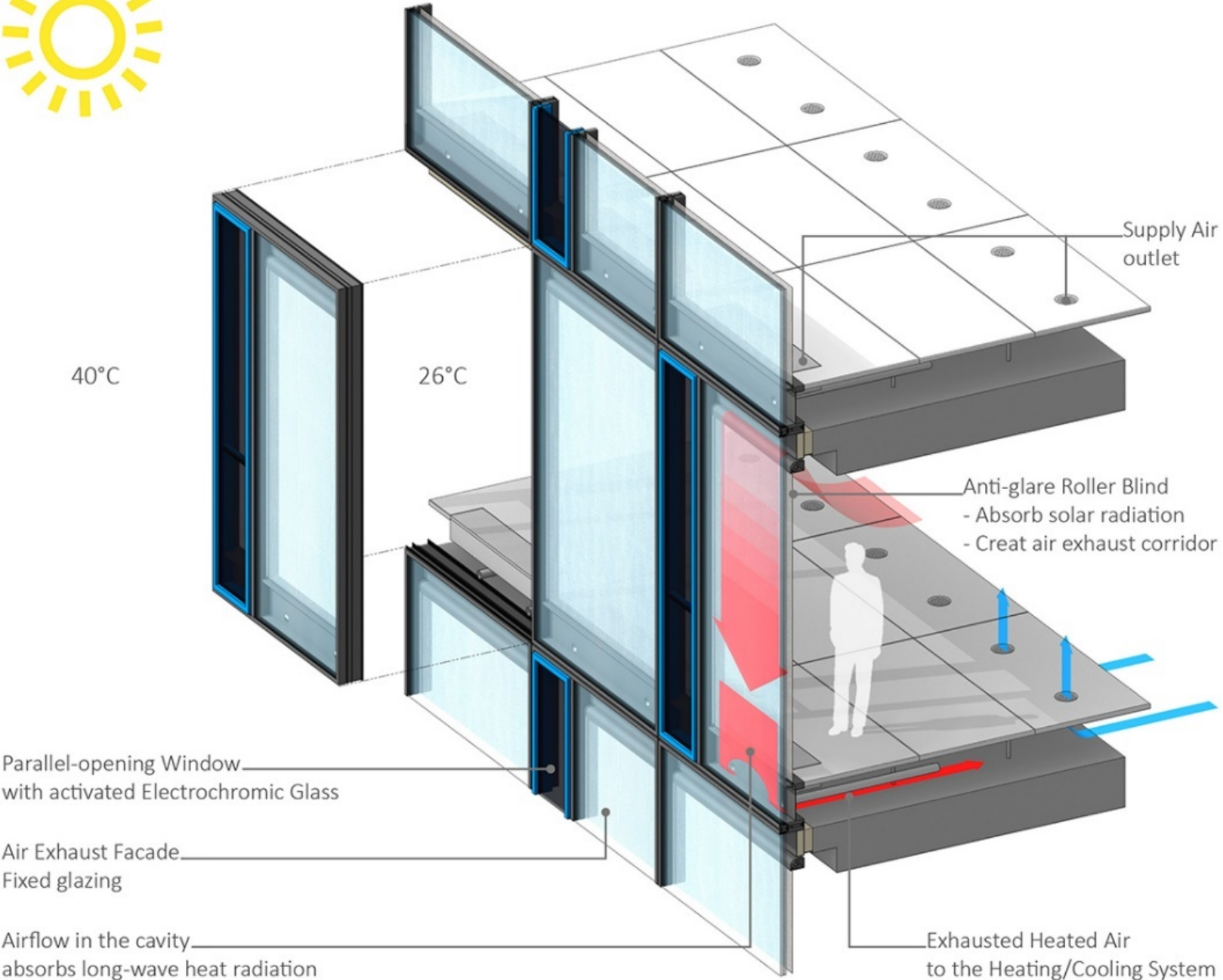
Ottomare Suites Zeytinburnu, Istanbul



Şölen Basın Ekspres, Istanbul

Back Up

Festo Façade



40°C

26°C

Supply Air outlet

Anti-glare Roller Blind
- Absorb solar radiation
