

ACT Facade

Active Cavity Transition Facade





Background

More and more contemporary office buildings are built as fully-glazed high-rise buildings due to client's wishes or architectural intents, such as maximum visual contact to the outside or brand image of the companies. However, high transparency ratios in the façade bring along energy saving problems while maintaining the same comfort levels inside the buildings.

In contemporary office buildings cooling accounts for the majority of the energy consumption because of internal heat sources. High solar income during summer or at low winter sun heat up the inside of these buildings additionally.

As is known solar control glazing alone is not sufficient to guarantee summer heat protection and meet the guidelines of workplace regulations concerning sun protection and anti-glare protection

ACT *Facade*

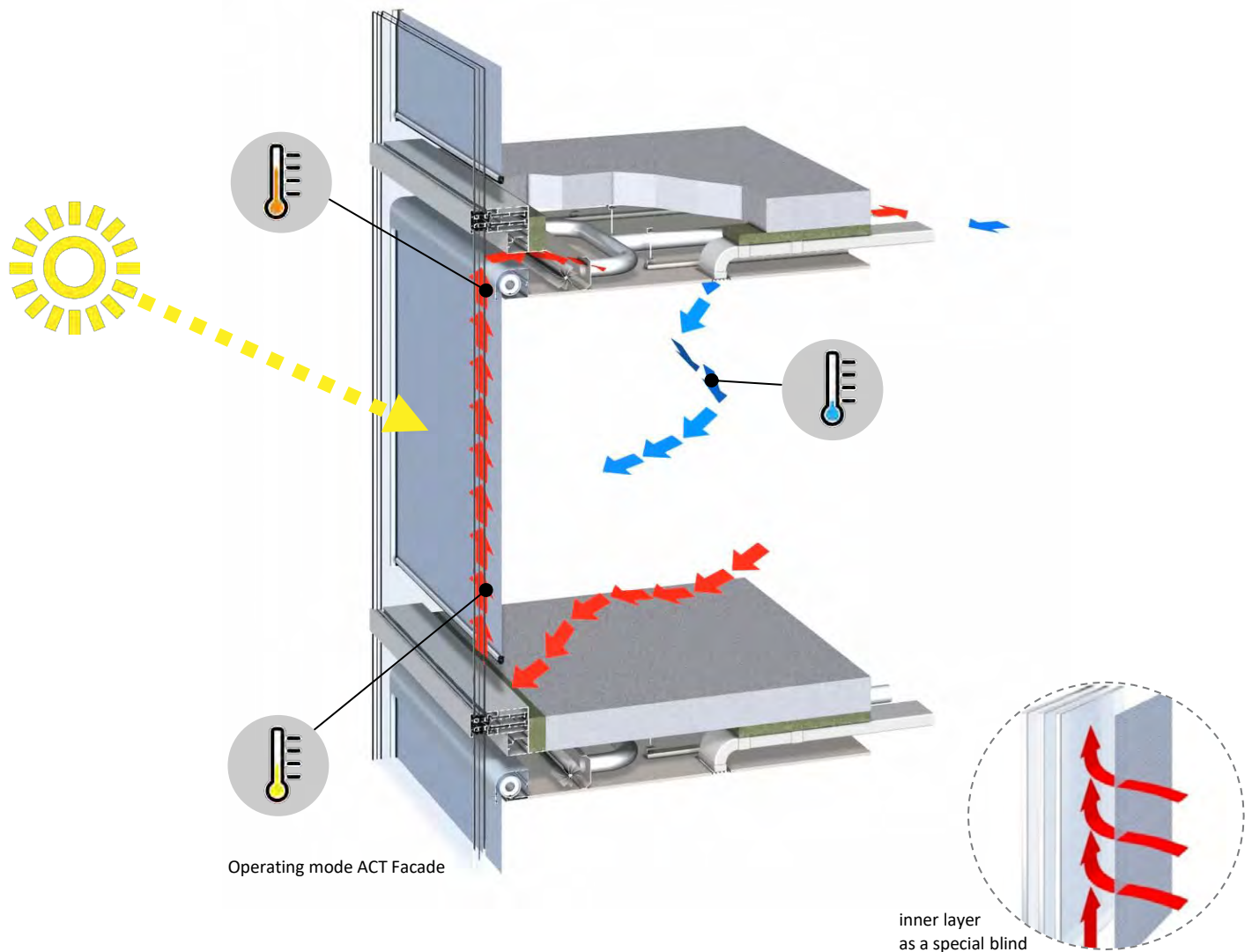
Active Cavity Transition Facade – Concept

Based on the classical air-exhaust façade out of an external insulated glazing plus an internally ventilated glazing, which was yet successfully realized by Priedemann Façade Experts at the "Treptowers" high-rise buildings in Berlin in the early nineties, a new concept of an internal blind was developed to act as adequate sun shading.

The mandatory inner blind for anti-glare is being activated and becomes a separation layer in the façade system to generate an air-exhaust corridor between blind and external glazing.

Enabling an internal sun-shading by generating a buffer zone for the exhaust of heat from solar radiation and at the same time without any external influences like wind etc.

Implementation & Operation



Operating mode ACT Facade

inner layer
as a special blind

The newly developed Active Cavity Transition (ACT) Facade is an efficient combination of typical façade components such as insulated external glazing, glare control blinds and mechanical ventilation.

Solar radiation causing overheating of the interior space is captured within the given corridor between blind and glazing. On the surface of the blind the solar radiation is being absorbed and changed into long-wave heat radiation.

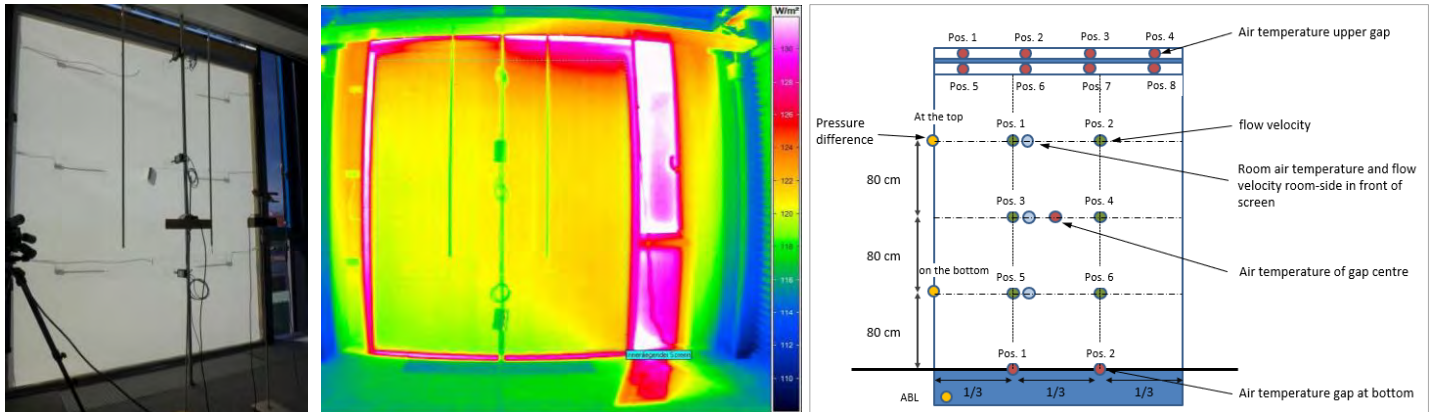
The exhaust air from the office is then sucked into and through this interspace leading away the generated heat by its air flow. Thus, preventing unnecessary heating-up of the indoor space.

In addition, the surface of the blind facing the interior is cooled creating lower surface temperatures. This enables a higher quality in comfort because it prevents radiation asymmetry within the building.

As a result, less cooling energy is needed, and a higher user comfort can be ensured.

Since the blind and exhaust air system can be operated individually this façade solution creates a dynamically g-value of the all-over system regardless of weather conditions.

Testing & Benefits



Testing of ACT FACADE at Fraunhofer IBP VERU building

To verify the efficiency of the ACT FACADE and to define the ideal layout and combination of parameters such as screen choice, dimensions for the corridor and the intake width for the exhaust air etc. several simulations and scientific testing have been yet executed.

At the Fraunhofer Research Institute on Building Physics in-situ testing facility (VERU) close to Munich, Germany, different set ups had been analyzed. Testing a unitized façade element with the ACT FACADE system (see Fig. above) to pre-select and evaluate construction details, material properties and exhaust air volume and velocity.

