

## facades – a roadmap:

Prof Dr.-Ing Ulrich Knaack

TU Delft / Faculty of Architecture – The Netherlands

TU Darmstadt / Faculty of Civile Engineering – Germany

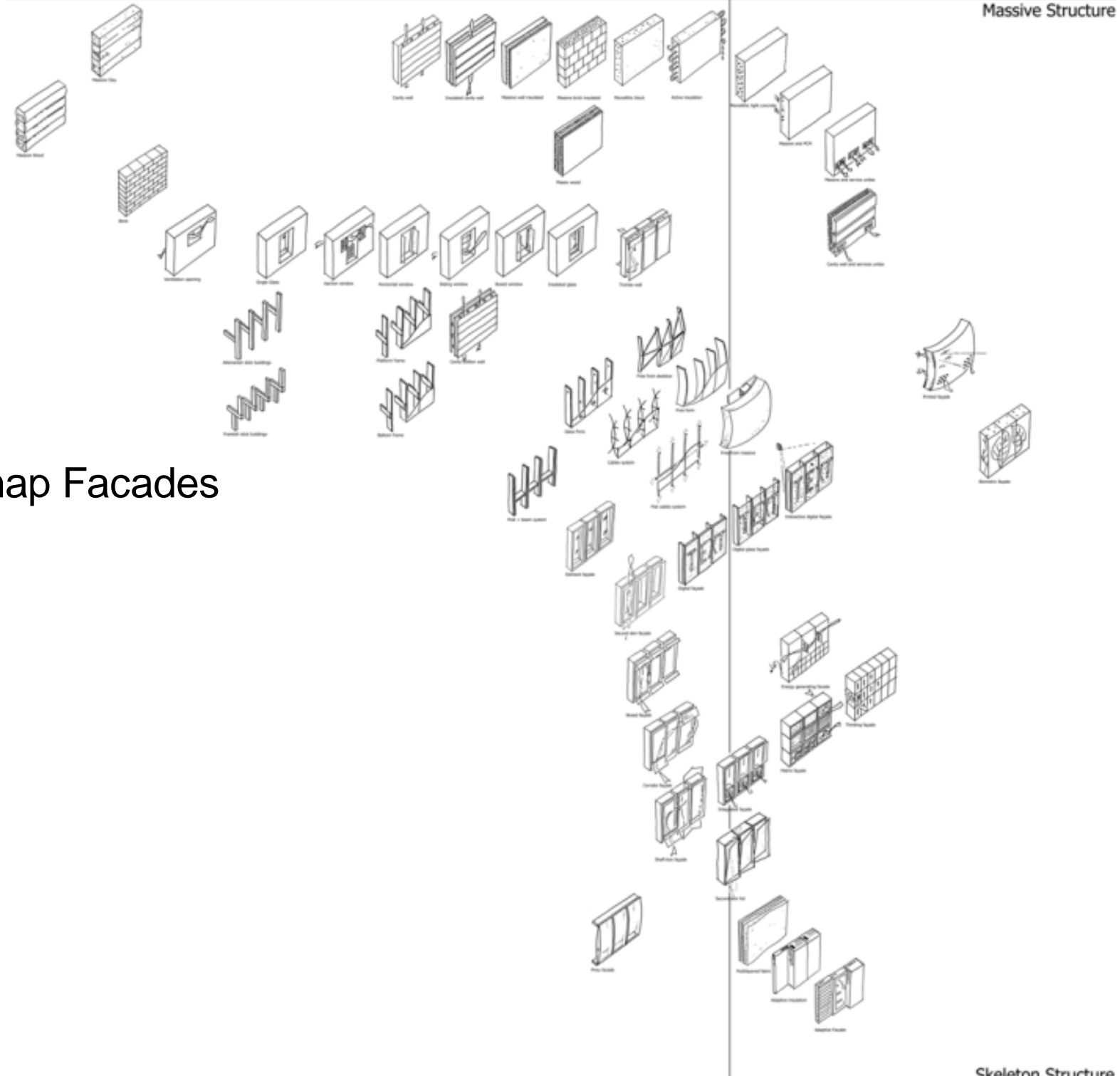
Imagine envelope bv. – The Netherlands @ imagine group

<http://facadeworld.com/>

<http://imagineblog.tumblr.com>

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Massive Structure



# Roadmap Facades

Skeleton Structure



# Influences



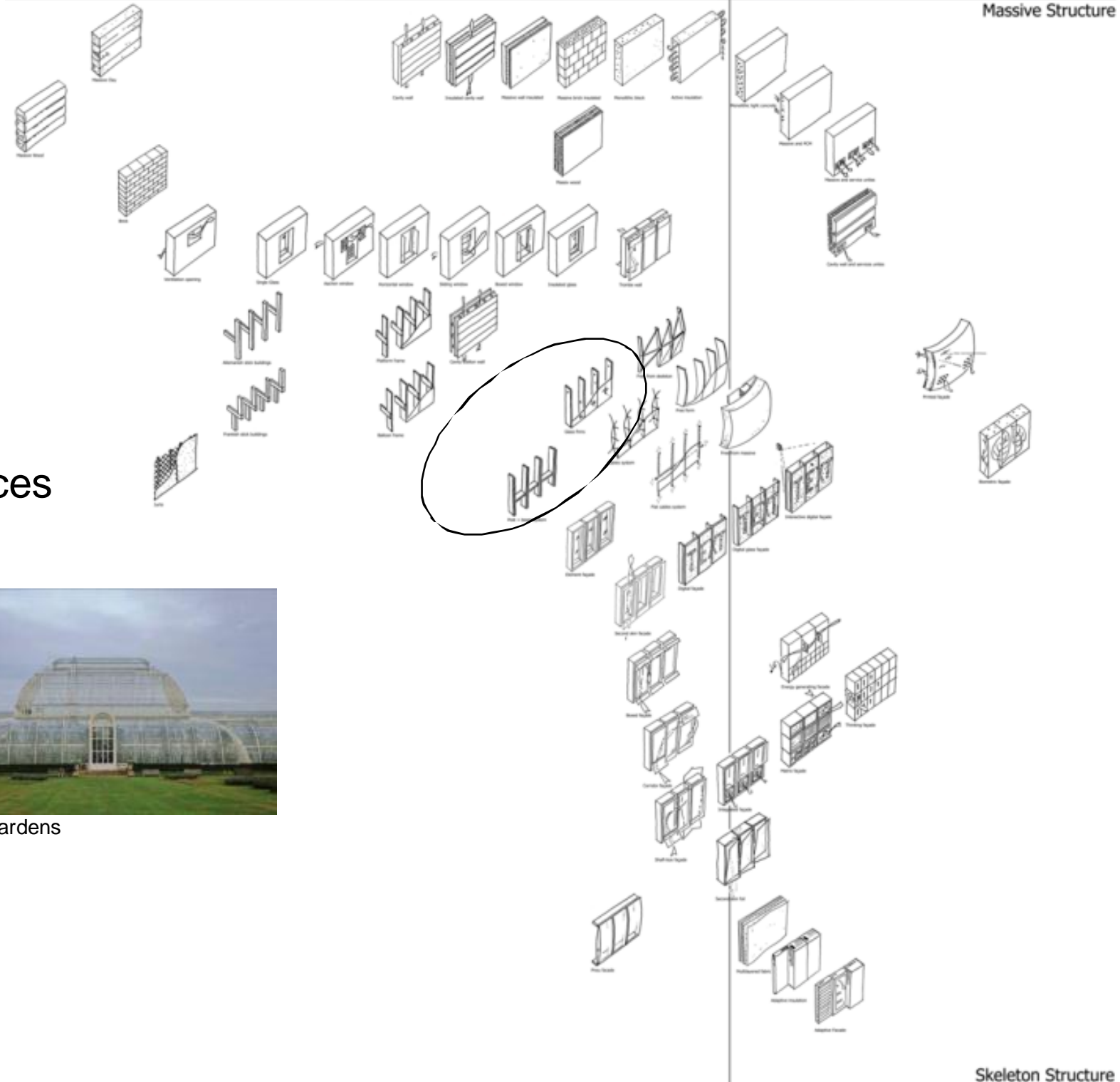
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Massive Structure

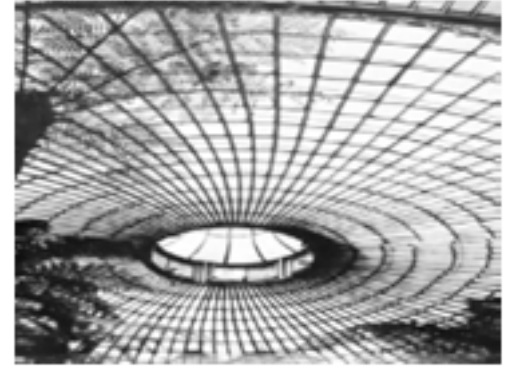
# Influences



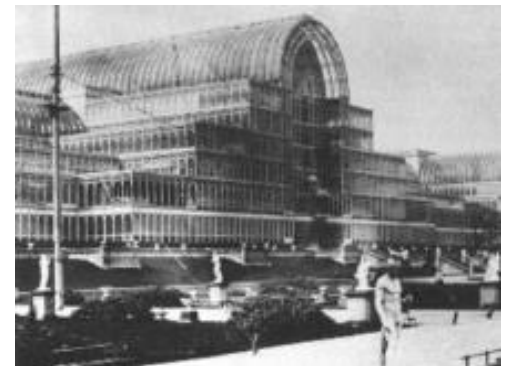
Kew Gardens



Skeleton Structure

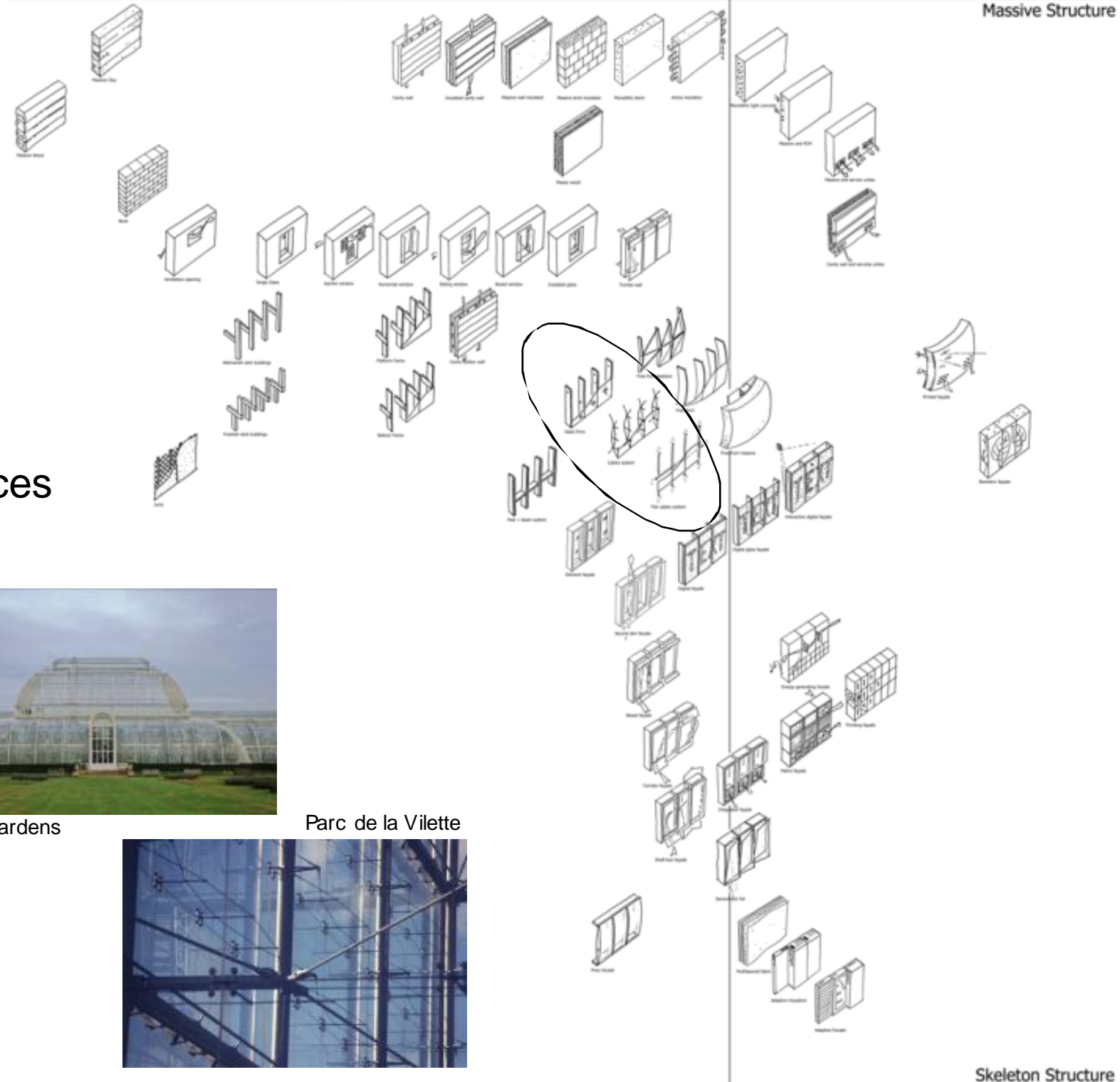


first generation structural glass



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Massive Structure



# Influences



Kew Gardens

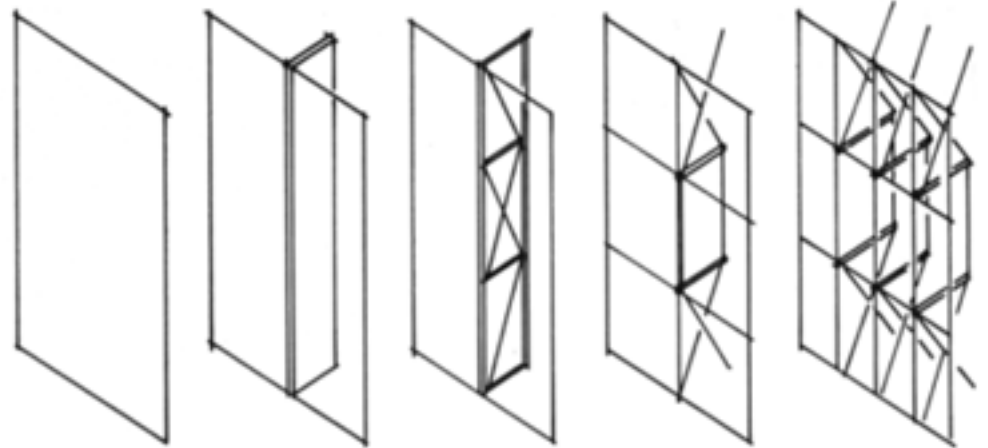
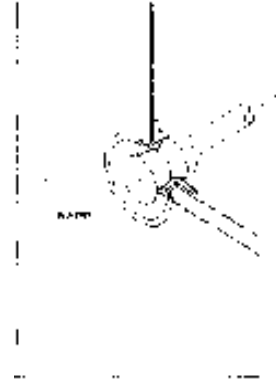
Parc de la Vilette