- Create air exhaust corridor

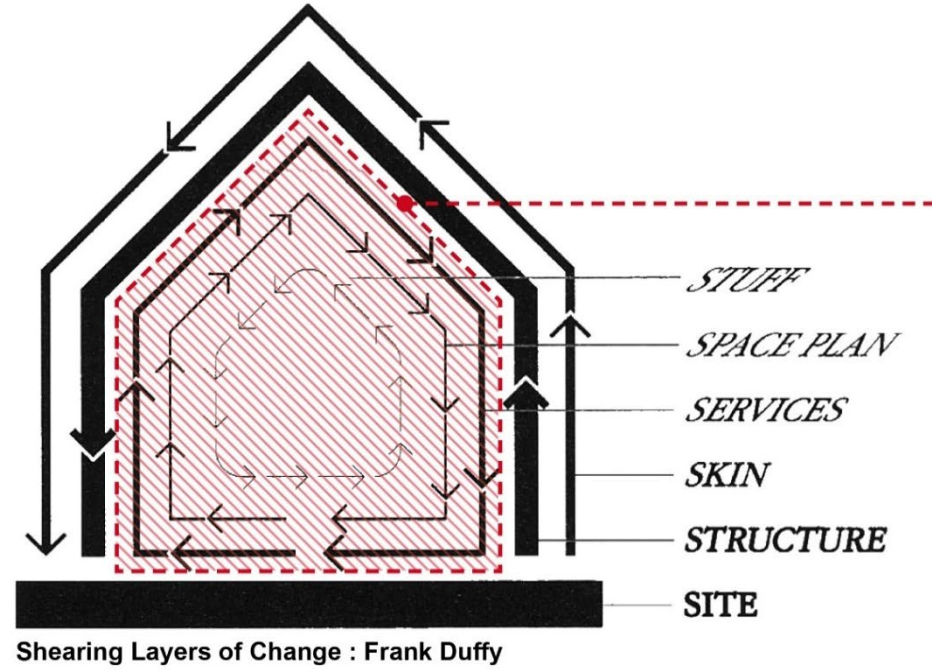
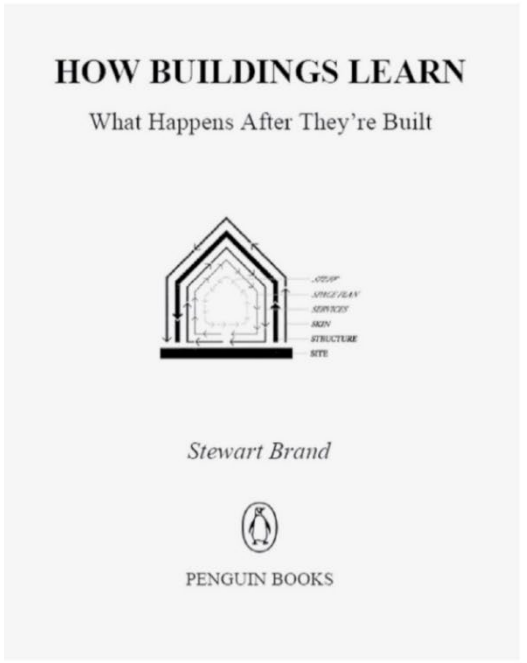
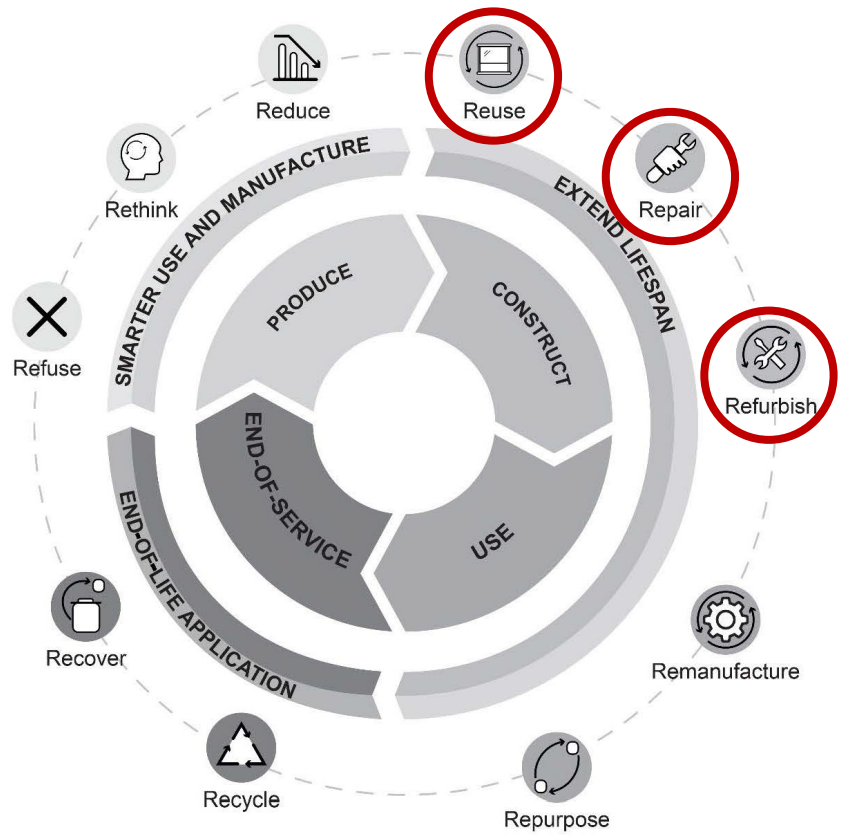
Parallel-opening Window with activated Electrochromic Glass