Showcasing that with the right air speed, constructional detailing and blind materials a majority of the solar radiation could be exhausted before entering the room. During October having a high direct solar radiation towards the façade because of the low angle of the sun in Germany from a global radiation of 800 W up to 380 W could be extracted through the exhausted air not including the reflection from the external glazing.

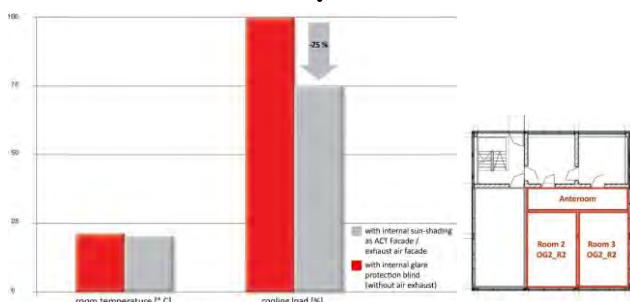
In addition to this testing also a parallel measuring at the Fraunhofer IBP Twin-Rooms has been done. Giving a direct comparison between a ventilated inner blind, as Exhaust Air Façade, and a non-ventilated inner blind, standard system only for glare protection, behind the glazing.

During these measurements for the ACT FACADE a reduction of energy for cooling of up to 25 % compared to the standard system could be quantified. Taking specific climate conditions in Dallas and standard facade systems even significantly higher savings in cooling load of the all-over building can be expected.

Besides the in-situ testing also several simulations and calculations had been done. These also confirm the effect of the ACT FACADE as a fully working sun-shading generating a dynamic g-value, enabling summer heat protection and lowering the indoor temperature as well as cooling loads.

The undertaken measuring and simulation shows that the Exhaust Air Façade ensures high values of comfort and energy efficiency and at the same time can be executed cost and especially space-efficient. Using standard components such as insulated glazing, zip-guided blinds and mechanical ventilation, that have to be implemented in up-to-date building offices anyhow, and at the same time generating floor space till the glazing, minimizing the space consumption of the façade to mullion and the depth of the insulated glazing.

25% Cooling load reduction



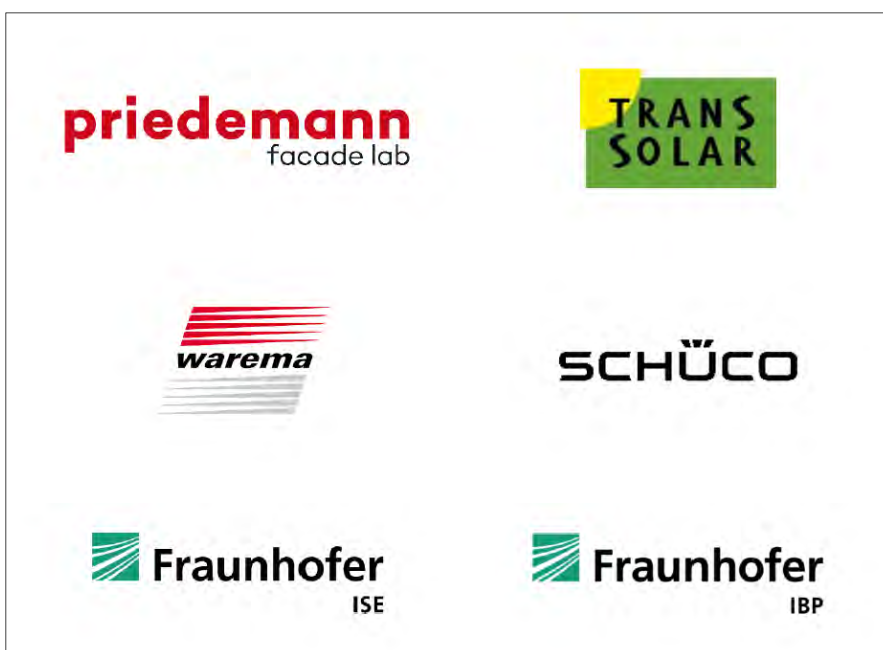
Measured result at VERU building, Fraunhofer IBP (© Fraunhofer IBP)

ACT Facade



To view the animation on your browser,
please click here [“ACT Facade”](#)

Consortium of Experts



Ever since then we have been working on further projects and new and advanced solutions. As a team with various research partners, we continue to explore the ACT potential. For this we brought together the expertise of Priedemann Facade-Lab, Transsolar, Warema, Schüco, the Fraunhofer Institute for Building Physics IBP and the Fraunhofer Institute for Solar Energy Systems ISE.

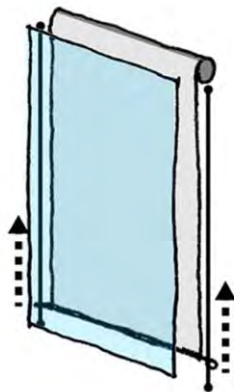
Further *Development*

With new construction projects and architectural façade design intents **new demands on the ACT Facade arise**. However within this further developments on operation, materiality and components a compromise between view, glare, daylight autonomy and solar heat gain must be found to improve user comfort as well as energy efficiency.

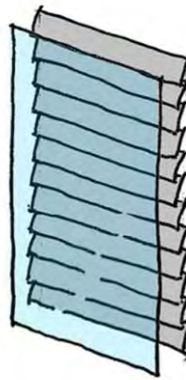
Therefore different variations for the screen layer seem possible for the ACT Facade as well as relevant to gain wider acceptance of the system by architects and clients through design and component flexibility. These include screens of various colors and openness factors, with ZIP or rope guidance, as venetian blinds as proposed for the Active and Adaptive concept but also as vertically relocatable curtains.



Textile variations



Rope guidance



Venetian blind



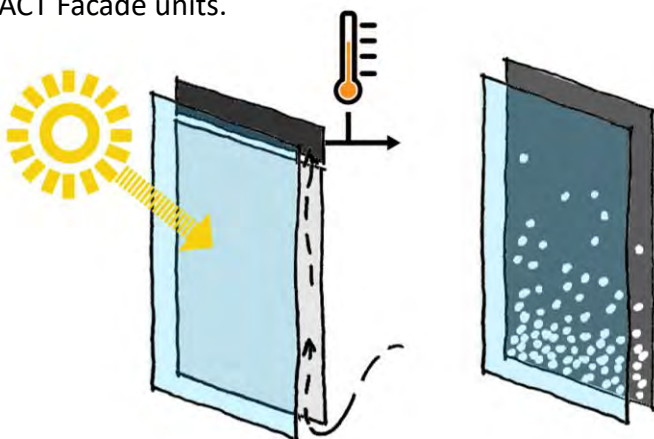
Curtain

For future applications of ACT Facade the combination with further technologies is envisioned. Such as newly developed textiles for the screen including colored low-e coating, integrated PV and/ or OPV, adaptive textiles through smart material integration etc.

Moreover the whole façade unit can be enriched by using special energy harvesting technology such as translucent amorphous photovoltaic or PV integrated in the spacer within the exterior glazing – also enabling self-sufficient decentralized ACT Facade units.

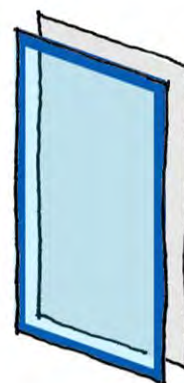
The inner layer has a high degree of flexibility.

In case of for example the refurbishment of a single skin facade the ACT Facade system could be implemented by solely exchanging the inner facade layer. By this not only ease of construction is given but also the potential of individual design by the architect but also the user/tenant.

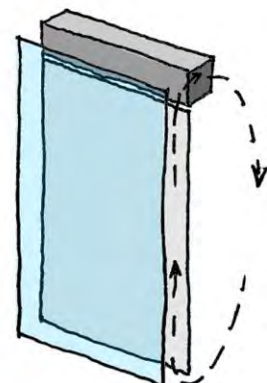


Solar thermal air collector

Smart textiles/ foils



Active glass/ photovoltaic



Decentralized/autarky

Active and Adaptive

The finalist concept of the Metals in Construction 2020 Design Challenge focuses on reducing effort and resources on building refurbishment whilst still enhancing the façade performance of 63 Madison Avenue in New York – an archetype for US office buildings struggling with high energy demand and low user comfort.