Skeleton Structure



second generation structural glass





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Massive Structure

Influences



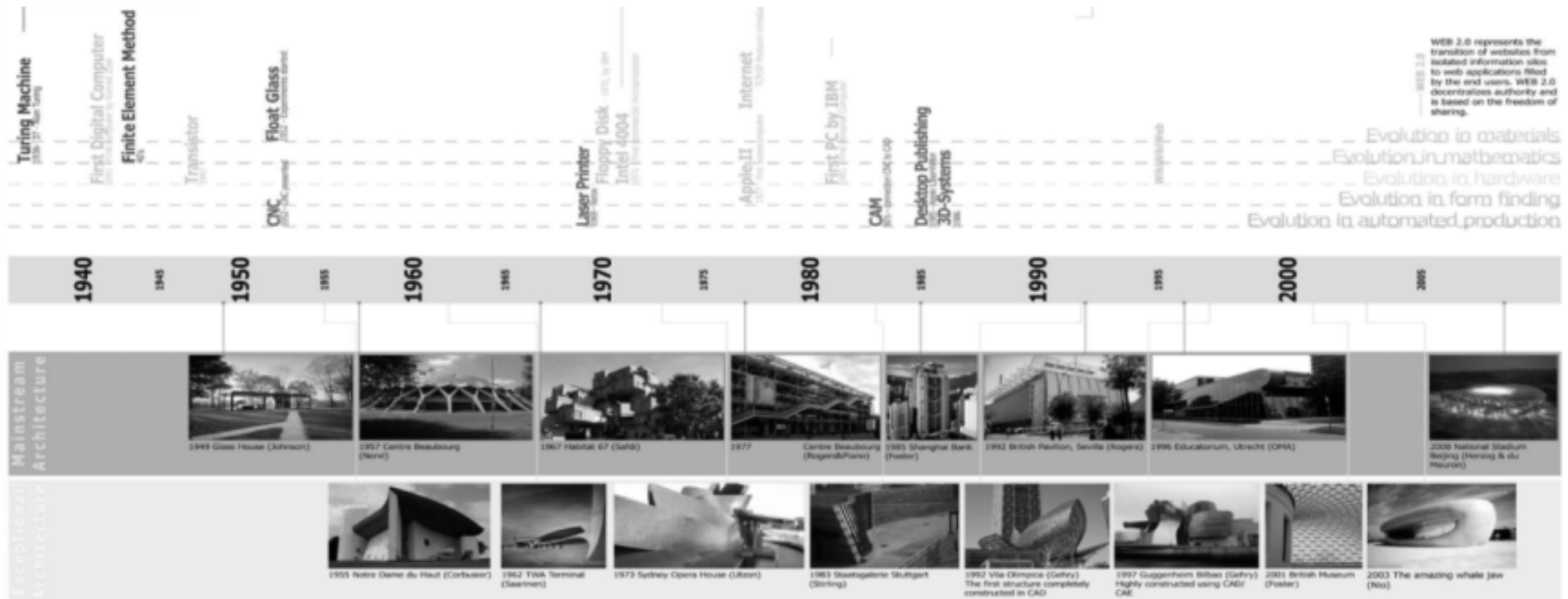
Kunsthaus Graz

Skeleton Structure





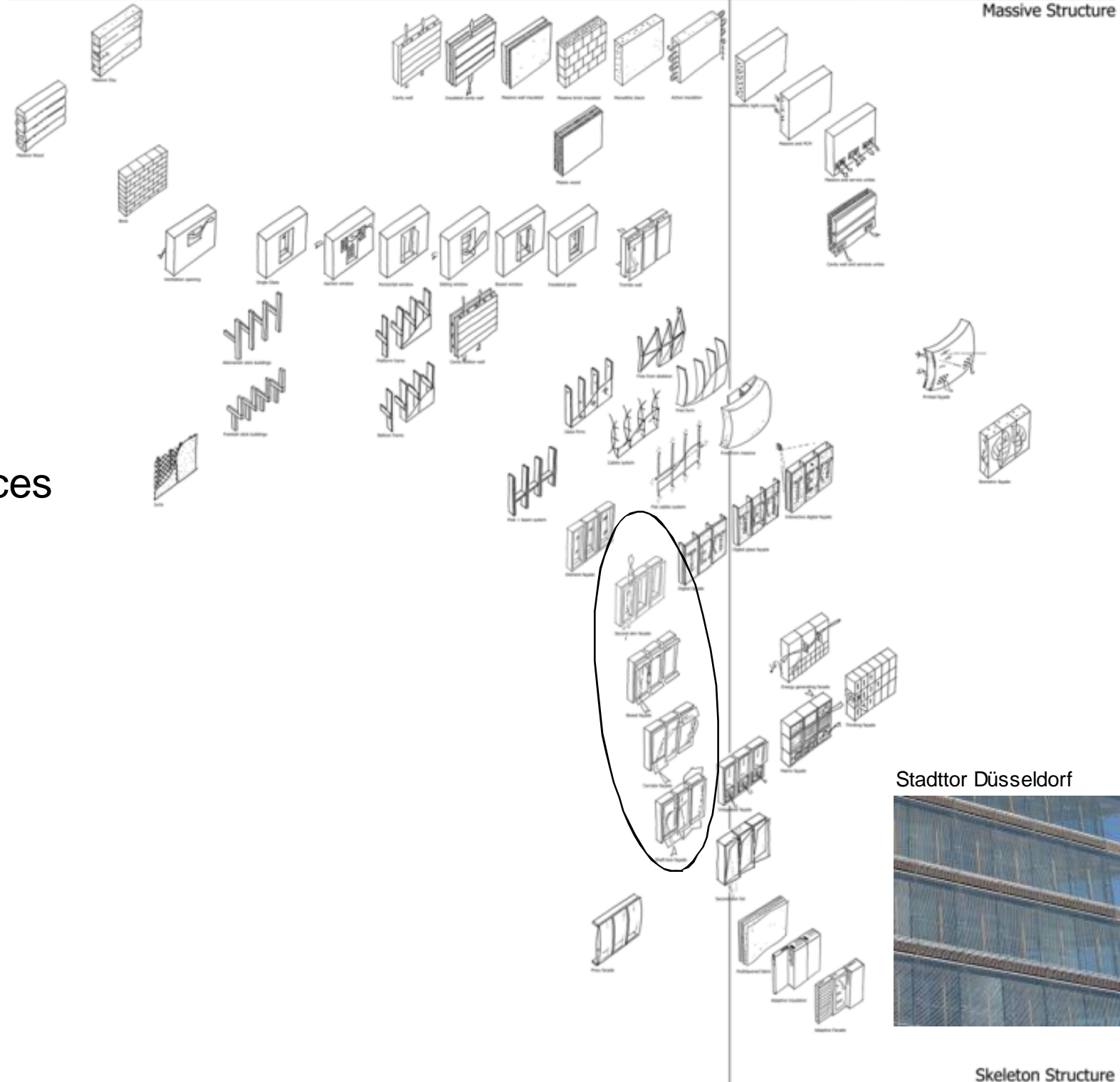
# free form facades



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Massive Structure

Influences



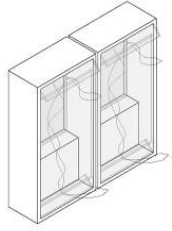
Stadttor Düsseldorf



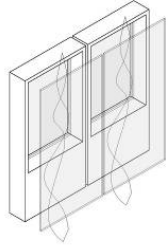
Skeleton Structure



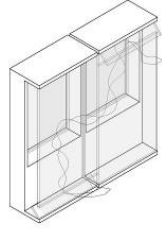
# double facades



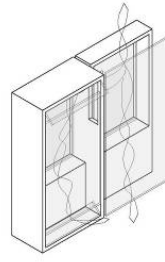
boxed w window facade



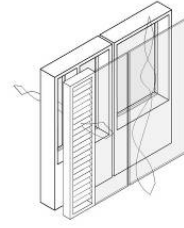
second skin facade



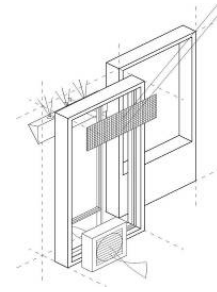
corridor facade



chimney boxed w window facade



alternating facade

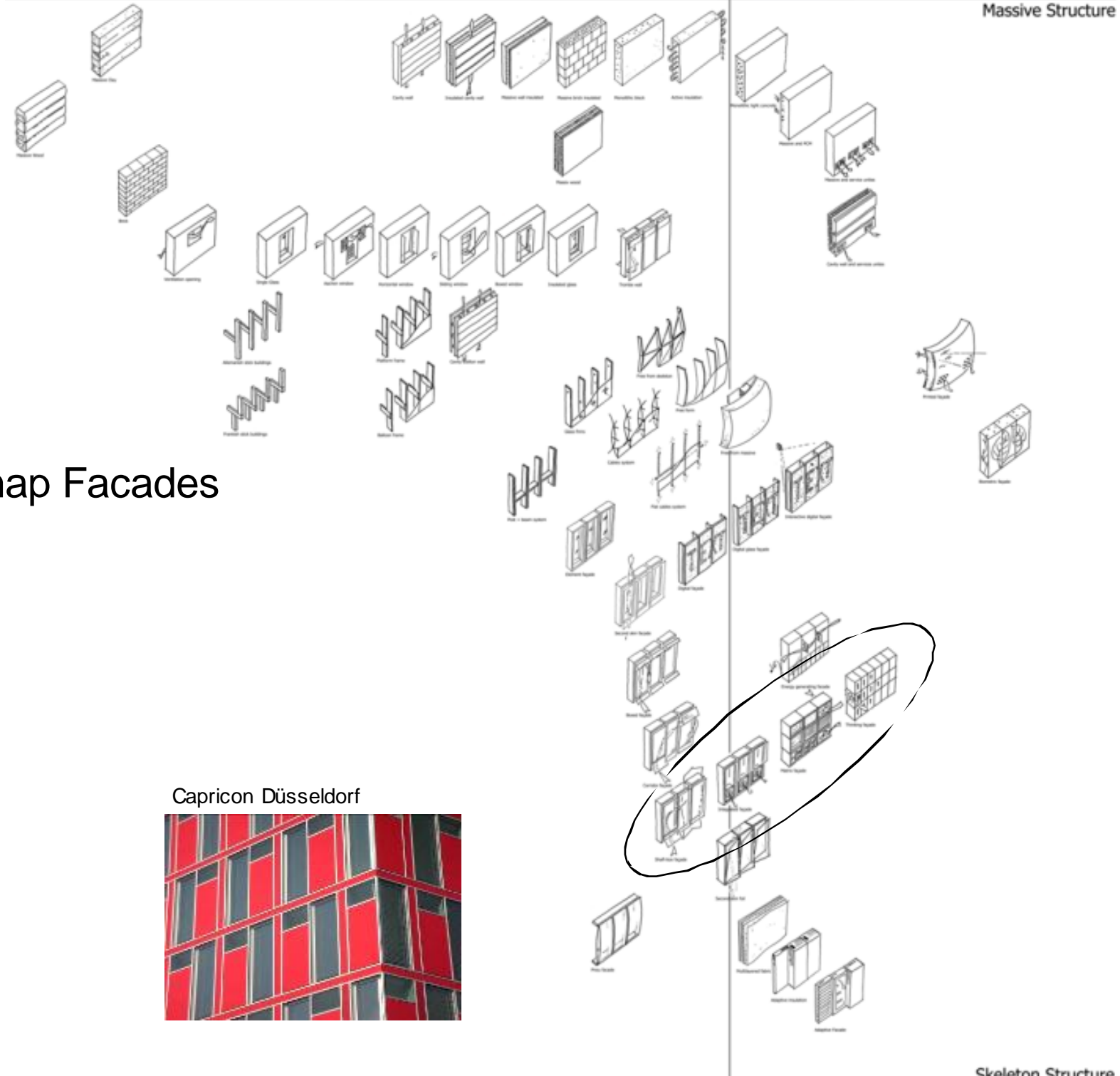


component facade



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Massive Structure



# Roadmap Facades

Capricon Düsseldorf



Skeleton Structure



## component facades

Llody s of London



Posttower Bonn



T-motion facade



Capricon Düsseldorf

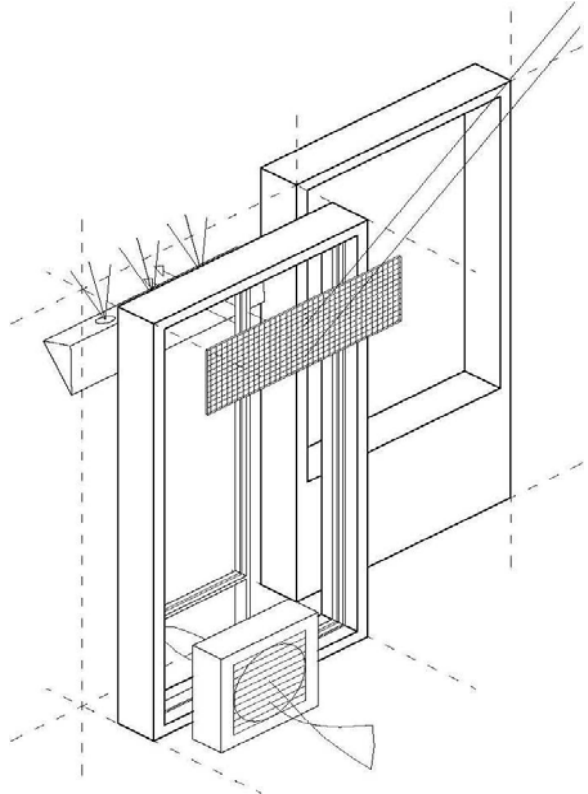


SmartBox

E<sup>2</sup> Fassade

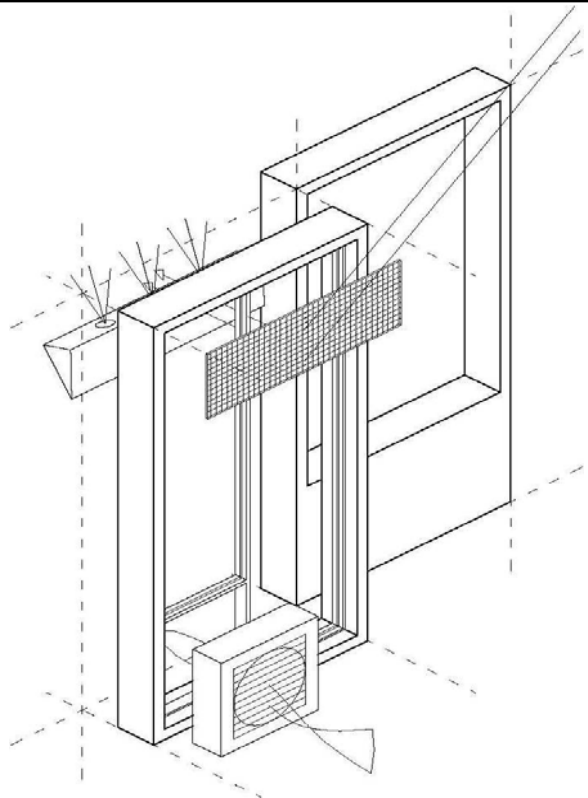
NEXT Facade

„Component facade“: Posttower Bonn



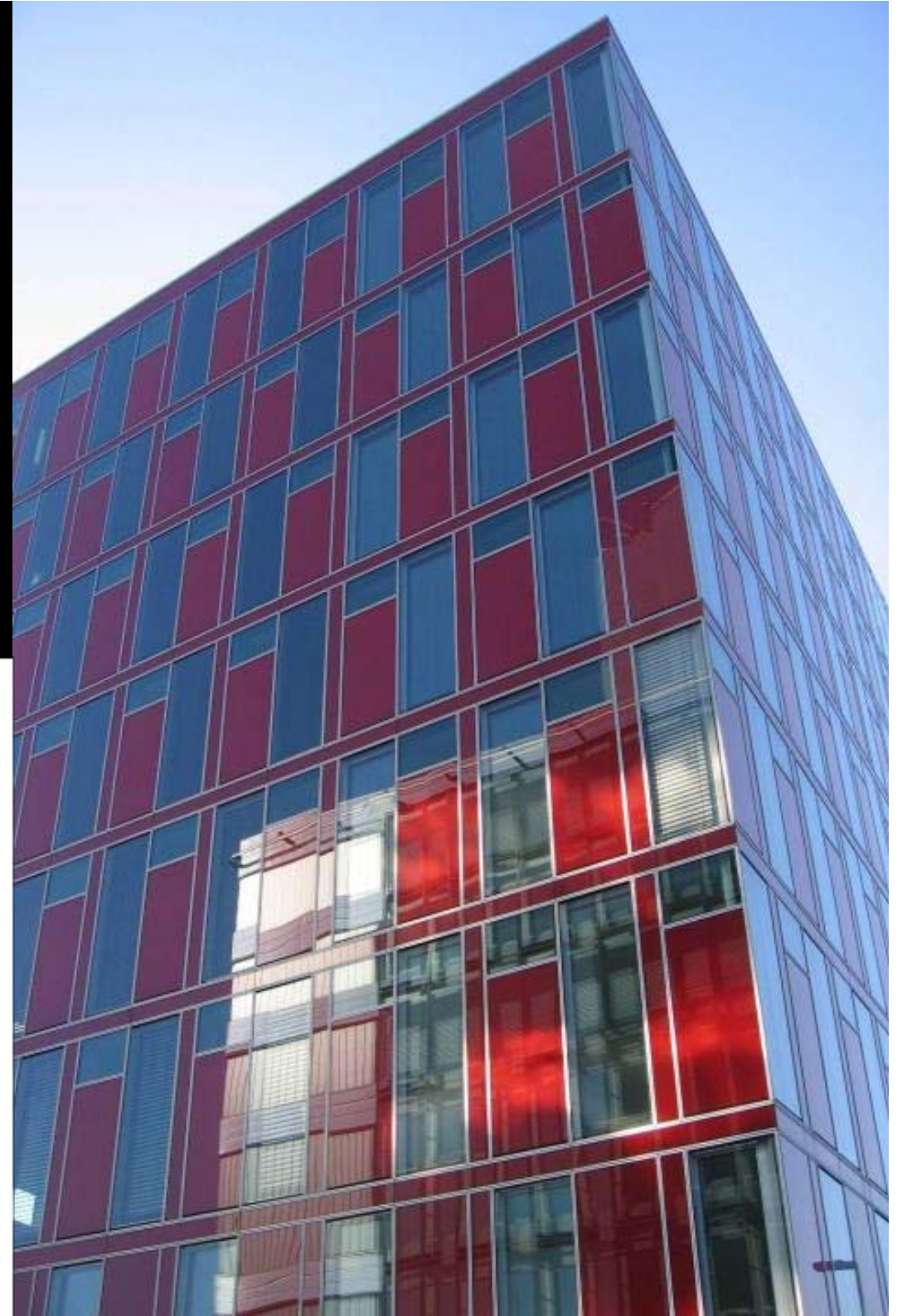
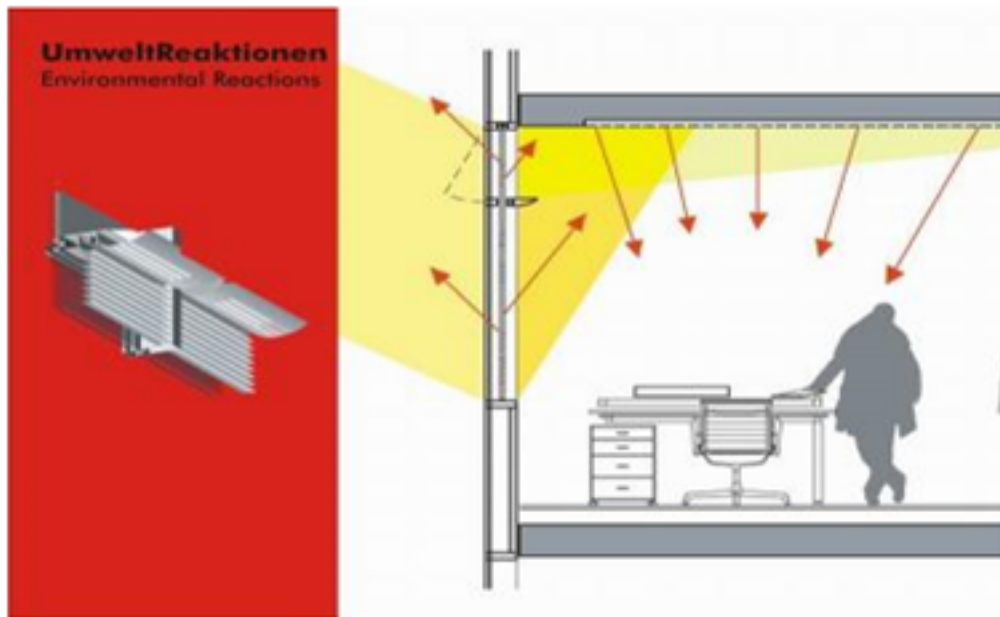


„Component facade“: Posttower Bonn



„Component facade“: Capricon Düsseldorf

GATERMANN + SCHOSSIG  
Architekten · Generalplaner





„Component facade“: Capricon Düsseldorf

GATERMANN + SCHOSSIG  
Architekten · Generalplaner





„Component facade“: E<sup>2</sup> facade by Schüco



# Modular Facades

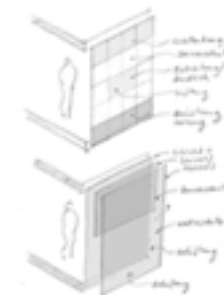
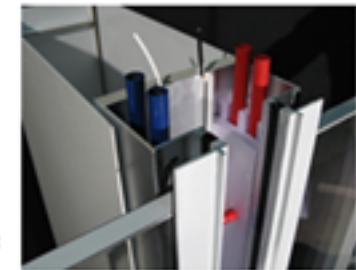
## Development of a modular façade system

The need for higher energy performance and the integration of two traditionally different disciplines poses a new challenge for façade construction. The goal of this research project was the development of a catalogue of demands for building services integrated façades and a roadmap for new constructional solutions.

Kawneer Alcoa is a major façade system supplier. Their curtain wall and window systems are widely applied. On one hand the architectural market asks for customization and on the other it needs a standardized product range with a manageable amount of parts. The integration of building service components in façade construction asks for a new modular approach in combining these disciplines.

Essential for the success of a façade product are the construction phases from Pre-Design over Production and assembly to the re-use of components and the involvement of different stakeholders. Who decides what at what moment? Both has been analysed and on the basis of the outcome several new constructional concepts for services integration have been developed.

The project has resulted in the design of a façade system with vertically integrated media and a European patent no. EP 2117091 A2.



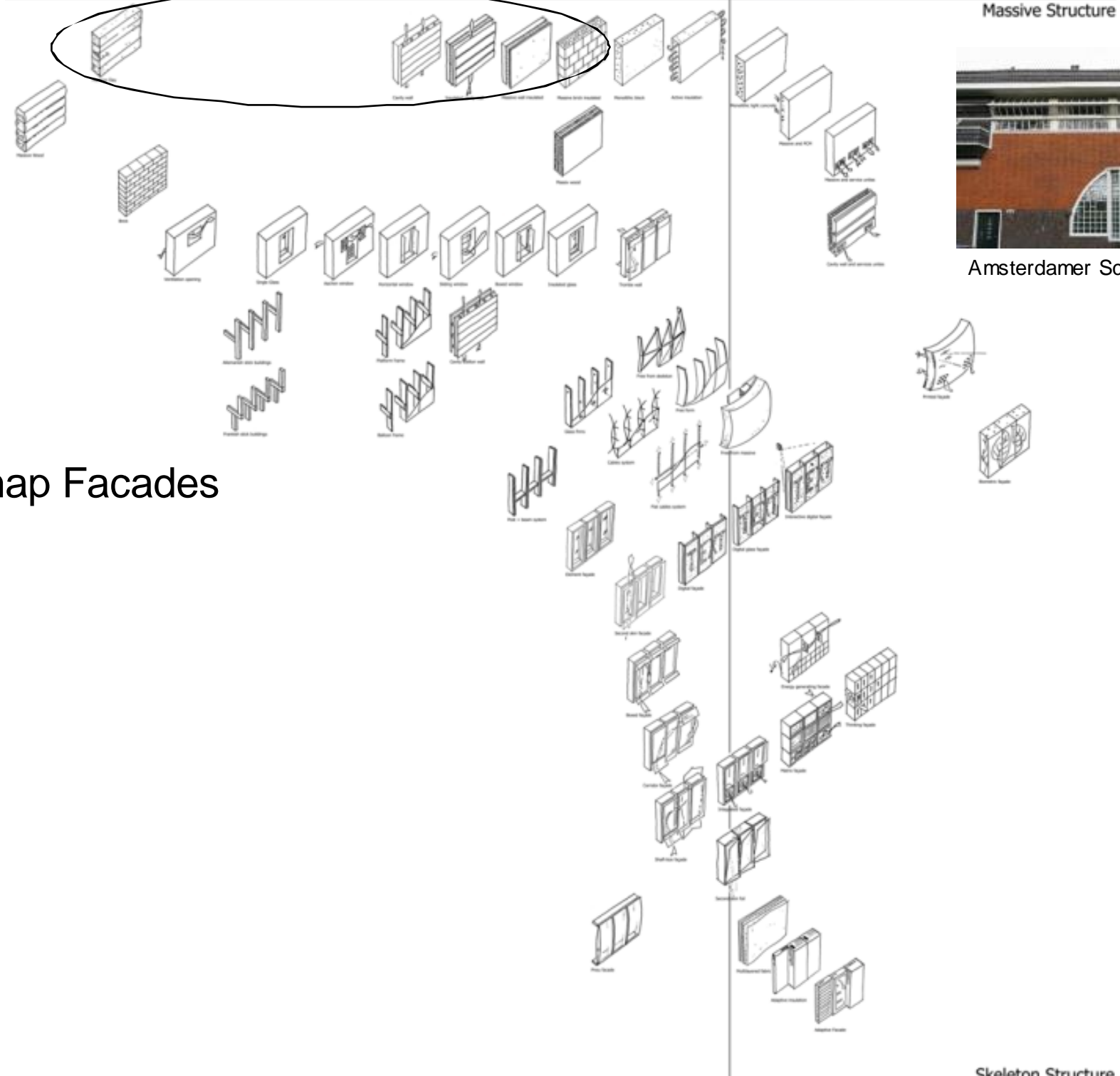
„Component facade“: NEXT by Alcoa



**PROJECT INFORMATION**  
Project leader: Tibor Kón  
Directed by: Tibor Kón  
Period: 2009 - April 2010  
Budget: € 24.000  
Funded by: Kise Kawneer Architectural Systems