Air Exhaust Facade Fixed glazing

Airflow in the cavity absorbs long-wave heat radiation

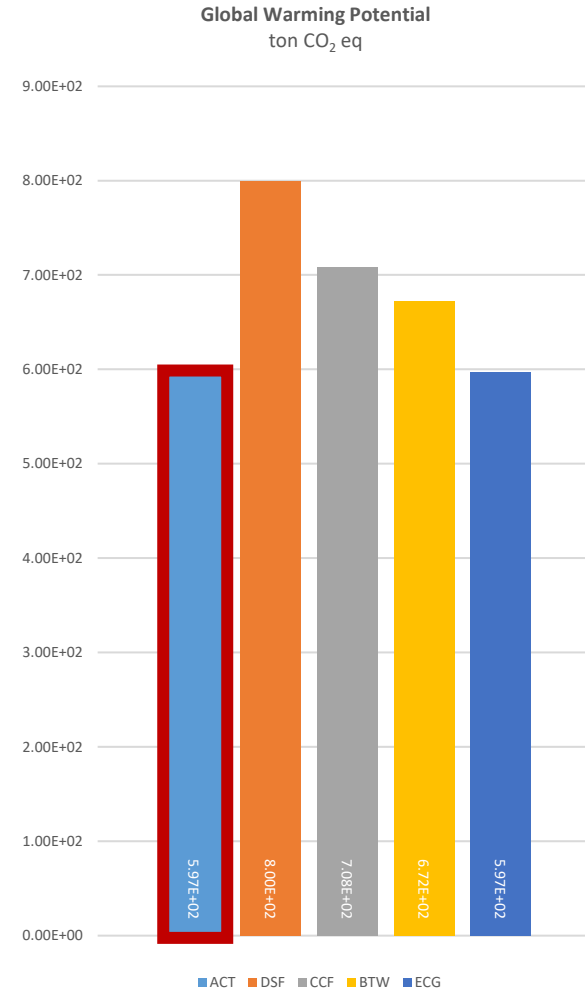