For this purpose “Active and Adaptive” carries the concept of ACT Facade forward which is already known to IGS readers from 2016’s Festo AutomationCenter project report.

Goal of the Metals in Construction Design Challenge was to develop visions for transforming the facade of one of Manhattan’s 60-year-old buildings to reduce carbon emissions and address the city’s Green New Deal - also presenting concepts as role model for broader application.

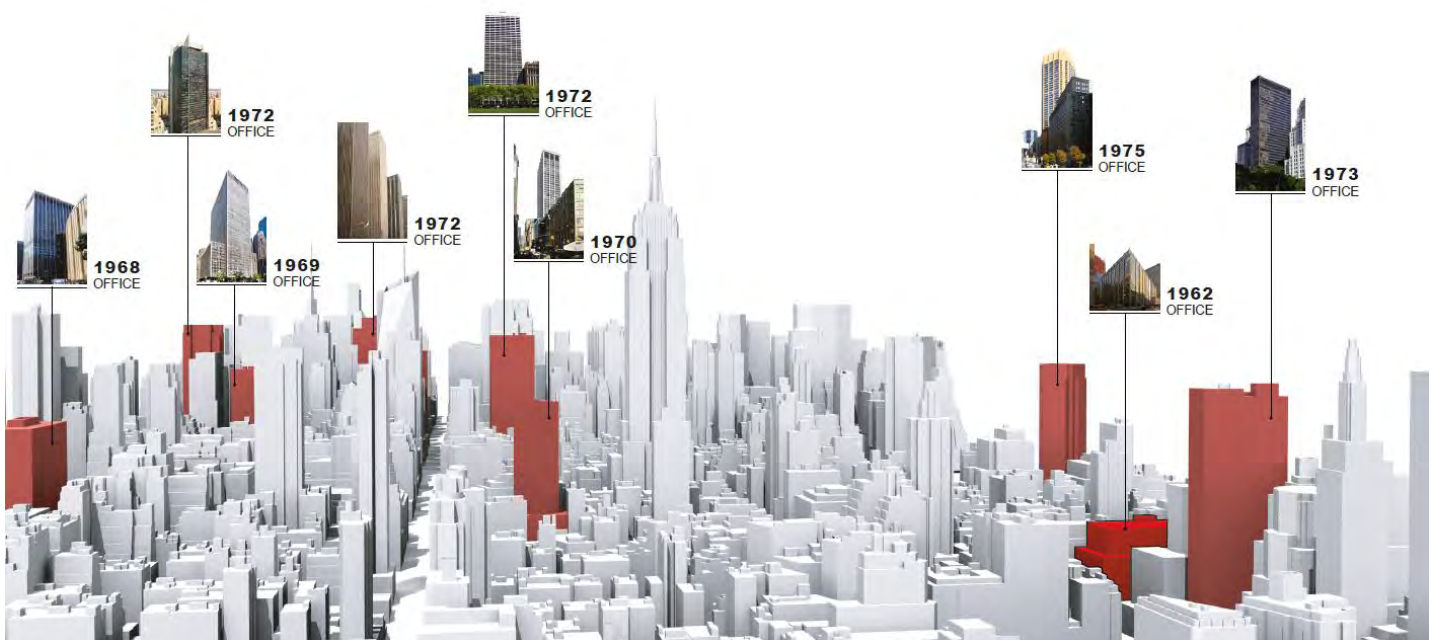
Focusing on what is necessary

Following the basics of a circular economy the Active and Adaptive concept aims for reducing construction and demolishing efforts to a reasonable minimum while at the same time increasing overall building performance and therefore extending the buildings life-span.

Concluding

within the ACT Facade concept lies a wide variety for broad application not only in new construction but also in refurbishment (see Figure below) as it has also been awarded by the Metals in Construction Jury.

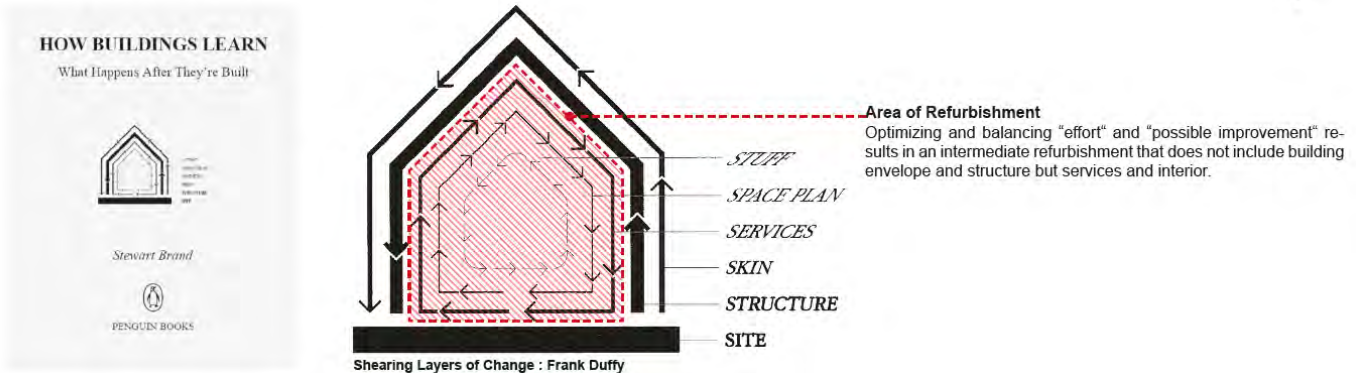
To view the competition submission with more information, please click here [“Active and Adaptive”](#)



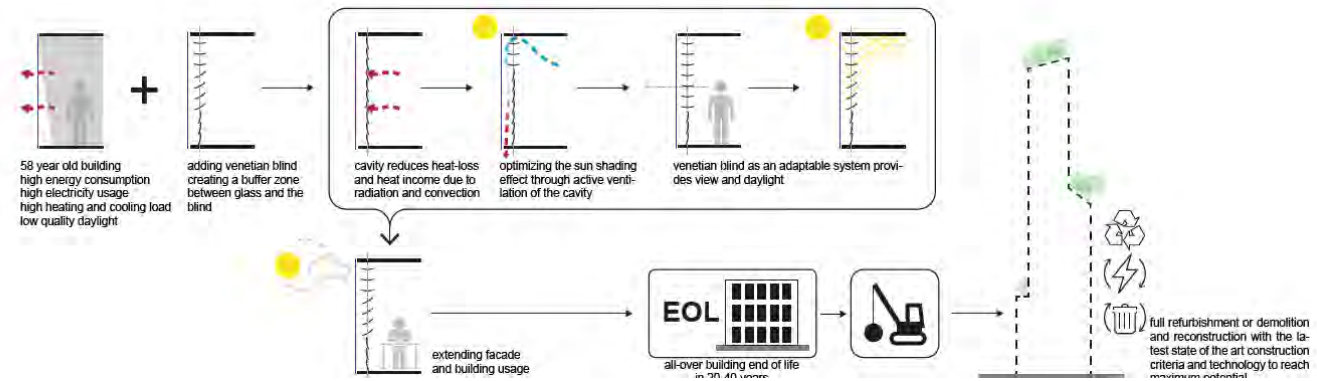
Active and Adaptive/ ACT Facade concept for broad application