**RELATED PUBLICATIONS**  
• Kón, T., Hovik, J. (2010) „Residualstruktur - reduzierte Glasfensterstruktur für Gebäude“, *Architektur InformationsMagazin* EP 2117091 A2

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Amsterdamer Schule

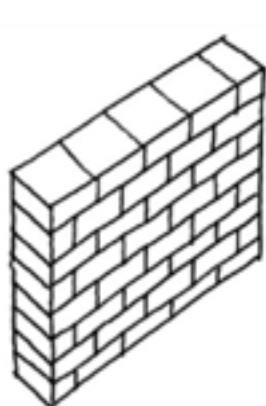
# Roadmap Facades

Skeleton Structure

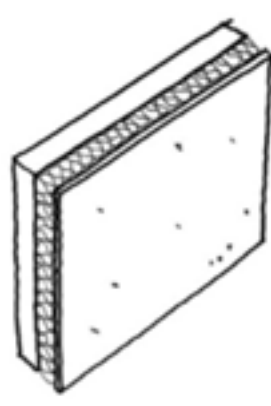




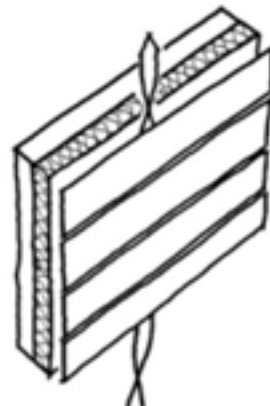
massiv construction to layered construction