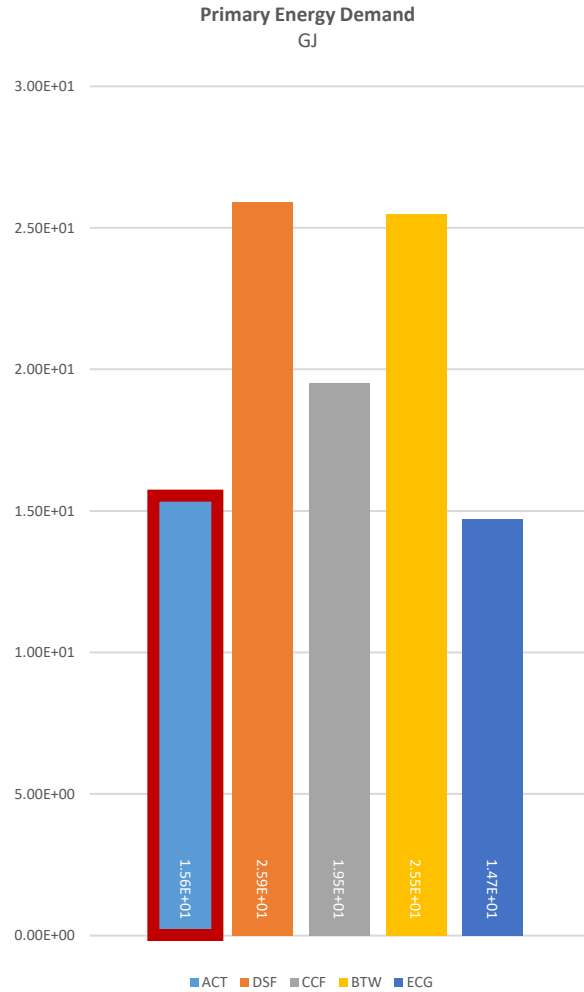
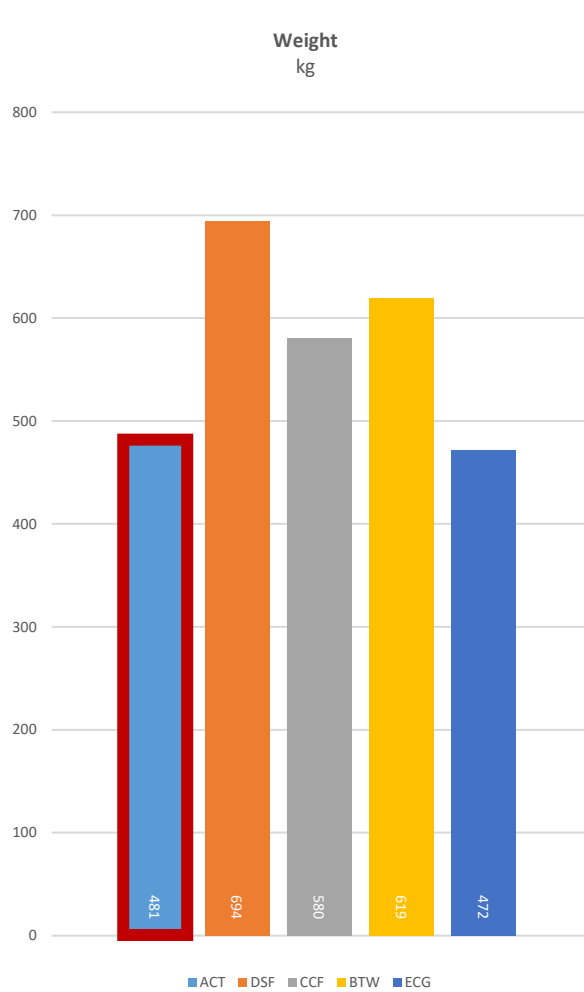
Exhausted Heated Air to the Heating/Cooling System