Active and Adaptive

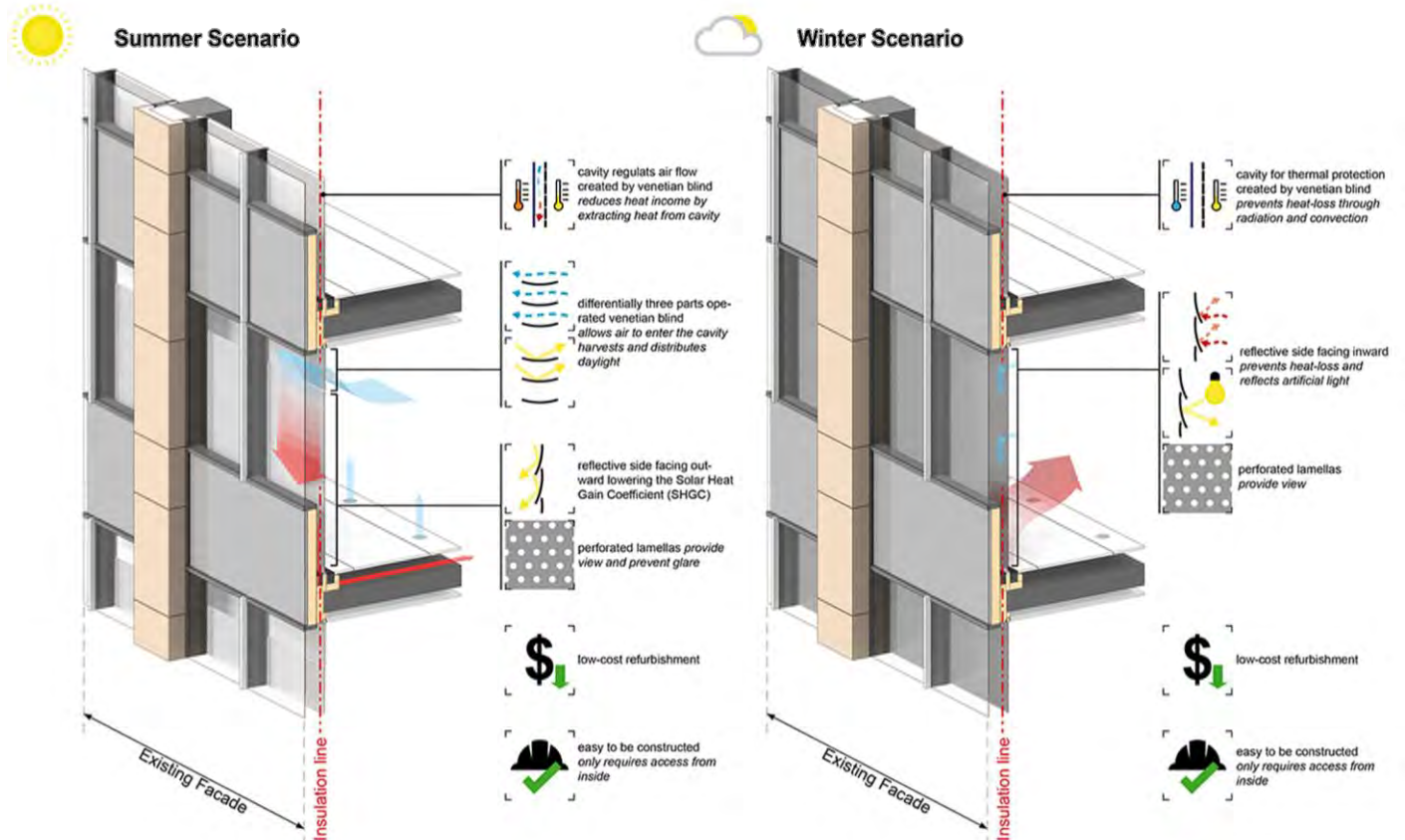
Shearing Layers of Change

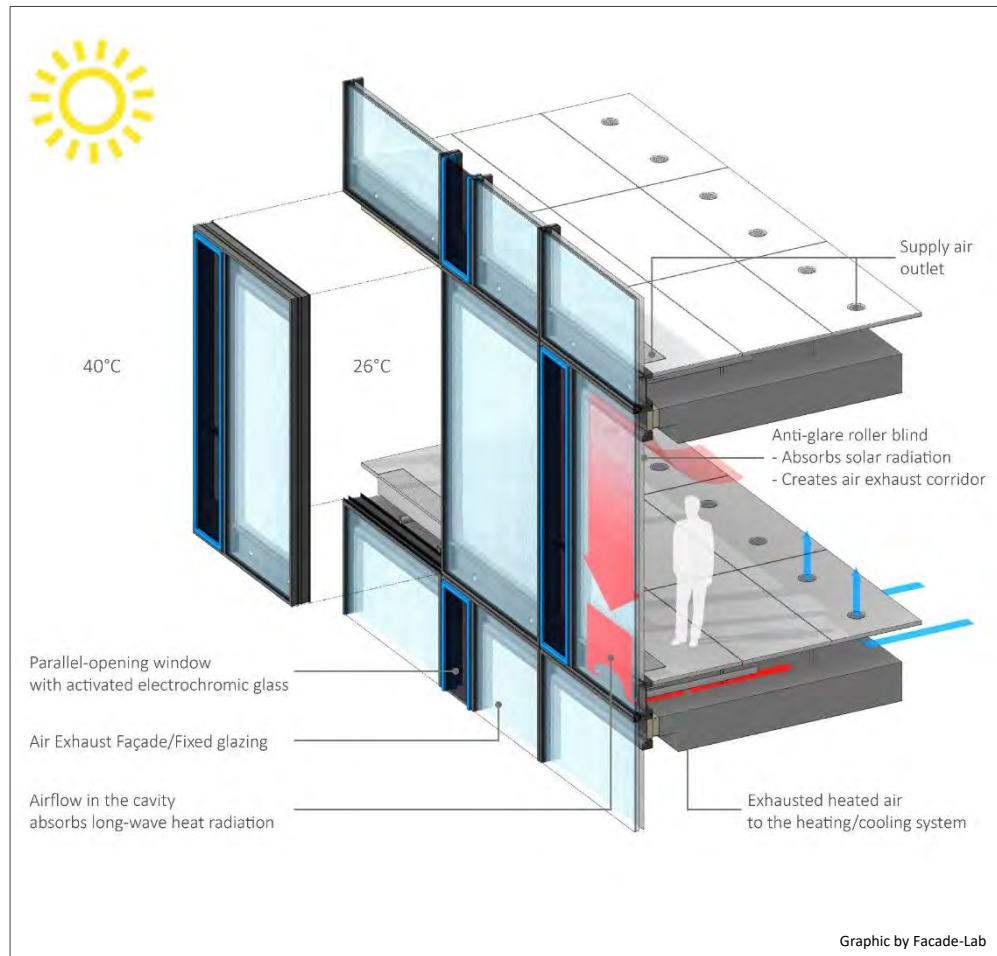


Refurbishment Concept

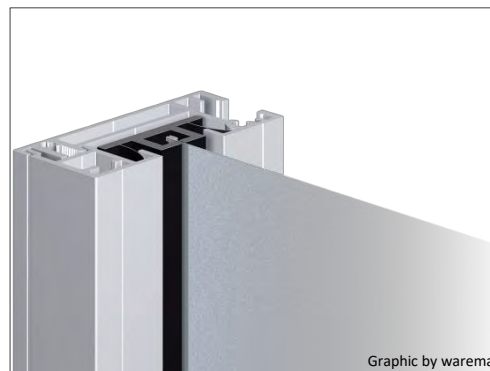


Operation Principle

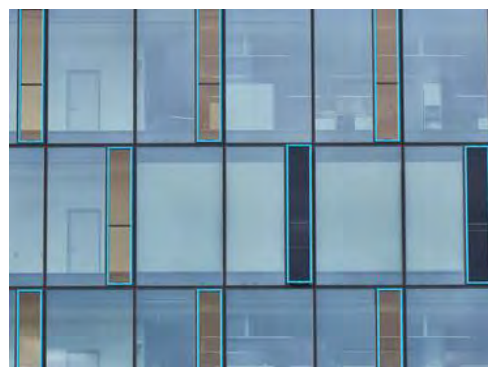




Innovative Exhaust Air Façade, system sketch – activated ACT Façade, ventilation and solar protection concept



Inner layer as a special blind, flexible function



Exhaust Air Façade with closed anti-glare roller blinds



FESTOAutomationCenter after finalization in 2015

Client

Festo AG

Owner ▪ Developer

Festo AG

Architect

architekturbüro jaschek

Project Data

- ca. 68 m building height
- ca. 8.500 m² facade surface

Building Function

Office

Technical Features

- ACT Facade
- Parallel-opening windows
- Sunshade, electrochromatic glazing
- Automated robot cleaning
- DGNB Platinum