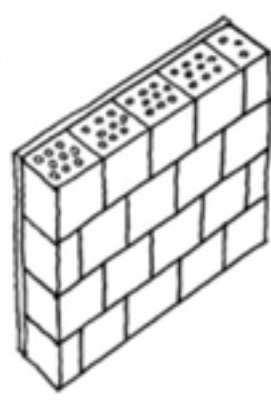
Brick



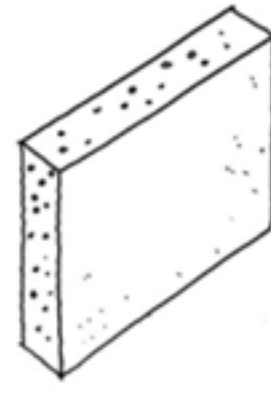
Massive insulated



Cavity wall



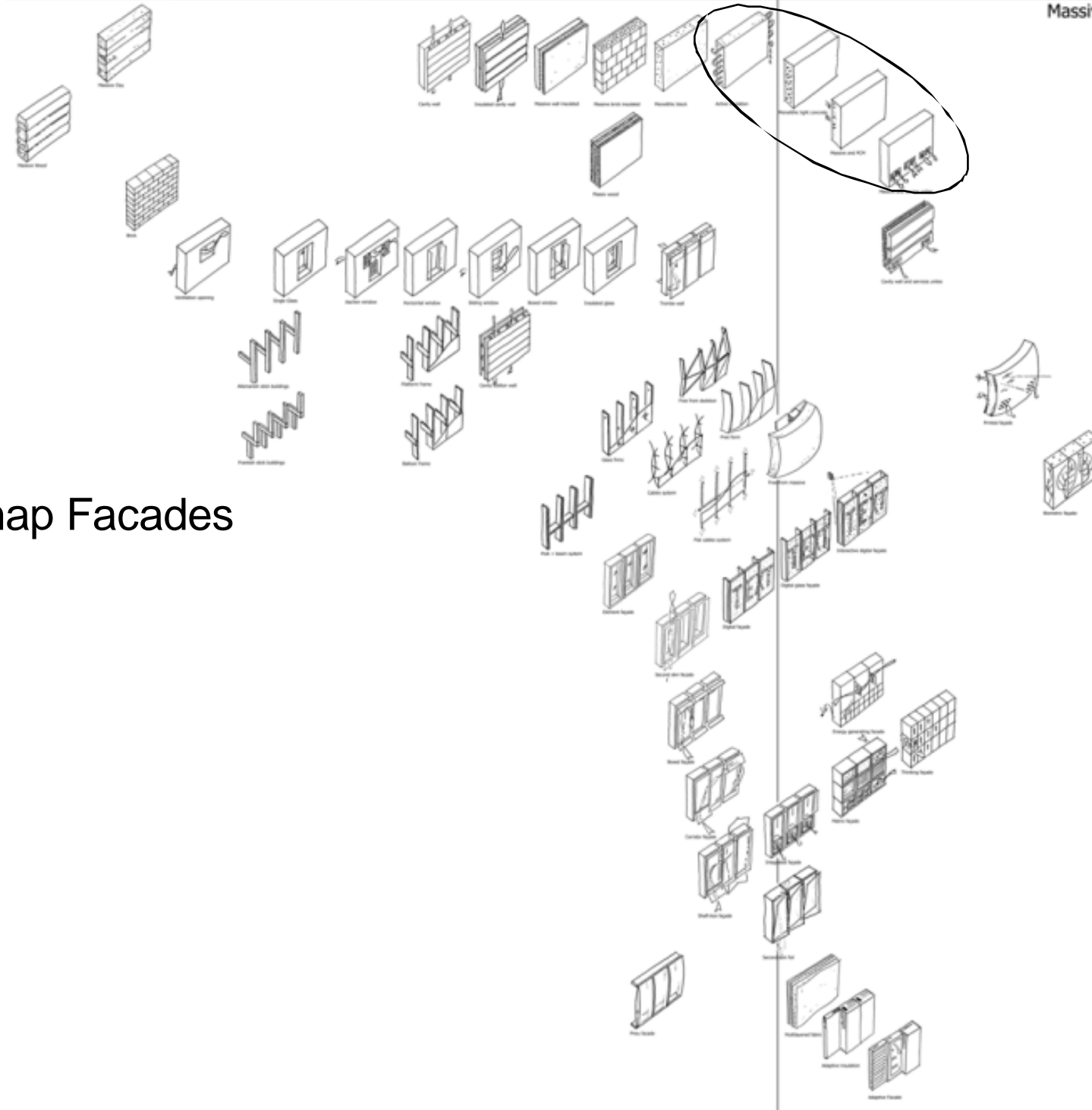
Massive brick insulated



Monolithic block

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Massive Structure



# Roadmap Facades

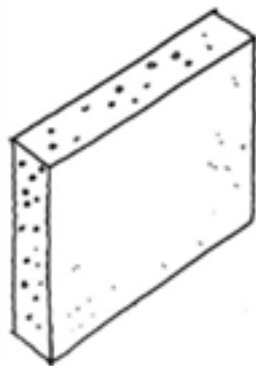


Design School Essen

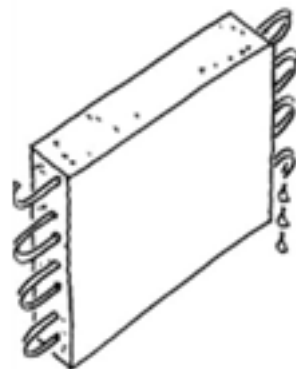
Skeleton Structure



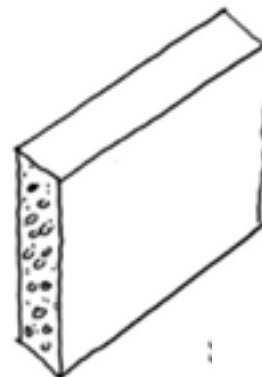
massiv and performing construction



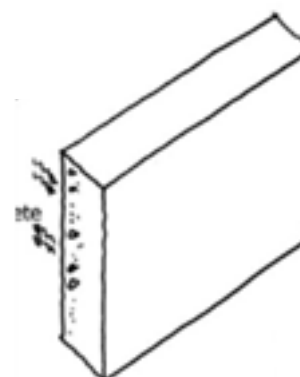
Monolithic block



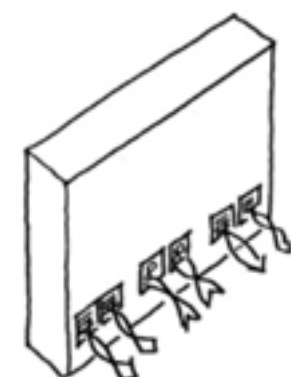
Active insulation



Monolithic light concrete



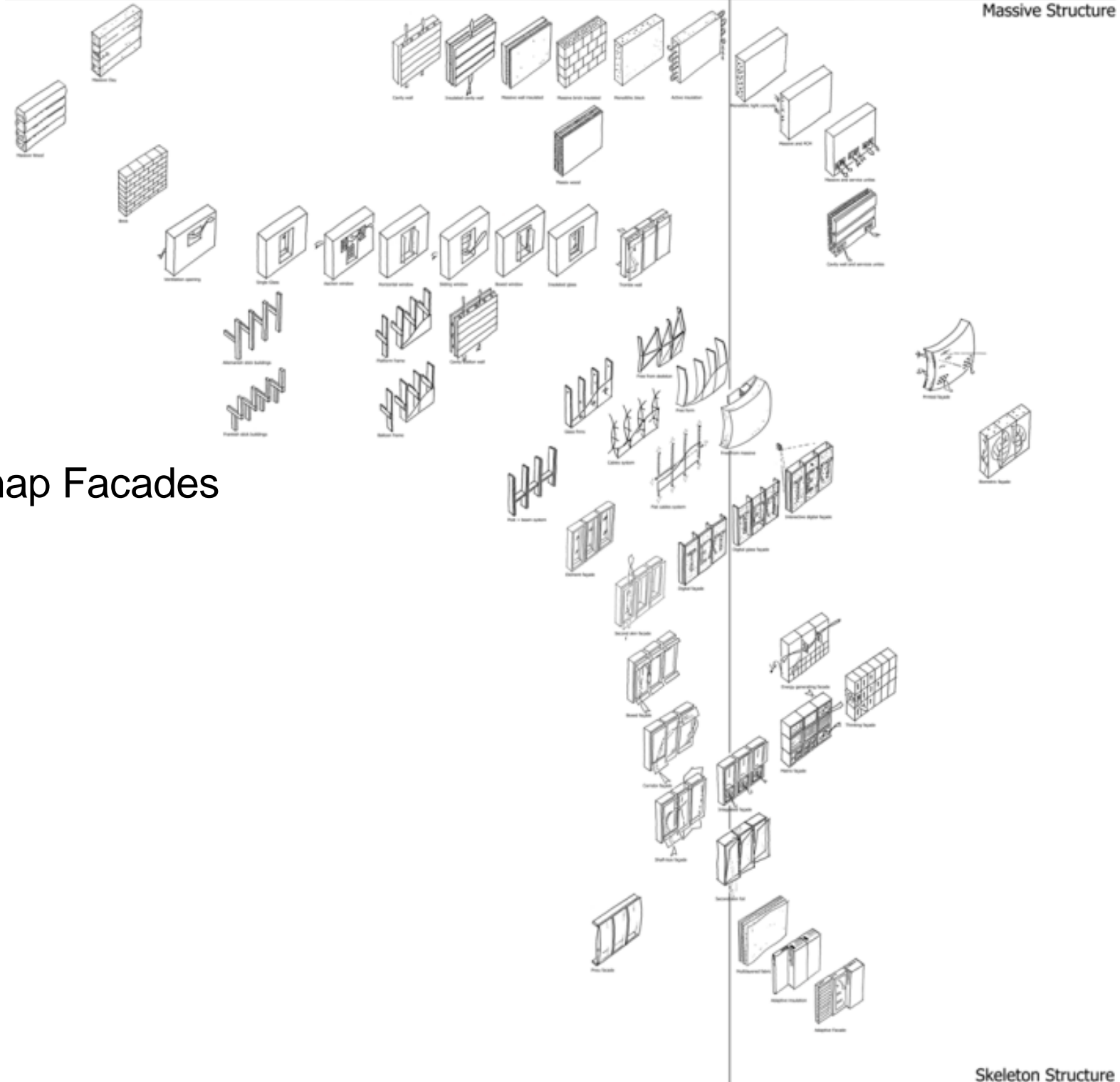
Massive and PCM



Massive and service unites

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Massive Structure



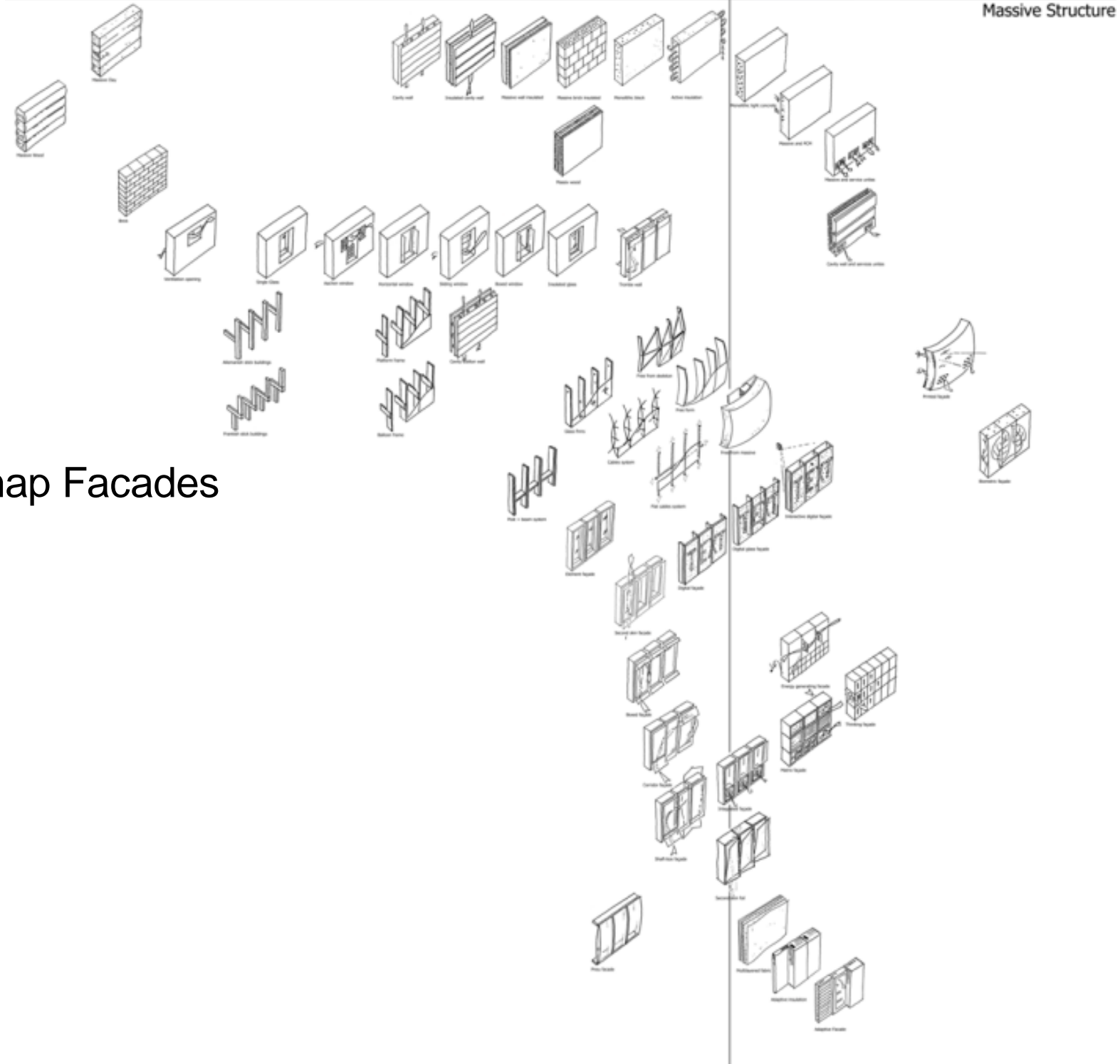
# Roadmap Facades

Skeleton Structure



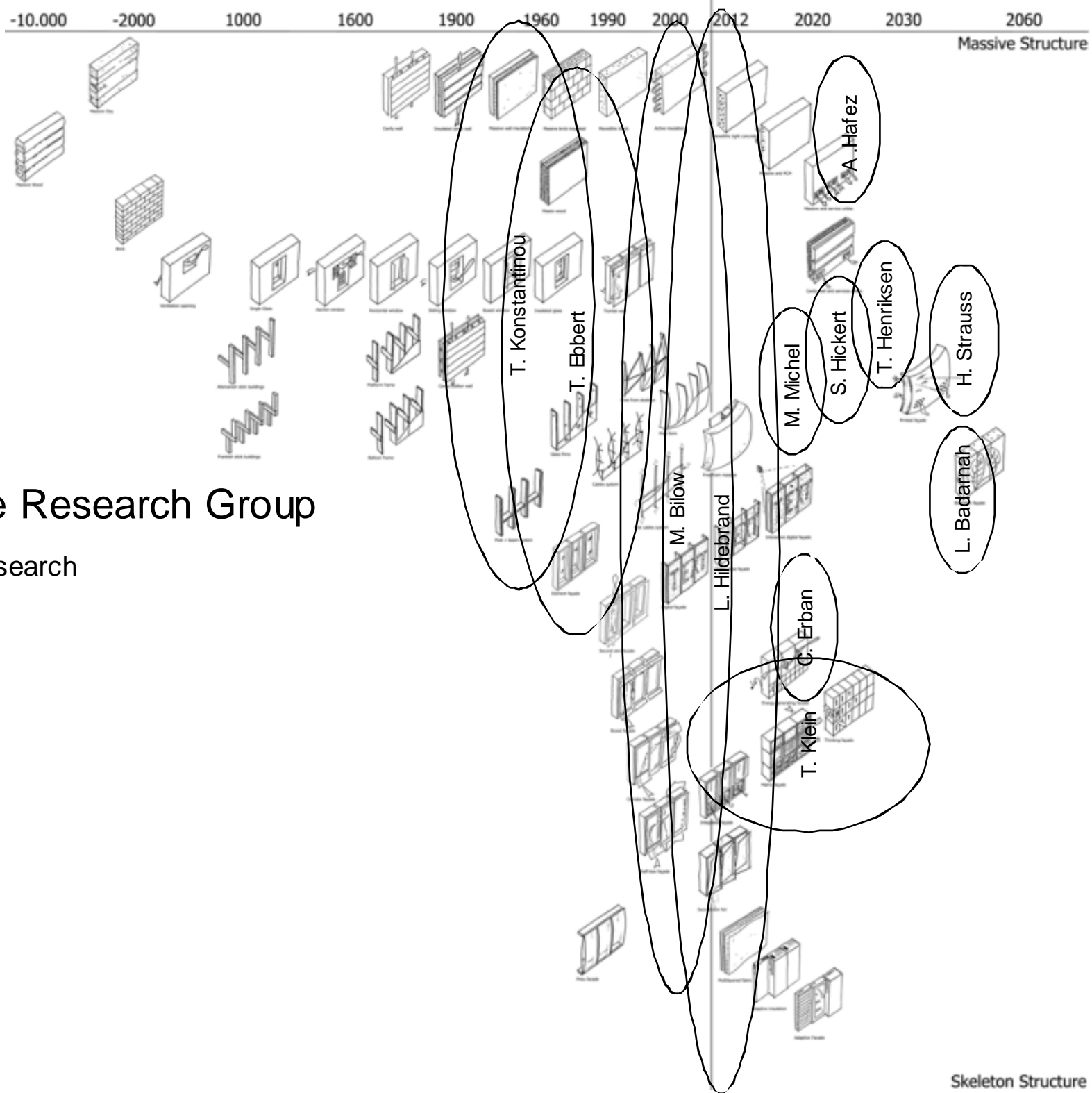
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Massive Structure



# Roadmap Facades

Skeleton Structure



# Façade Research Group

Active Research

# Photovoltaic in Buildings

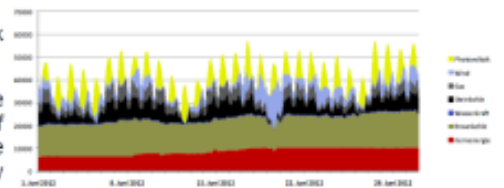
Photovoltaics panels are conventionally mounted on South oriented roofs and façades to maximize their annual power generation. Since a new EU regulation will possibly demand much more photovoltaic to be used in the building envelope a deeper understanding of non due South oriented photovoltaic is required.

As per the European Parliament Directive 2010/31/EU, Article 9.1 all new buildings will have to be "nearly net zero energy" by 2020 (2018 for public buildings). Thus any energy required for the operation of the building will have to be compensated by the equivalent amount of energy supplied back by the building.

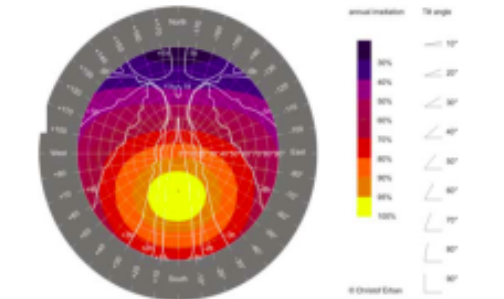
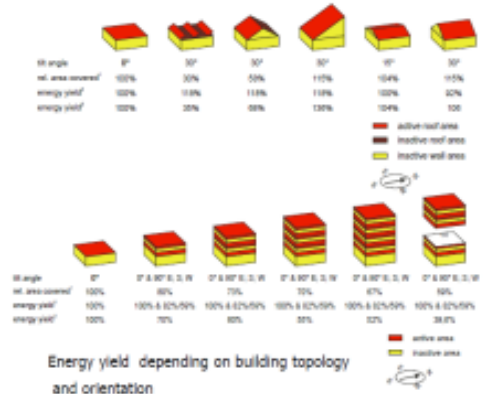
In order to be creditable, the energy provided back necessarily has to be created from renewable sources.

The current studies focus on the dependency of the shape and orientation of building surfaces of residential as well as commercial buildings onto the electricity generation by photovoltaic panels. As very large areas will be required to meet the upcoming requirements of the EU-directive, it is essential to know up front how much useable pv-area will be provided by the building topology its orientation and height.

Since photovoltaic panels generally are preferably oriented towards south to gain a annual maximum yield, a very significant impact onto electricity generation and their time wise and technology wise distribution in the public grid is expected.



The possibilities of peak shifting by modulation of orientation and tilting angle of photovoltaic are investigated.



Power supplied by photovoltaic in dependency of tilting and orientation angle incl. time shift of maximum power output

**PROJECT INFORMATION**  
 PhD Researcher: Christof Erban  
 First Mentor: Prof. Dr. Ing. Ulrich Kraack  
 Period: 2011-2013

**RELATED PUBLICATIONS**  
 Erban, C. - *New limits for building design; Advanced building skins*, *Goa*, 2012  
 Erban, C. - *Merely U and g will not be enough*, 2012, *Engineered Transparency*, GLASSTEC Düsseldorf



# Facade integrated energy generation and long term energy storing

## Research on energy autarkic buildings

Facades have more and more changed to be appreciated as energy envelopes than only as weather climatic shelters. The amount of fossil energy resources on earth is endless. The use of energy for building climatisation has to be more sufficient than several decades ago. Building envelopes need to be less energy permeable in case of fossil energy driven complexes or need to generate energy for conditioning in respect to environmental energy sources by themselves. Long term or seasonal energy storages are necessary for demand related provisions.