Circular Economy



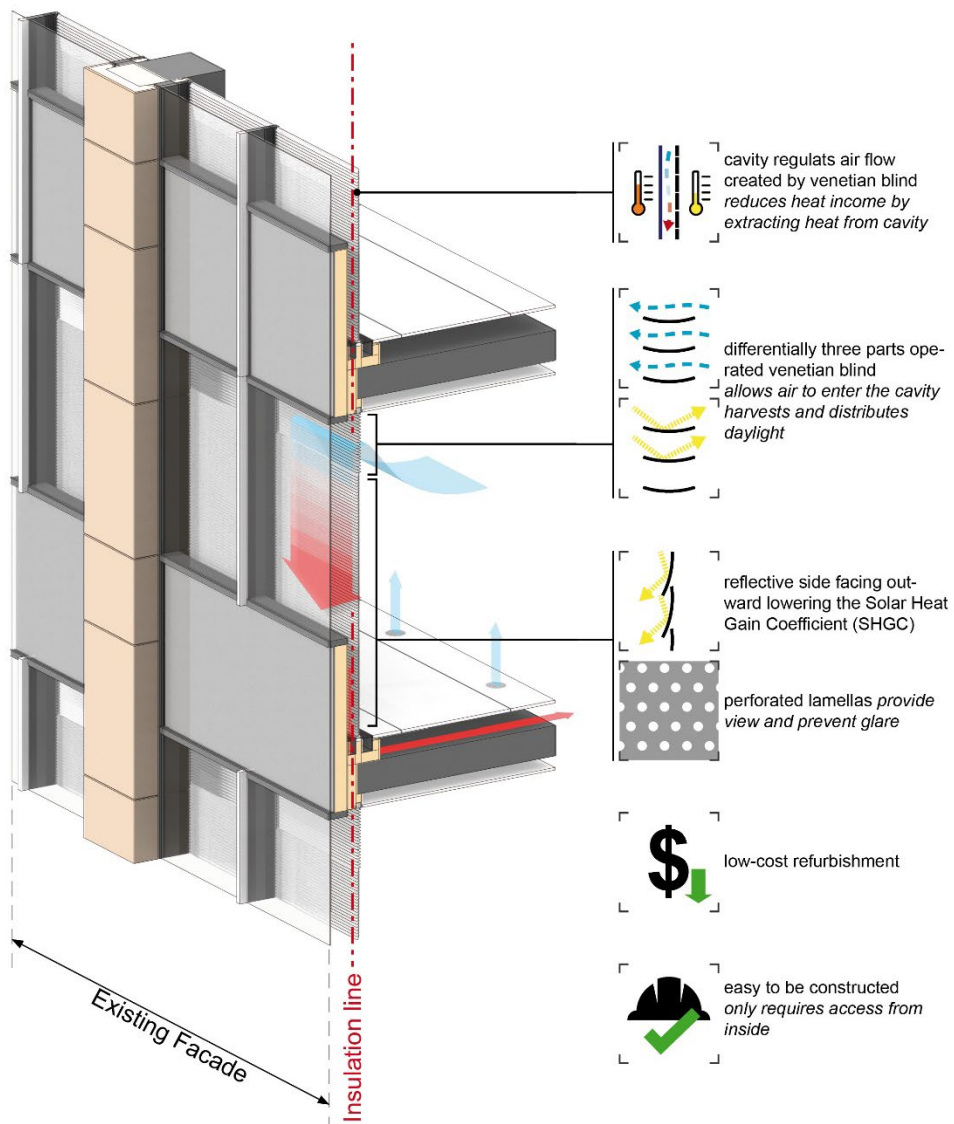
LCA

A1 – A3

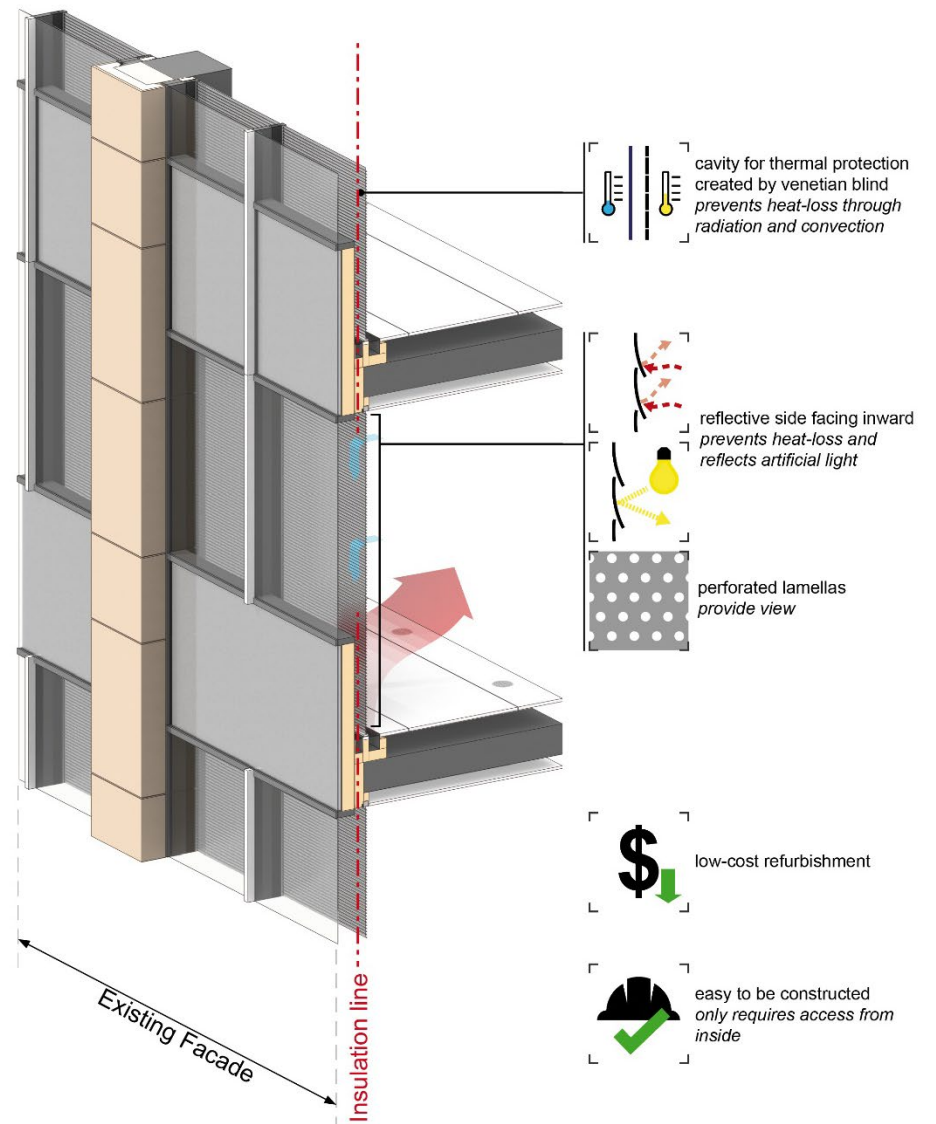


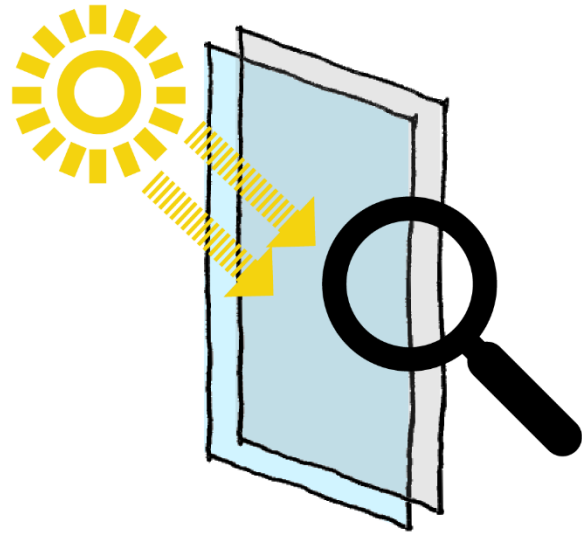
Functionality

Summer Scenario

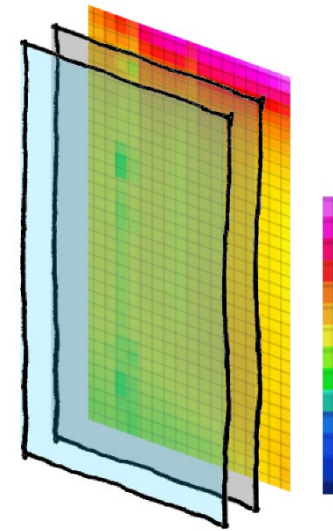


Winter Scenario





SHGC-VALUE
MEASUREMENTS



SIMULATION MODELS
+ VERIFICATION

Building Certification

LEED | DGNB etc.



LEED Potential

- **Sustainable Sites**
 - Heat Island Reduction

- **Energy and Atmosphere**
 - Enhanced Commissioning
 - Optimize Energy Performance
 - Demand Response