Consultancy Services

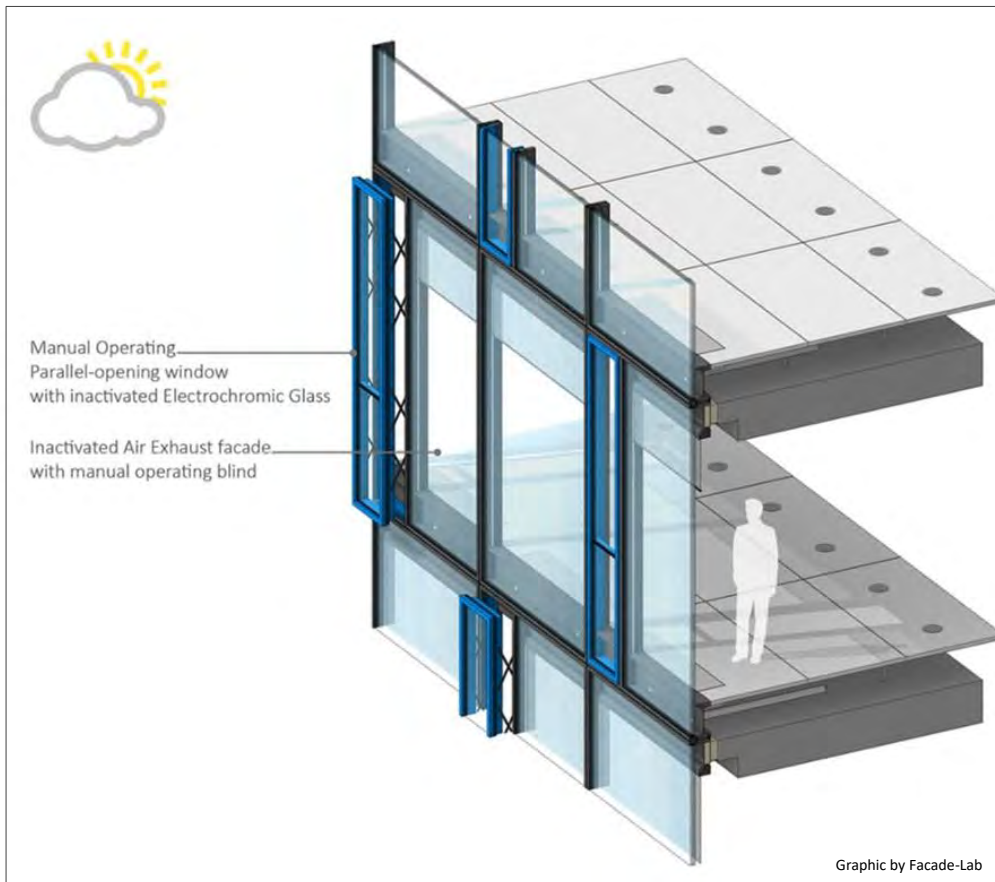
- Project Objectives and Brief
- Concept/Schematic Design
- Detailed/Developed Design
- Technical/Construction Design
- Specification/Tender Documentation
- Tender Evaluation
- Design Compliance Control
- Mock-Up Association
- Execution Compliance Control
- Handover, As-Built Documentation

Facade-Lab

Research & Development

Status

Completed 05/2015



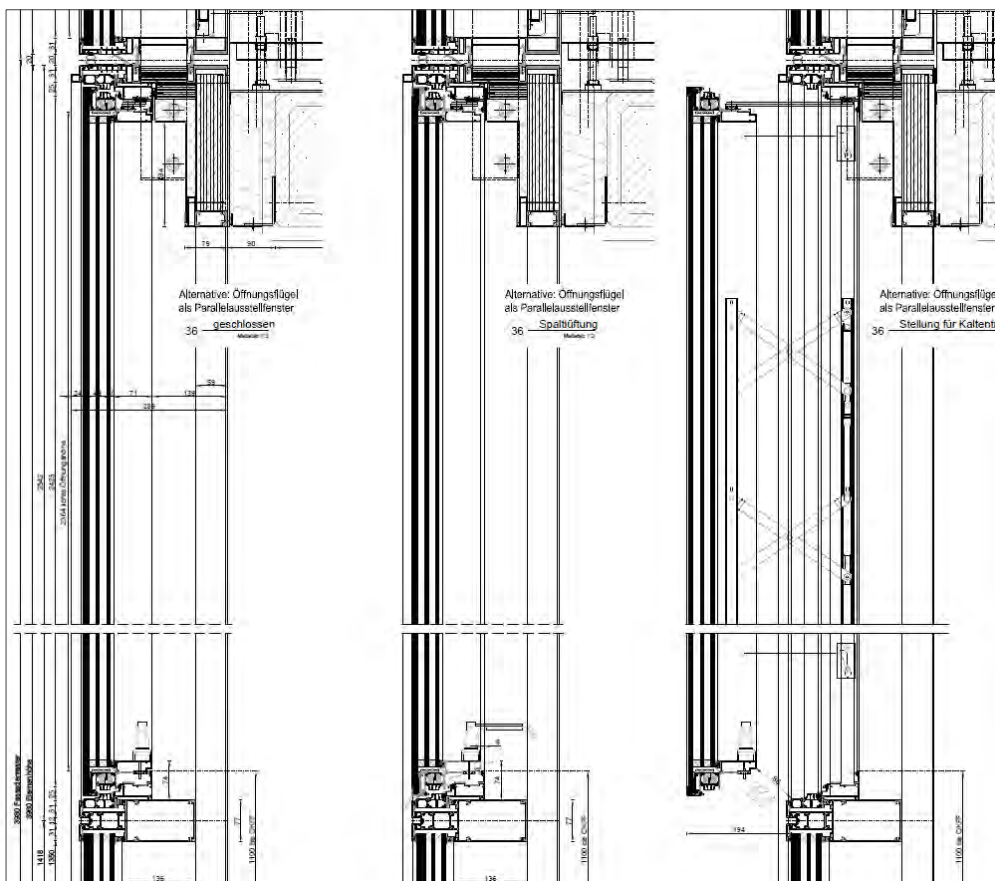
The construction of the facade is realized as a 7.50cm thick two-part modular system.

A layer of permanent glazing (2.4 x 4.0m), and a layer of slim operable windows 70cm wide by 4.0m in height.

These windows operate via electrochromic glass panels by EControl, which incorporate electric current to adjust their level of opacity. Due to the building orientation, only two of the four sides have to be "activated" at the same time.

Thus always two sides are open for best view and the other two sides activated for the exhaust air.

Innovative Exhaust Air Facade, system sketch – inactivated ACT Façade, manually operating elements



Typical detail, vertical section of Parallel-opening window in a closed status, with gap ventilation, as cold smoke extraction

Parallel-opening window

FESTOAutomation Center Stuttgart, Esslingen



Festo AutomationCenter with parallel-opening windows



Mock-Up – Parallel-opening window with step protection

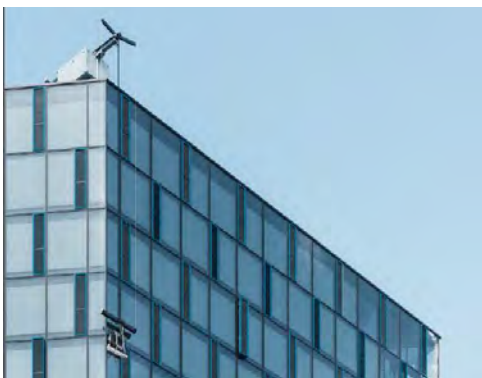




Automated robot cleaning, view from inside

To keep this newly generated absolute view clear at all times a new self-sufficient cleaning robot was implemented – cleaning the whole 8.500 sqm of façade within 24 hours.

The system has now been operated since July 2015. Even as exterior temperatures have reached up to 40° Celsius, the room temperature remains at a constant mid to upper 20's degree, saving 10-20 % of energy required for cooling, and providing a consistent environment for user comfort.