Current European primary energy supply regulations, a dislocation of renewable energy generation and energy consumption abroad BRD and an overstrained and insufficient public supply network in Germany as well emphasize the necessity of research in decentralized energy generation and storing.

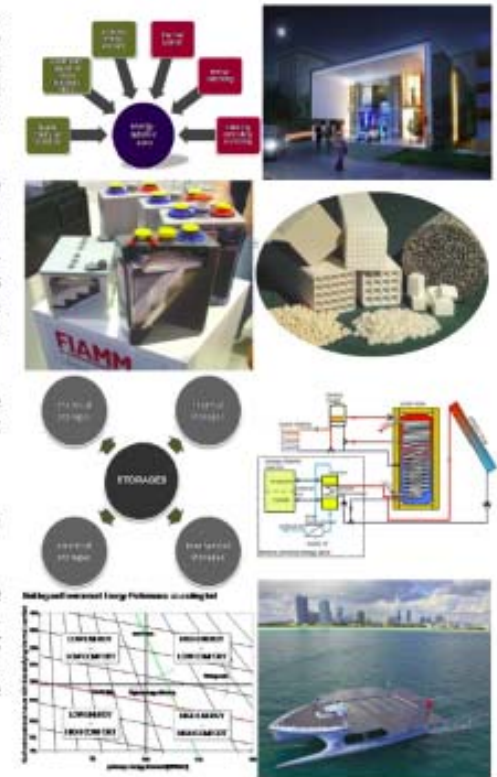
Several technologies have established throughout the decades being sufficiently as energy collectors based on environmental renewable energy sources. Appropriate solutions for every scale of usage or building offer a huge variety and independence towards fossil sources. Facades are constructive layers which regulate climatic exchange and energy losses of a building.

It seems to be obvious that facades should also be able to manage climatic exchange and energetic generation in one.

Environmental energy sources are extremely linked to daytime and season. The temporal differences between offering and demand make energy storages essential.

Modern volumetric and gravimetric energy storage technologies are physically and chemically complex. The engineering task will be defined by a sufficient adjustment of facade integrated energy collectors, energy storages and technical devices to provide specific levels of thermal comfort.

Researches on the three above mentioned key topics require an integral method of analysing and working.



### PROJECT INFORMATION

PhD Researcher: Christian Wegel  
 First Mentor: Prof. Dr.-Ing. Ulrich Knack  
 Second Mentor: Dipl.-Ing. Tillmann Klein  
 Period: 2012-2015  
 Funded by: Solarlux Aluminium Systeme GmbH, GER

### RELATED PUBLICATIONS

- Sobek, Werner, AZ/Architekturzeitung - Architekturzeitschrift für Architektur & Architekten, 2010
- FIAMM Group, NaWGL2 - batteries, 2012
- Kerkels, Henner, thermo-chemical heat storage-technology and perspectives, 2012-05-12, p.8, 22
- Cody, Brian, energy efficiency in buildings, VDI-Berichte Nr. 2004, 2006, p.72 (redwan)
- www.yachtmagazine.com/sun-powered-transatlantic-crossing/, 2012-10-29



## Ecologic assessment of the building envelope

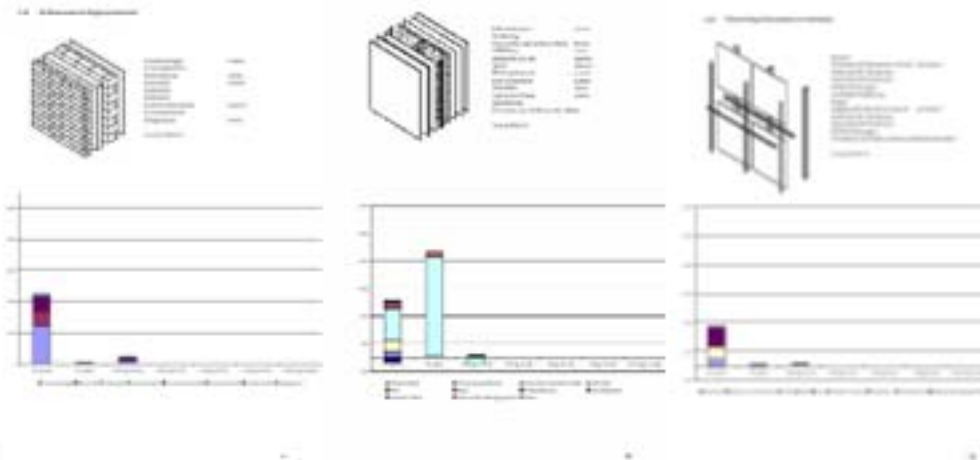
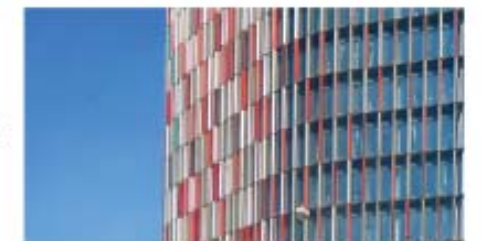
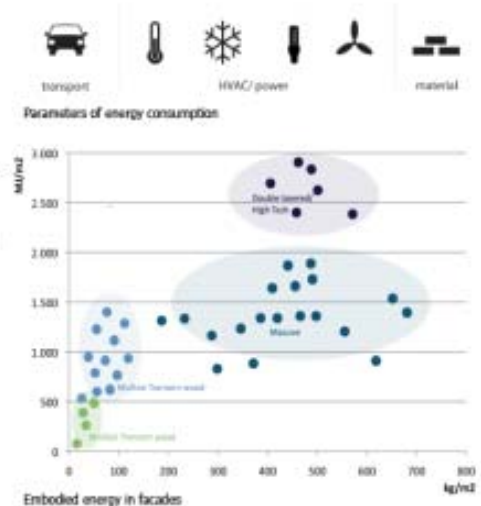
The effort linked to the building substance increases in relevance for reducing the environmental impact as the demand for heating, cooling, ventilation and electricity is sinking. The energy to produce the building elements accounts for a relevant part of the overall energy consumption in the context of a building. Energy concepts rarely include the energy invested to construct, maintain and demolish a building. This share -the embodied energy- can account for half of the buildings overall balance. Both the performance and the embodied energy are relevant in the design phase and need to be balanced at this stage of planning

As today's buildings have to meet a very high standard concerning sustainability it is essential to approach not only one parameter but regard the energy balance holistically. Throughout its life cycle the energy consumption in the context of building consists of transportation energy, the amount to operate a building and the embodied energy. This study focuses on the last mentioned: the energy amount linked to the building substance.