- **Materials and Resources**
 - Building Life-Cycle Impact Reduction

- **Indoor Environmental Quality**
 - Daylight
 - Quality Views

- **Innovation**
 - Innovation
 - LEED Accredited Professional



LEED v4 for BD+C: Core and Shell Project Checklist

Y	?	N	Credit	Integrative Process	Points
0	0	0	Location and Transportation		20
Y			Credit	LEED for Neighborhood Development Location	20
Y			Credit	Sensitive Land Protection	2
Y			Credit	High Priority Site	3
Y			Credit	Surrounding Density and Diverse Uses	6
Y			Credit	Access to Quality Transit	6
Y			Credit	Bicycle Facilities	1
Y			Credit	Reduced Parking Footprint	1
Y			Credit	Green Vehicles	1
0	0	0	Sustainable Sites		11
Y			Prereq	Construction Activity Pollution Prevention	Required
Y			Credit	Site Assessment	1
Y			Credit	Site Development - Protect or Restore Habitat	2
Y			Credit	Open Space	1
Y			Credit	Rainwater Management	3
Y			Credit	Heat Island Reduction	2
Y			Credit	Light Pollution Reduction	1
Y			Credit	Tenant Design and Construction Guidelines	1
0	0	0	Water Efficiency		11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
Y			Credit	Outdoor Water Use Reduction	2
Y			Credit	Indoor Water Use Reduction	6
Y			Credit	Cooling Tower Water Use	2
Y			Credit	Water Metering	1
0	0	0	Energy and Atmosphere		33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
Y			Credit	Enhanced Commissioning	6
Y			Credit	Optimize Energy Performance	18
Y			Credit	Advanced Energy Metering	1
Y			Credit	Demand Response	2
Y			Credit	Renewable Energy Production	3
Y			Credit	Enhanced Refrigerant Management	1
Y			Credit	Green Power and Carbon Offsets	2

Project Name:
Date:

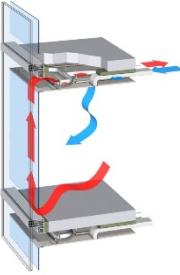
0	0	0	Credit	Materials and Resources	Points
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
Y			Credit	Building Life-Cycle Impact Reduction	6
Y			Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
Y			Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
Y			Credit	Building Product Disclosure and Optimization - Material Ingredients	2
Y			Credit	Construction and Demolition Waste Management	2

0	0	0	Credit	Indoor Environmental Quality	Points
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
Y			Credit	Enhanced Indoor Air Quality Strategies	2
Y			Credit	Low-Emitting Materials	3
Y			Credit	Construction Indoor Air Quality Management Plan	1
Y			Credit	Daylight	3
Y			Credit	Quality Views	1

0	0	0	Credit	Innovation	Points
Y			Credit	Innovation	5
Y			Credit	LEED Accredited Professional	1

0	0	0	Credit	Regional Priority	Points
Y			Credit	Regional Priority: Specific Credit	1
Y			Credit	Regional Priority: Specific Credit	1
Y			Credit	Regional Priority: Specific Credit	1
Y			Credit	Regional Priority: Specific Credit	1

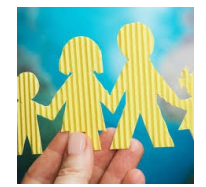
0	0	0	TOTALS	Possible Points:	110
Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80 to 110					



Hot-Spot Analysis USA – ACT Facade

- Houston
- Dallas
- San Antonio
- Austin
- Miami
- Charlotte
- Raleigh/Durham
- Phoenix
- Las Vegas
- Nashville
- NYC
- Boston
- Washington DC
- Philadelphia
- Chicago
- Detroit
- Denver
- Minneapolis
- Los Angeles
- San Francisco
- San Diego
- San Jose
- Seattle
- Portland, OR
- Honolulu

Success Factors



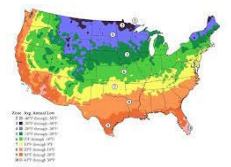
Market Growth

- 1. Population Metropolitan Area 3.9
- 2. **5 Year Annual projected change in %** 4.7
- 3. 5 Year Annual net migrations in 000s
- 4. Growth total since 2010 Population



Market Trends

- 1. **Strict Energy Saving Policy (e.g. LL97 NYC)** 10
- 2. Amount of Refurbishment vs New Construction Project 8.4
- 3. PWC Real Estate Outlook Prospects to watch 5.3
- 4. **LEED** Projects Realized all time / **PHIUS** 4.3



Climate

- 1. **Yearly CDD** 8.0
- 2. **Yearly HDD** 5.7
- 3. Month with Highest Max Average Ambient Temp. Summer 7.6
- 4. Month with lowest Max Average Ambient Temp. Winter 3.9
- 5. Daily Average Horizontal Window Incident **solar radiation** 7.1
- 6. Global Horizontal Irradiation (kw/h sqm / day) 6.9



Monetary

- 1. **Price per Square Feet** to Buy Apartment in City Centre USD 8.4
- 2. **Electricity Rates** by State (Dollar Cents/kwH) 5.7

Hot-Spots

- 1. Austin/Houston
- 2. NYC
- 3. Washington DC
- 4. Phoenix/LA
- 5. San Diego

→ Sales & Marketing

- 1. AIA
- 2. Conferences
- 3. LinkedIn
- 4. LEED/PHIUS