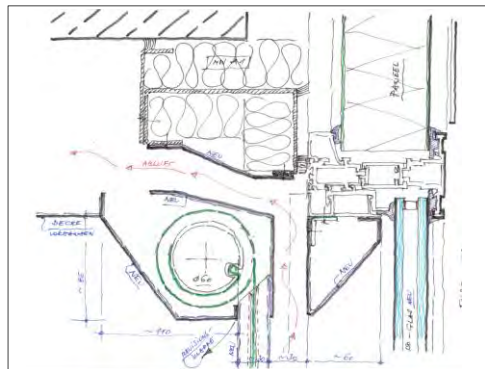
Automated cleaning system, view to the top



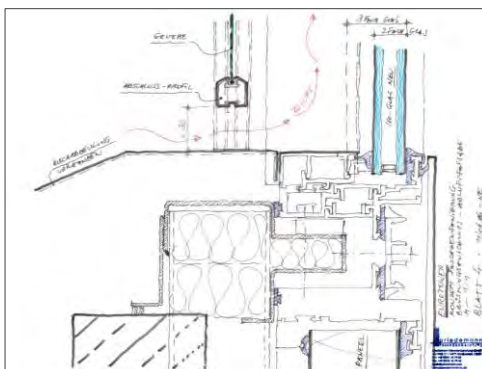
Cleaning – automated with robot, outside elevation



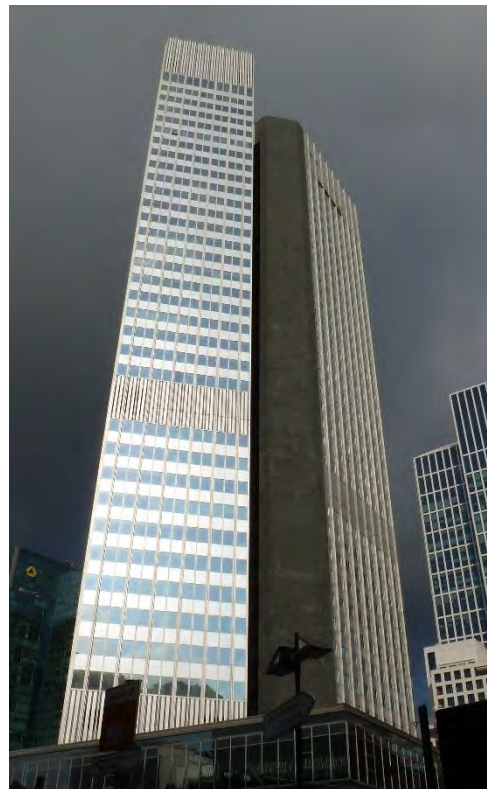
Facade elevation before refurbishment



Concept design – variation of an exhaust air facade



Concept design – variation of an exhaust air facade



The Eurotower after refurbishment

Client

RFR Propoerty

Owner • Developer

European Banking Authority

Architect

- Richard Heil (1971)
- Christoph Mäckler
Architekten
(Reconstruction)

Project Data

- ca. 148 m building height

Building Function

Office

Technical Features

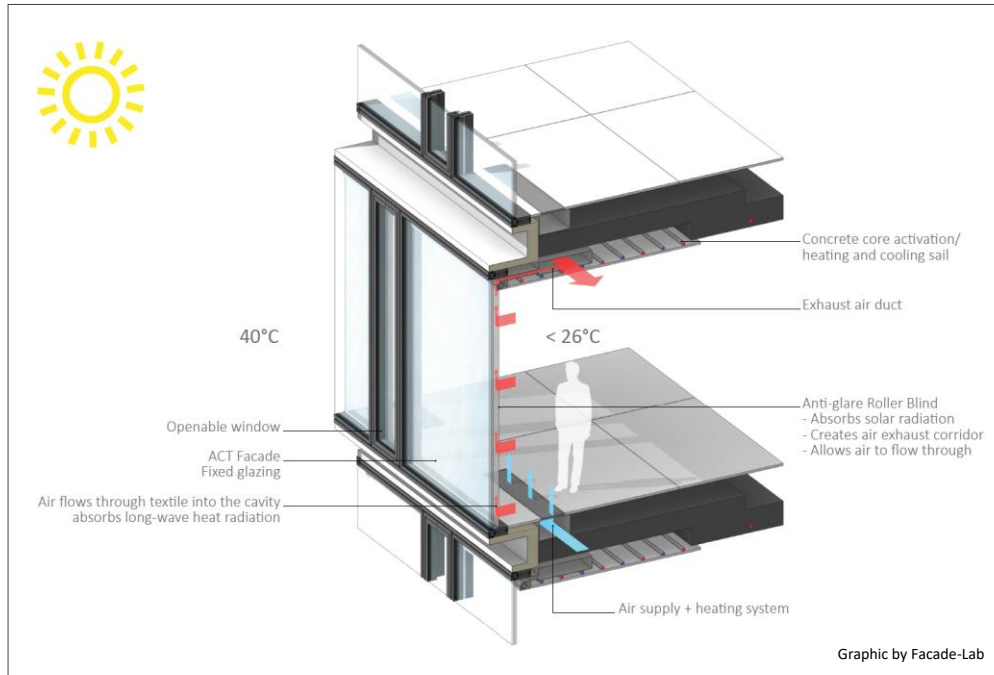
- Refurbishment
- Facade system with inner blinds with upgrading to an ACT Facade

Consultancy Services

- Project Objectives and Brief
- Concept/Schematic Design
- Detailed/Developed Design
- Technical/Construction Design
- Specification/Tender Documentation
- Tender Evaluation
- Design Compliance Control
- Execution Compliance Control

Status

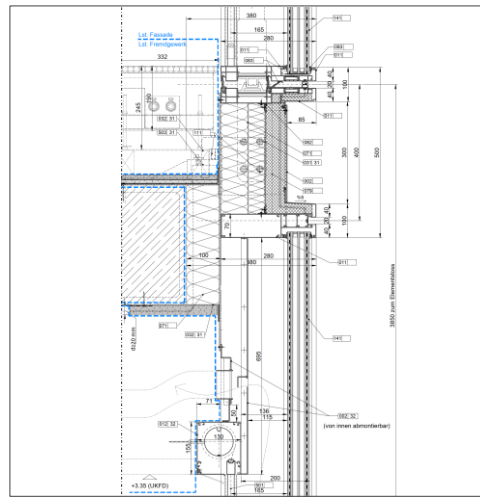
Completion in 2015



Competition rendering by HENN Architects



VERU test facade



Vertical section



Facade rendering by architect

Client

Continental AG/ HENN GmbH

Owner • Developer

Continental AG

Architect

HENN GmbH

Projektdaten

- ca. 20 m building height
- ca. 15.000 m² facade surface

Building Function

Office

Technical Features

- ACT Façade
- Unitized curtain wall
- Stick system facade, steel
- Ceramic digital printing on the glazing
- Glass roof
- Revolving door

Facade-Lab

Research & Development

Consultancy Services

- Project Objectives and Brief
- Architectural Competitions
- Concept/Schematic Design
- Detailed/Developed Design
- Technical/Construction Design
- Specification/Tender Documentation
- Design Compliance Control

Status

Completed 12/2023



Image: realestate.union-investment.com

Weser Tower in Bremen

Client

Union Investment Real Estate GnbH

Owner - Developer

Union Investment Real Estate GnbH

Architect

JAHN, Chicago

Project Data

- ca. 82 m building height

Building Function

Office

Technical Features

- Refurbishment of the South facade
- Upgrading to an ACT Facade with inner textile blinds and air duction through the ventilation sashes

Consultancy Services

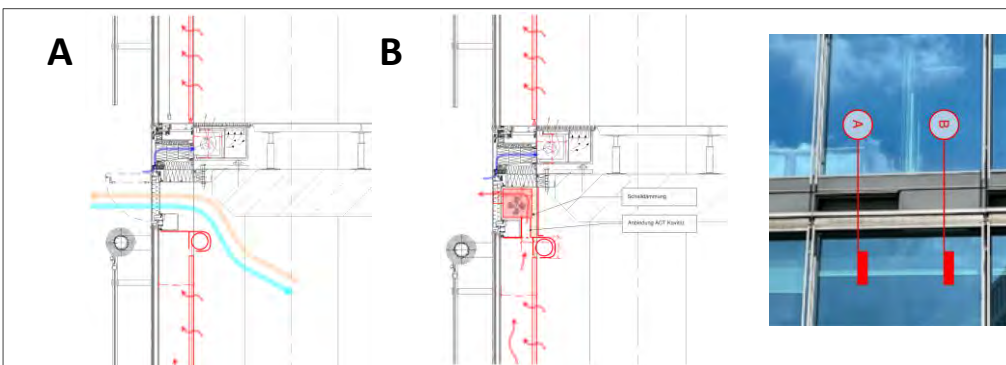
- Project Objectives and Brief
- Feasibility Study
- In-situ measurements
- Coordination/ General Transferee (entire planning and execution)

Status

Under construction



Current situation – Vertical facade section, south facade



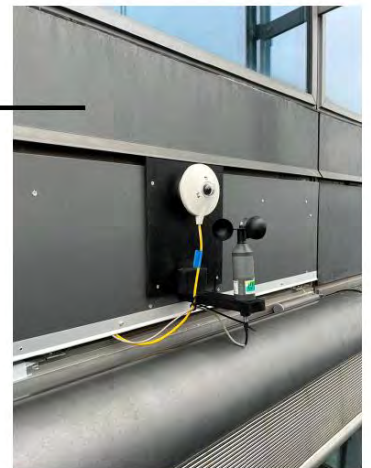
Variant 1 – preferred solution



Transformation into a test façade



Measuring room



Wind speed and irradiation at facade level on the outer façade of the measuring room