For a residential building with massive construction and EnEV 07 standard the performance energy approximately accounts for 30 years of operational energy. As actual improvement can only be made in the design phase the planner needs an instrument to display different scenarios in order make a decision.

The façade can account for one third of the embodied energy depending on the building structure and the building envelope's typology. Materialization and mass of the façade define the extend of environmental impact. The ratio of invested (embodied) energy and the gained functions and qualities bear the basis to judge environmental sensible decisions.

The finding of this study is an instrument that assesses the overall energy performance over the whole life cycle including the building materials, comfort zone and the service life of the building. The insights gained from developing the tool and assessing the case studies will be put into a comprehensible format for architects in strategies to for architects during the design phase.



**PROJECT INFORMATION**  
 PhD Researcher: Linda Hildebrand  
 First Mentor: Prof. Dr. Ing. Ulrich Knack  
 Period: 2009-2012  
 Funded by: 1st, 3rd and 4th money stream

**RELATED PUBLICATIONS**  
 Hildebrand, Knack; *Graue Energie in der Fassade*, Zero Zeitschrift für Nachhaltiges Bauen, München, 2009  
 Hildebrand, Knack; *Bewertung von Fassaden auf dem Hintergrund von Grauer Energie*, 2009, Berlin

# Integrated Façade Components

## A new product architecture for metal-glass facades

Metal-glass facades belong to the most successful products in the building industry. Since their invention at the end of the 19th century they have developed from architectural applications to highly developed façade systems, but their constructional principle has remained unchanged. New requirements in saving energy ask for a rethinking of this type of façade.

Simply spoken the purpose metal-glass facades is to connect different façade fillings, such as glass panels. It is responsible take care of wind- water tightness and architectural design. The constantly rising need for saving energy has resulted in a need for better U-values and that has lead to a high complexity of this subtle interface.

An improvement of metal-glass facades is hardly possible. Another thing that proves to be a new challenge for façade construction is the need to integrate building service components into the physical façade area. Basically façade system are facing the problem to become innovation blockers.

In this PhD research the product architecture of existing façade constructions is analysed. The comparison to other disciplines, such as the automotive industries and ship building, shows how radical changes can effect construction from design to production and assembly processes.

New constructional concepts are developed and it becomes clear that they will have to face the incrementally evolved building industry. Will the market determine future façade construction or will a new way of construction create a different kind of façade industry?



**PROJECT INFORMATION**  
 PhD Researcher: Timm Kien  
 First Mentor: Prof. Dr. Ing. Ulrich Knaack  
 Second Mentor: Prof. Dr. J. Max Bodegout  
 Period: 2009-2011  
 Funded by: IAC, 3rd and 4th round stream

**RELATED PUBLICATIONS**

- Knaack, U., Kien, T.: Fassadengestaltung mit Systemen. Deutsches Architekturmuseum 12/2006 p. 82-86
- Knaack, U., Kien, T.: Façade Technology: Inspiring Emerging Developments. DAU 4/2009 p.45-62



# Modular Facades

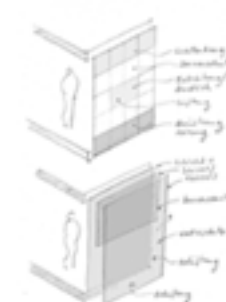
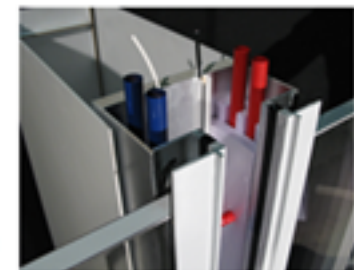
## Development of a modular façade system

The need for higher energy performance and the integration of two traditionally different disciplines poses a new challenge for façade construction. The goal of this research project was the development of a catalogue of demands for building services integrated façades and a roadmap for new constructional solutions.

Kawneer Alcoa is a major façade system supplier. Their curtain wall and window systems are widely applied. On one hand the architectural market asks for customization and on the other it needs a standardized product range with a manageable amount of parts. The integration of building service components in façade construction asks for a new modular approach in combining these disciplines.

Essential for the success of a façade product are the construction phases from Pre-Design over Production and assembly to the re-use of components and the involvement of different stakeholders. Who decides what at what moment? Both has been analysed and on the basis of the outcome several new constructional concepts for services integration have been developed.

The project has resulted in the design of a façade system with vertically integrated media and a European patent no. EP 2117091 A2.



**PROJECT INFORMATION**  
 Project leader: Tibenon Klein  
 Directed by: Tibenon Klein  
 Period: 2009 - April 2010  
 Budget: € 25.000  
 Funded by: Kiese Kawneer Architectural Systems

**RELATED PUBLICATIONS**  
 • Klein, T., Houbek, J. (2010) „Passivhausstruktur + vertikale Dienstleistungsstruktur für Gebäude“, *Architektur Informationsmagazin* EP 2117091 A2

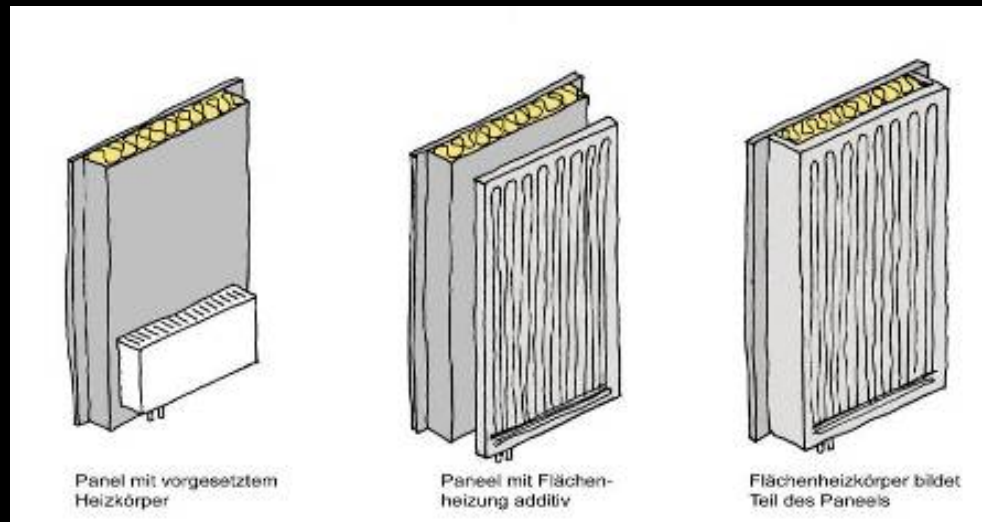


15-08-2004

Imagined by Marcel Bilow

Keyw ords: decentralized, heatin/cooling, lightness, installations, concrete

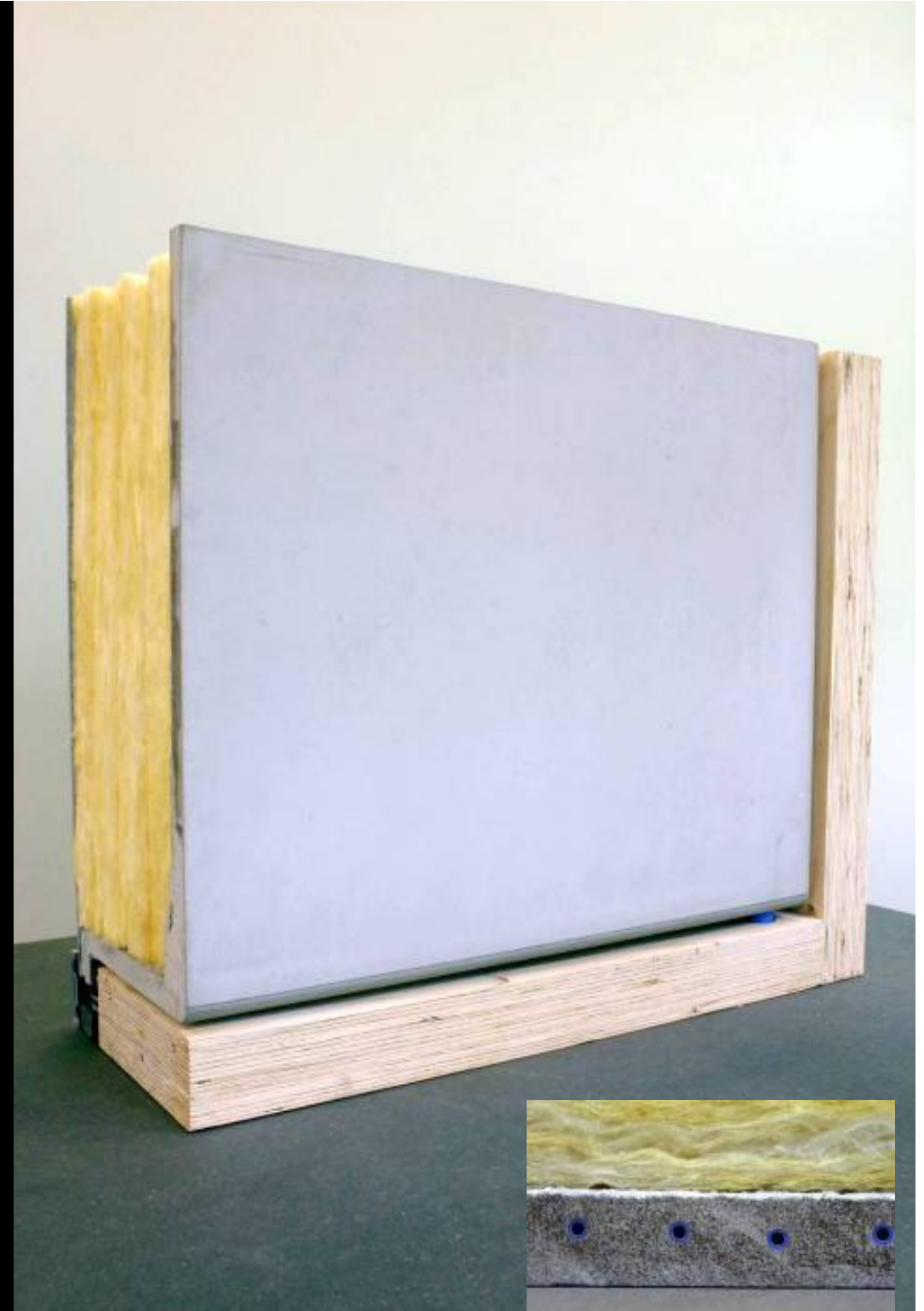
More Info:



## facade heating / cooling panel

To avoid the classical heating units in front of the glass surfaces these unglazed units should be used as heating / cooling surfaces. The developed facade panels are formed of fiber reinforced concrete which is imbedded with textile.

They are used as load bearing construction of the panels and can be inserted into the facade framew ork. The surface oriented towards the room is inlaid with meadows of capillary tubes which heat in summer and cool in winter. The use of fiber reinforced concrete provides a good heat conduction as well as stability.



01-05-2007

Imagined by Ulrich Knaack, Marcel Bilow, Tillman Klein

Key words: composite, loadbearing, lightness, system building, composite

More Info:

## integrated sandwich construction / Jackbox

Idea of the project JACKBOX refers to a sensible combination of technical possibilities and intelligent materials to be able to produce multifunctional system components. The sandwich panels made in vacuum procedure exist of the following construction:

- external GRP skin as weather protective coating
- sandwich core out of PU foam, in addition, as a heat insulation
- inside layer of fiber reinforced concrete with integrated cooling-heating capillary pipe mats, beside thermal component mass, in addition, an efficient radiation heating.

The parts of the building conceived as single modules were produced as a GRP sandwich with fiberglass-reinforced plastic skin and hard foam cores as large-size elements and afterwards were cutted. It is to be folded by incisions in the roof area possibly the wall elements in the desired form. After the elements were fixed in the desired form, became the inside layer of textile-reinforced concrete with inlaid capillary pipes sprayed.