Client
Gerhard Spangenberg
Architekt
ARGE Spangenberg / Koch

Owner • Developer
ARDEX

Architect
- Gerhard Spangenberg
Architekt

Project Data
- Tower with 24 storeys
- ca. 90 m building height

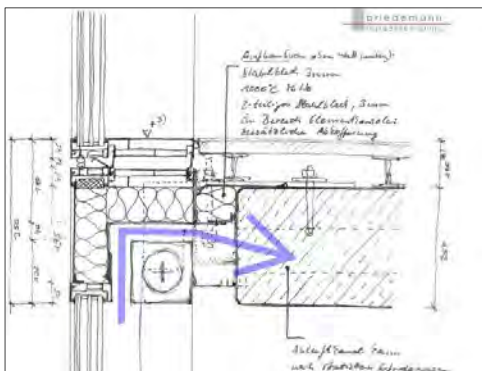
Building Function
Office

Technical Features
- Exhaust air facade
- Unitized curtain wall
- Stick system facade, double height
- Parallel vent windows
- Sloped facade elements

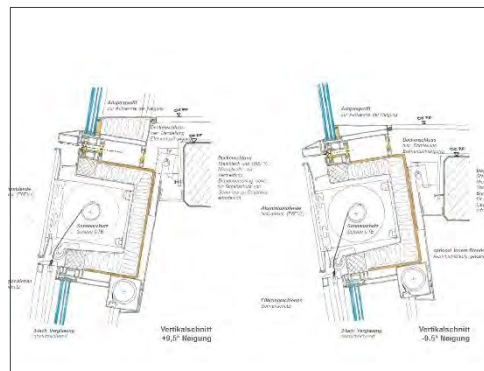
Consultancy Services
- Facade consultancy
- Concept design
- Design development
- Typical detailing
- BMU Concept
- Tender/specification

Status
In planning

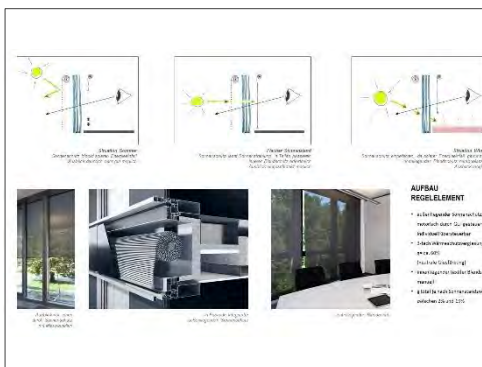
Rendering of the ARDEX-Tower



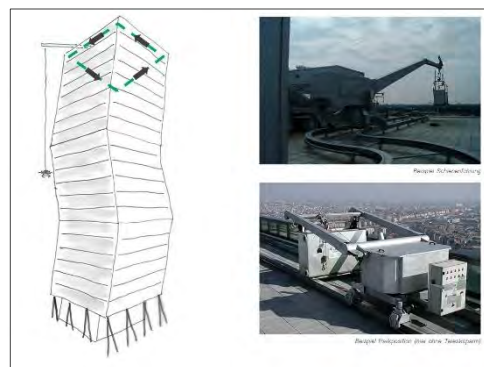
Exhaust air facade – concept sketch of vertical section



Facade concept, vertical section



Study of the sun protection and glare protection



BMU concept – progress at the very beginning



Facade Experience

Priedemann was founded in 1993, since then, a simple mission moves us: **To do the ONE thing, that makes our heart beat – FACADES.**

Our knowledge is rooted in German craftsmanship, but we constantly strive to extend our horizon by using the latest technologies, focusing on research & development and learning from our daily challenges.

We take over responsibility from inception all the way beyond realization.

Building Skins

Facade Consultancy & Engineering Services

We are focused on Facades: Priedemann Facade Experts are global operating engineering offices with the focus specifically on the building envelope. In a unique way we make our holistic full-service facade competency available to investors, architects and building contractors. Beside façade consultancy and third-party execution control, we develop the system design and prepare the final shop drawings. Mastered facade techniques, brave to own responsibility and the passion to chase nearly impossible objectives are our strengths.

Services

Whether it is the comprehensive consultancy package or a single engineering discipline; our clients can rely on Priedemann's competency from project conceptualization to the stages beyond commissioning. We understand the envelope as an interface to almost all adjacent trades and we consider ourselves as the partner of all five main construction participants, namely the investor/ developer to the architect/ general consultant,

the general contractor and the façade fabricator extending finally to the supplier of the envelope's components and materials. Over 1,000 successfully completed projects world over and long-term client relationship tells its own tale.

Beyond standard Solutions

Dare to tackle something new, exceed expectations – Priedemann Facade Experts stands for innovative solutions with a practical approach. Beside applied implementation of sophisticated facade projects in all climate zones, we contribute in research and engage in professional knowledge exchange. The Facade-Lab, a subsidiary of Priedemann, drives the quest for innovative facade solutions and develops specific and customized products. We develop and test these products together with our partners from the science and research industry. In addition, a separate facade forum offers a platform for the exchange with colleagues and manufacturers. In a showroom of 750 sqm we exhibit over 60 mock-ups, material samples and information.

Continuous Support

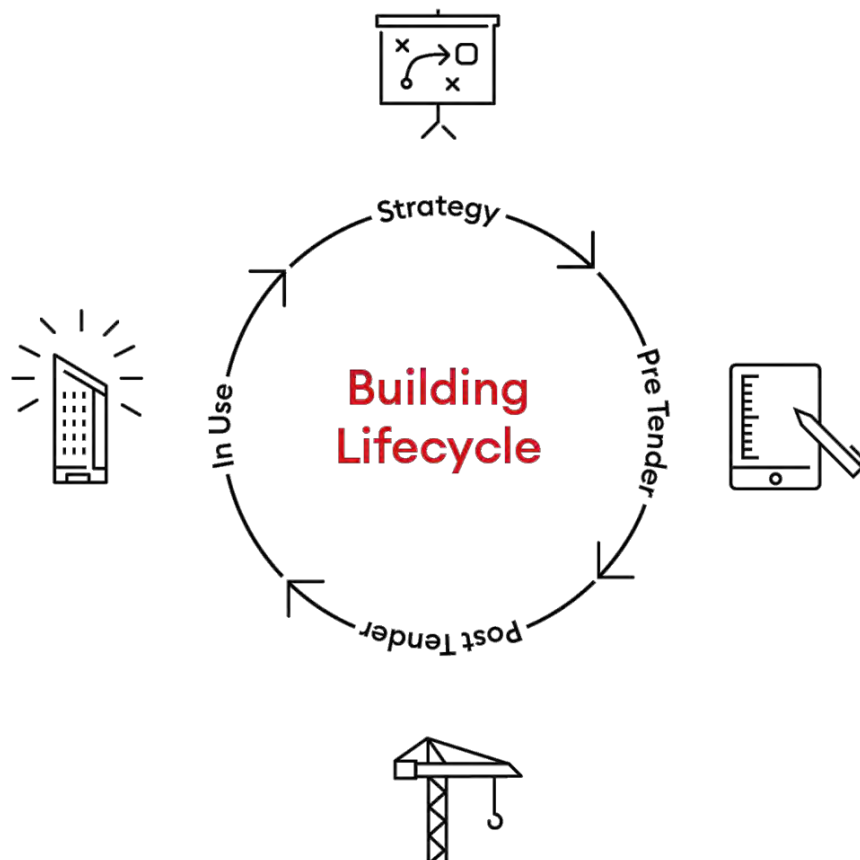
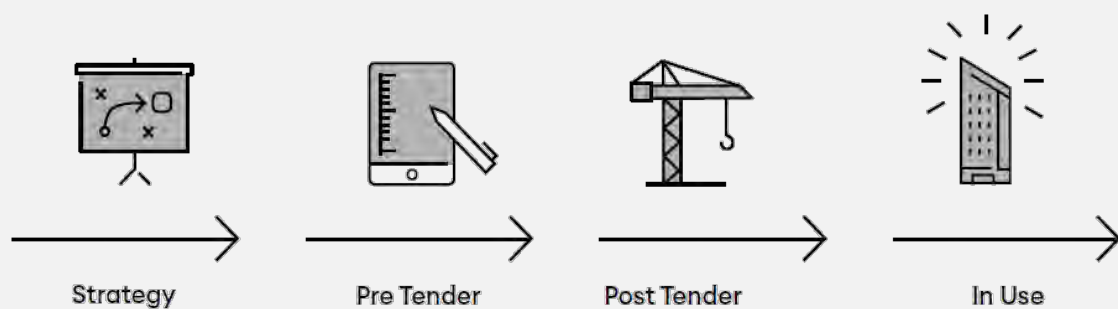
So when a project begins - or at any time in the planning phase when Priedemann Facade Experts are involved - we clarify the need of intentions.