Marcel Bilow / Ulrich Knaack / TU Delft + HS OWL









## Panel - technical solution



### Structure Thermally activated fibreC panel

12 mm concrete top layer  
max. panel thickness 22 - 26 mm

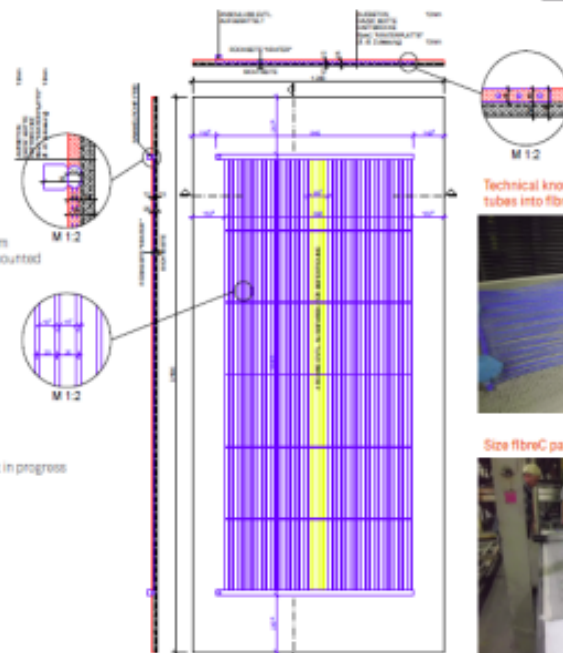
### Capillary tube mat

Material: PP  
Collector pipe: oval 20x12x2mm  
Capillary tube: 4.3/0.8mm  
Centre distance capillary tubes: 20mm  
Plug-in connections: 90° or saddle-mounted

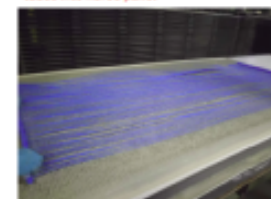
Standard dimensions of mat:  
length: 600-6000mm in 10mm steps  
Width: from 150mm in 20mm steps  
Weight: approx. 740g/m<sup>2</sup> (incl. base)

### Approval

Dttr approval fibreC until 01/2013  
RMC and prefabricated concrete part in progress



Technical know-how: Integration of capillary tubes into fibreC panel



Size fibreC panels: 1200 x 2500 mm



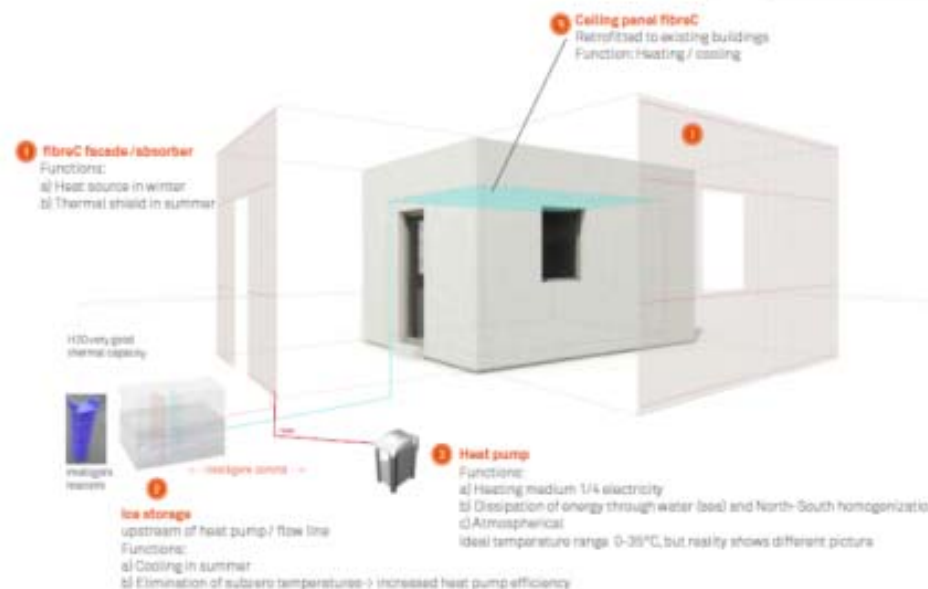
Strictly confidential © Rieder Group



## Application - layout for demonstration installation



## fibreC Bionics | Ideas for building-component activation 2.0



Strictly confidential © Rieder Group

6

# Integral Facades

## Integrating building services into solid facades

Through the last decades the facade industry has witnessed significant development. New materials were introduced, energy performances were enhanced, and new functions were added. But on the other hand, the industry is still depending on scattered decisions taken by scattered disciplines and that results at the end in a layered facade system. Other more developed industries, like car and airplane industries, are trying to enhance their products through more applying more integrated designs. The facade industry must adopt the same integration strategy in order to move forward. But how can the facade industry respond to such a strategy?

In today's facade industry, every specialist is concerned with certain aspects related to his discipline, which results mostly in a final product composed of many layers, each representing a function. More functions means more layers. The industry is adopting the layered strategy for many years now for the sake of practicality and cost saving. On the other hand, other developed industries, like car industry for example, although their production is of highly precise measurements and they rely totally on industrial and technological process in manufacturing their products, they are trying to lessen their product's parts through more integrated designs. This helps them to enhance the quality of their products



Layered facade

The scattered design solutions, is something the building industry in general, and the facade section in particular, must abandon if it is to move forward and improve. Solutions should be oriented towards integrated designs. However, such strategy cannot be implemented in the current design process with scattered parties and decision makings. Implementing any integrated design solution will then result in major changes in the current design processes, disciplines will come together in a new different way, with new shared decisions, demands, inputs,...etc.

The objective of this research is to enhance the building industry by proposing new integrated design strategies for solid facades. This will take place through investigating how the design and construction process in the facade section will respond to the integrated design approach, then proposing methods that can be followed to implement integrated facade design solutions.



Integrated facade in Zollverein School Project

### PROJECT INFORMATION

PhD Researcher: Ahmed Hafez  
 First Mentor: Prof. Dr. Ing. Ulrich Kneadl  
 Second mentor: Prof. Dr. Ing. Holger Tschen  
 Period: 2011-2015

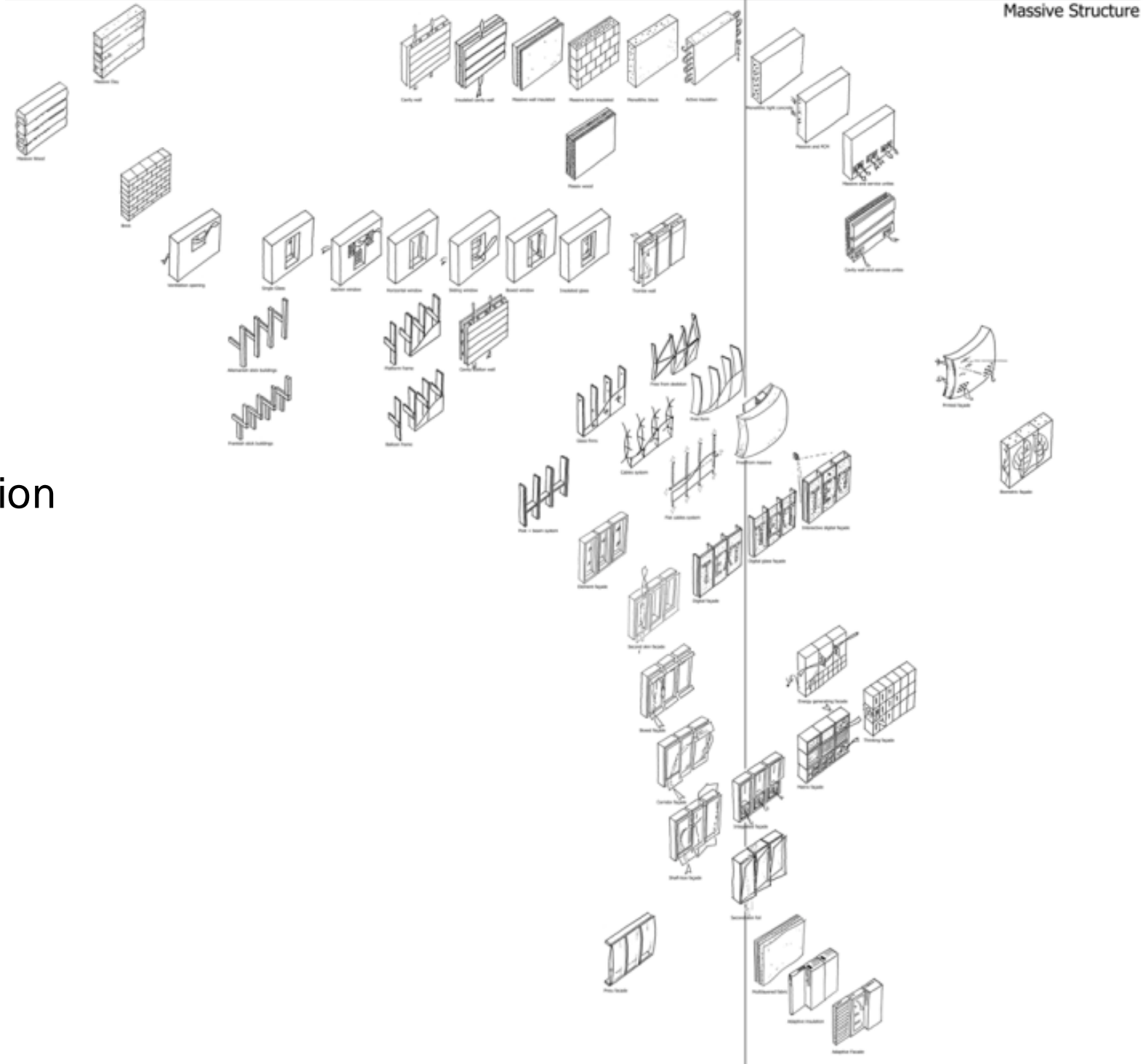
### RELATED PUBLICATIONS

Habraken, N. J. (2002) *The Use of Levels*. Open House International, Vol. 27, No. 2.  
 Lichtenberg, J.J.N. (2004) *Slimbouwen*, A Rethinking of Building, A Strategy For Product Development. Proceedings, Pies 2004 in Sustainable Architecture, 21st International Conference Passive in low energy architecture, pp. 681-686, 19-22 September 2004, Eindhoven, The Netherlands  
 Pavitt, T.C. & Gibb, A.G.F. (2003) *Interface Management within Construction: In Particular, Building Projects*. Journal of Construction Engineering and Management, ASCE, 129(1), 8-15.

-10.000    -2000    1000    1600    1900    1960    1990    2000    2012    2020    2030    2060

Massive Structure

Education



Skeleton Structure



TU Delft / The Netherlands  
 Hochschule OWL / Germany  
 Hochschule Luzern / Swiss  
 Universidad del Pais Vasco - San Sebastian / Spain  
 University of Bath / United Kingdom

# International Facade Master

**Profile**

Over the past twenty years, modern technologies and high functional demands have made facade specialists necessary for architectural solutions in the fields of construction and renovation. As a Certified Facade Designer, a technically high on the list of the most demanding and versatile professional qualifications, being "high" physical, conceptual and functional, in terms of design and functional architectural and construction of facade systems.

The International Facade Master provides an extensive overview and the scientific foundations of the field of facade engineering and is recognized by the scientific profession organizations.

**Study Contents**

**Basic Modules:**  
 Planning, Design, Realisation  
 Facade Design  
 Facade Engineering  
 Facade Construction  
 Facade Maintenance

**Project Modules:**  
 Facade Design  
 Facade Engineering  
 Facade Construction  
 Facade Maintenance

**Design of Construction**  
 Facade Design  
 Facade Engineering  
 Facade Construction  
 Facade Maintenance

# Msc Façade Design

We bring façades to life!

**Facade Design Program**  
 Facades - are - one - of the - most - technically - challenging - complex - and - multidisciplinary - parts - of - a - building - A - facade - defines - not - only - a - building - appearance - and - its - architectural - expression, but also how well it functions. The success of a building is measured in terms of its technical functionality with regard to comfort, pleasant ambience and support.

**façade Research Group**  
 Facades - are - one - of the - most - technically - challenging - complex - and - multidisciplinary - parts - of - a - building - A - facade - defines - not - only - a - building - appearance - and - its - architectural - expression, but also how well it functions. The success of a building is measured in terms of its technical functionality with regard to comfort, pleasant ambience and support.

**link professional practice**  
 Facades - are - one - of the - most - technically - challenging - complex - and - multidisciplinary - parts - of - a - building - A - facade - defines - not - only - a - building - appearance - and - its - architectural - expression, but also how well it functions. The success of a building is measured in terms of its technical functionality with regard to comfort, pleasant ambience and support.