As we guide from A-Z, we believe a guide needs to have the practical execution experience; to the extend that if the party who executes shows any kind of resistance, the façade consultant shall be able to take over the challenge to show forward.

As an independent practice, we are obliged to the entire life cycle of a building skin.

We love to start as early as possible such as with an architectural competition and we do not stop where the interfacing starts.

Responsibility from concept beyond completion

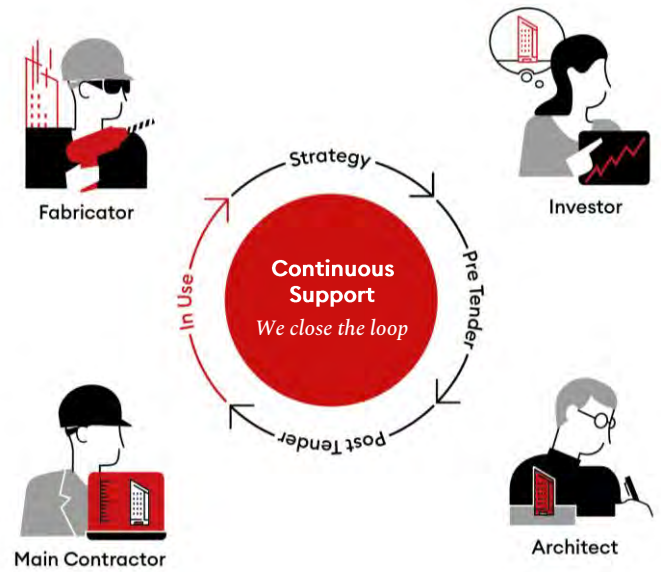


Continuous Support

At Priedemann, we take care of facade consulting AND engineering. In this way, we close the gaps between planning and execution.

We ensure that the project knowledge we have gained is transferred to the construction phase. In this way, you can rely on the ONE person responsible for the facade.

With this, we support the architect as design author and generalist on the building site and the client and investor as idea provider, initiator and financier.

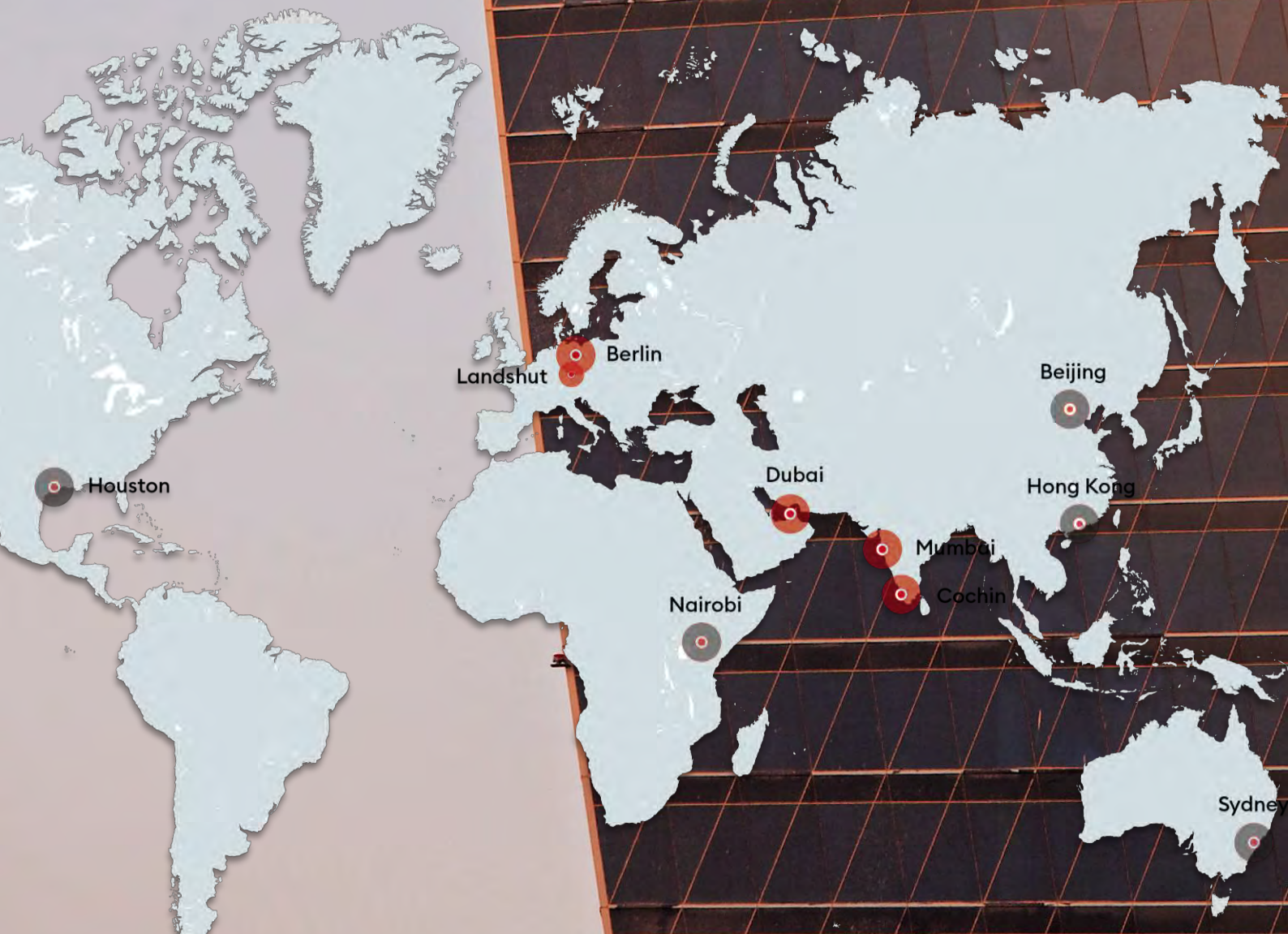


Scope of Services

	Consultancy	Engineering	Specials	Facade-Lab
Strategy	<ul style="list-style-type: none"> Architectural Competitions Refurbishment Concept Feasibility Study Project-/Peer Review Technical Due Diligence 	<ul style="list-style-type: none"> Factory Layout Prequalification 	<ul style="list-style-type: none"> Thermal Building Physics Building Acoustics Simulations Decentralized Energy Green Building Certification 	<ul style="list-style-type: none"> Research & Development Showroom Forum Mock-Up & Prototype Model Workshop
Pre-Tender	<ul style="list-style-type: none"> Project Objectives & Brief Concept/Schematic Design Detailed/Developed Design Technical/Construction Design Specs/Tender Docs Tender Evaluation 	<ul style="list-style-type: none"> Bidding Stage Association Value Engineering 	<ul style="list-style-type: none"> 3D Modelling BIM Parametric Digital Production Media Facade 	<ul style="list-style-type: none"> Collaborate Coordination/ General Transferee LEAN Processing Purchasing/ Procurement/ Awarding Execution/ Realization
Post-Tender	<ul style="list-style-type: none"> Design Compliance Control Mock-Up Association Execution Compliance Control Approval of As-Built Docs Variation Claim Evaluation Handover 	<ul style="list-style-type: none"> Construction Objectives & Brief System/Concept Design Mock-Up Development Provision/Shop Drawings Material Take Off Production Documentation Installation Documentation As-Built Drawings 	<ul style="list-style-type: none"> Maintenance Structural Design Design-, Cost Optimization BMU Concept & Design 	<ul style="list-style-type: none"> Asset Transformation
In Use	<ul style="list-style-type: none"> 1401 Monitoring 1402 Defect-/Failure Investigation 		<ul style="list-style-type: none"> Diverse PI Insurance 	

Priedemann Facade Experts

Thinking global – Acting local



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