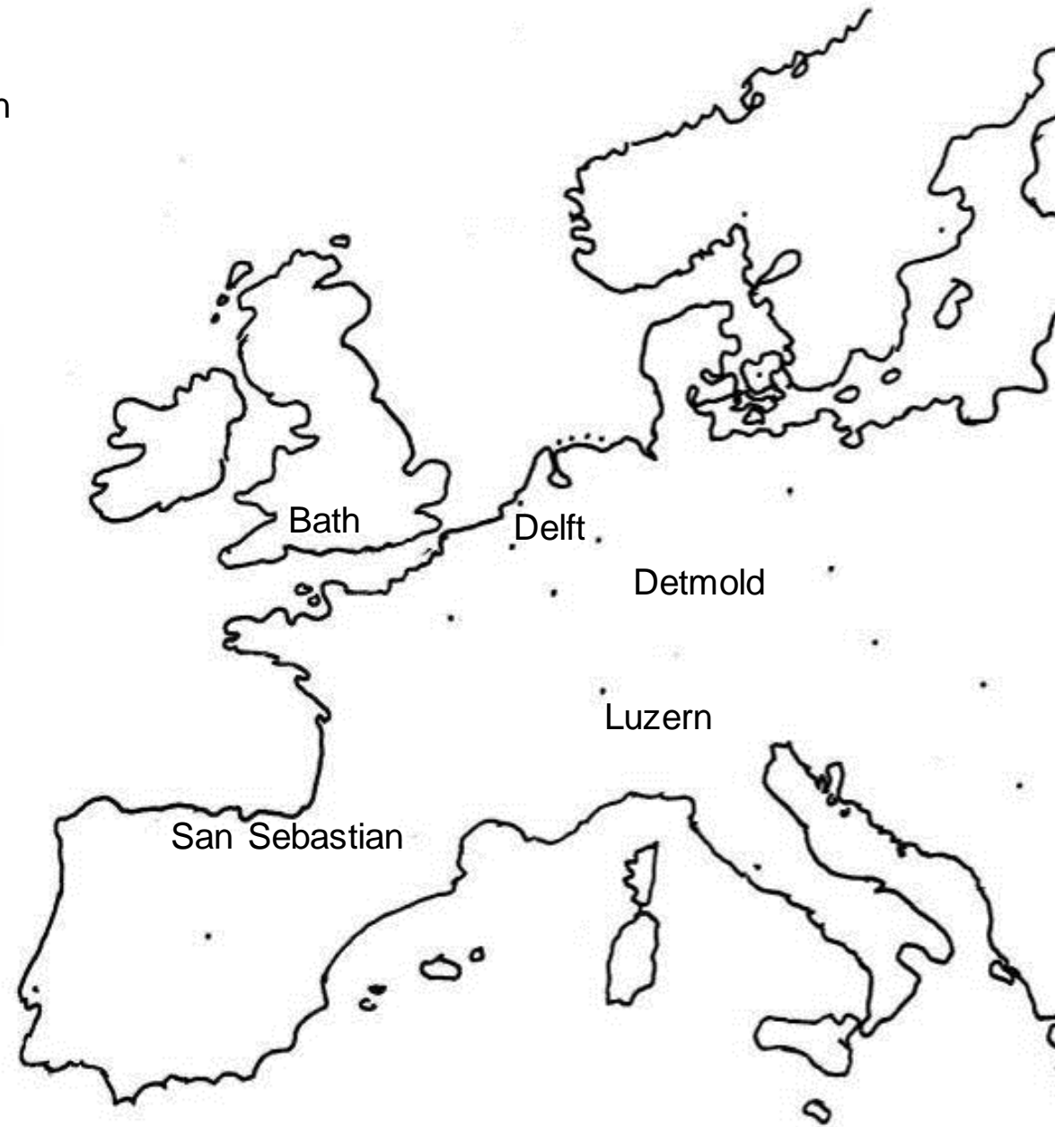
**International network**  
 Facades - are - one - of the - most - technically - challenging - complex - and - multidisciplinary - parts - of - a - building - A - facade - defines - not - only - a - building - appearance - and - its - architectural - expression, but also how well it functions. The success of a building is measured in terms of its technical functionality with regard to comfort, pleasant ambience and support.

## Design of Construction

Chair Design of Construction  
 02.11.2010  
 Website: www.dcc.tu-delft.nl

Logo: U (Chair Design of Construction)  
 Logo: VMRG  
 Logo: SCHIEL DESIGN  
 Logo: OSKOMERA  
 Logo: ECCO

TU Delft / The Netherlands  
Hochschule OWL / Germany  
Hochschule Luzern / Swiss  
Universidad del Pais Vasco - San Sebastian / Spain  
University of Bath / United Kingdom





european façade network MOBIL  
work program „emerging envelopes“ 2013-2016  
powered by Alcoa Foundation and  
Architecture for Humanity

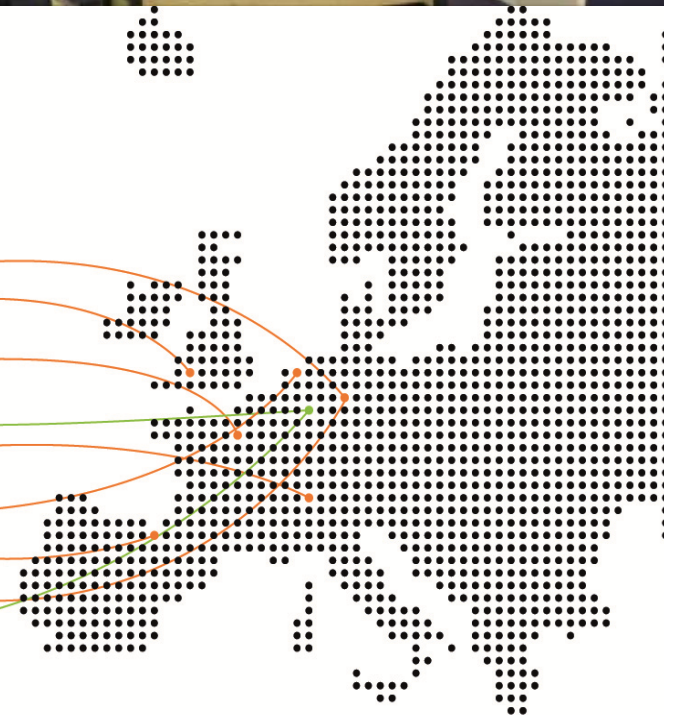


european façade network mobile

A cooperation of  
TU Delft – the Netherlands and  
Hochschule OWL – Germany



- Nov. 2013 Detmold
- Jun. 2014 Bath
- Jul. 2014 Paris
- Oct. 2014 Düsseldorf
- Nov. 2014 Lucerne
- May. 2015 Delft
- Jun. 2015 San Sebastian
- Nov. 2015 Detmold
- Oct. 2016 Düsseldorf





Fassade2014 / Luzern 29.11.2014  
 The Future Envelope / Delft 06.06.2015

The Future Envelope / Delft - Bath  
 FacadeXX / Detmold - Luzern



**facade2013**

There is an ongoing debate between designers and engineers. Four worldwide innovation centres from university and non-university organisations. The main is, both are important and have to be considered. A platform of interdisciplinary cooperation between scientists, research institutions, engineers, architects, press and relevant companies is needed. Our 7th Facade Conference "Design vs. Development" will explore between the partners to start a dialogue about how to improve the innovation process for facades.

**Design vs. Development** November 29th, 2013

8.30	Registration
9.15	Welcoming Udo Philippson, Dean
9.30	<b>Keynote #1 Design and Development</b> Colin Davies, London
10.15	<b>Innovation Strategies</b> Wolfgang Hübner, Schöck International AG, Bielefeld Caroline Knaack
10.45	<b>Technology towards Design</b> Mark Eickhout, DLR, Delft
11.15	<b>Innovative Application</b> Hilger Zedler, E.ON Energy Research Center, Inc., Basel <b>Integral Facade Design and Construction</b> Ulrich Knaack, TU Delft
12.15	Lunch break
12.45	<b>Keynote #2 Facade and Architecture</b> Bruce Hyman, Victorian College of Design, Sydney
14.45	<b>Environmental Quality</b> Thomas Auer, Thermovent Engineering GmbH, Stuttgart Caroline Knaack
15.15	<b>Light and Space</b> Mark-Anne Nijhuis, F&O, Delft
16.15	<b>Architectural Products</b> Thomas Weller, Craft Architecture, Berlin
16.45	Final Discussion

Registration: [www.facade2013.nl](http://www.facade2013.nl)

Location: Hochschule Luzern, Luzern



Hochschule Luzern  
 Technik & Architektur

Facade2010 -  
 Conference on  
 Building Envelopes  
 Information, Research - Contact

Thursday, 25th November 2010

Auktorhaus, Hauptstrasse 11a, Luzern  
 Museum of Transport, Luzern

WICONA  
 Hilti  
 Alu-Systeme  
 Schöck

# Conference on Building Envelopes

Faculty of Architecture TU Delft (NL)

Thursday 06. June 2013

Preliminary Program

8:45 Registration

9:15 Opening speech Ulrich Knaack/ Head of Department

**9:30 – 11:00 Session 1 – Design Value**

Kees Kaan / Claus en Kaan Architecten, NL

Mikkel Kragh / Dow Corning, Society of Facade Engineering, BE

Alex de Jong / OMA Architects, NL

**11:30 – 13:00 Session 2 – Performance Value**

Rudi Scheuermann / Arup Facades, D

Matthias Rudolf / Transsolar Climate Engineering, D

Jan Jongert / Superuse Studios, NL

**14:00 – 15:30 Session 3 – Financial Value**

Jan van 't Westeinde/ MAB Development Nederland BV, NL

Steffen Pekrul / Hochtief, D

Gunhan Karakullukcu / Ularte Engineering and Manufacturing, TR

**16:00 – 17:30 Session 4 – New Business**

Thijs Asselbergs / aTA architectuurcentrale, NL

Alexandra den Heijer / TUD Real Estate Management, NL

17:30 - Discussion



The Future Envelope 7

# Facade Value

Organisation: Facade Research Group TU Delft

Info: +31 (0)15 27 84094 / FutureEnvelope-BK@TUDelft.nl

Registration: [www.bk.tudelft.nl/futureenvelope](http://www.bk.tudelft.nl/futureenvelope), deadline 28. May 2013

Location:

TU Delft

Aula Congress Centre

Mekelweg 56

2628 CC Delft

IOS Publisher

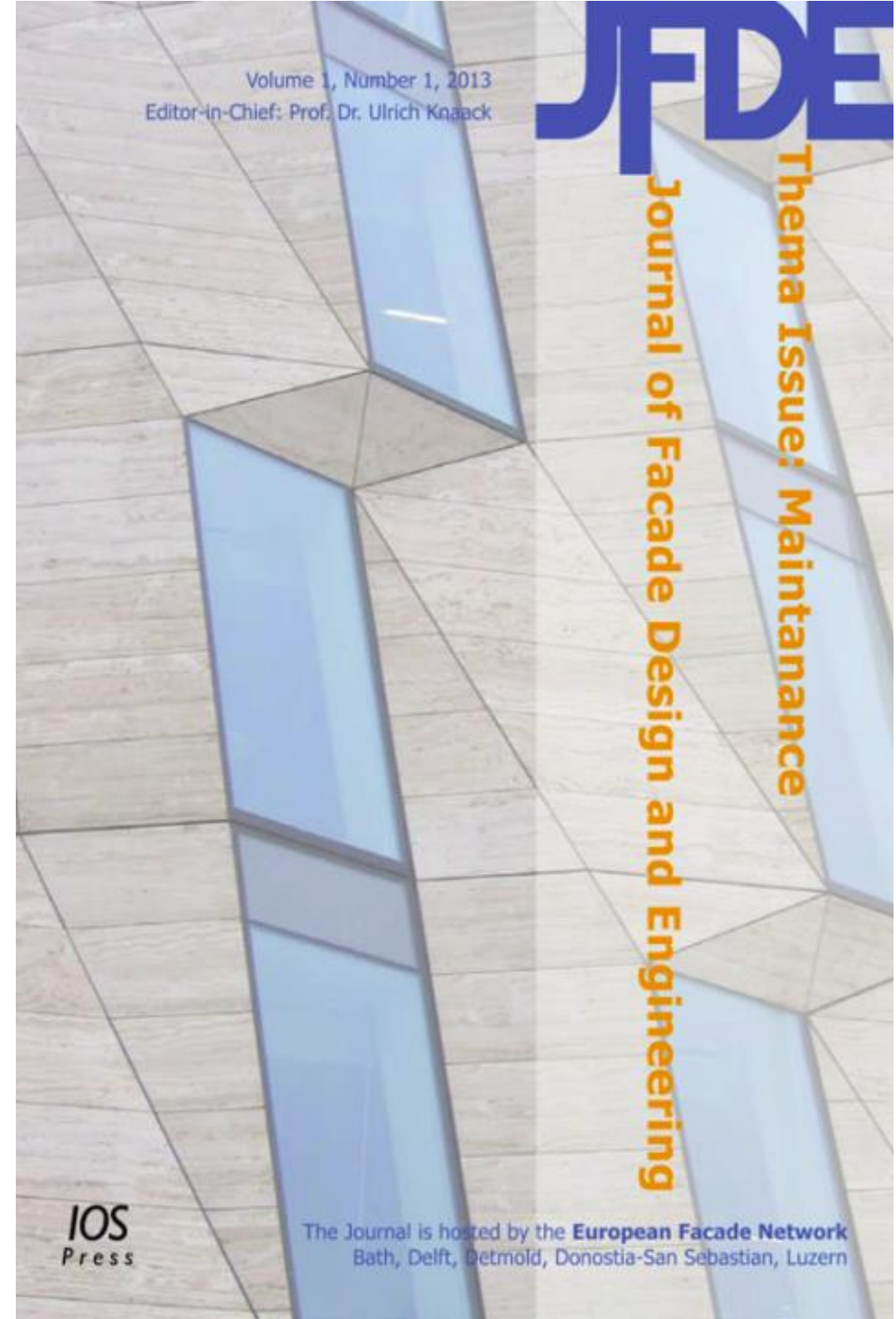
## Journal of Façade Design and Engineering

- Architecture
- Building Engineering
- Structural Design
- Structural Glass
- Climate Design
- Energy Generation
- Building Services Engineering
- Building Physics
- Design Management
- Facility Management

Open access journal:

<http://www.iospress.nl/journal/journal-of-facade-design-and-engineering/>

Contact: [jfde-bk@tudelft.nl](mailto:jfde-bk@tudelft.nl)





Birkhäuser Verlag (Berlin)

Facades – 2007/2014

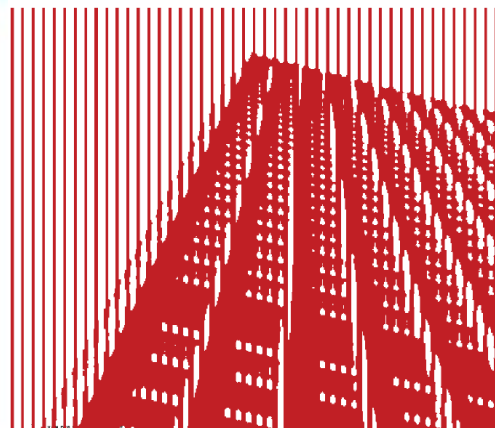
Components and Elements - 2009

Systems – 2012

Façade Physics - 2015

Advanced Facades - 2017

## Principles of Construction



## Principels of Construction

Educational Book Series  
Birkhäuser – Basel, Boston Berlin

Principles of Construction is a educational book series which provides young professionals and students with systematic structured principle knowledge of building technologies.

The amount of building construction related knowledge and the amount of existing constructional solutions are enormous. There is no point in attempting to create books that contains all this knowledge and all these solutions since this would lead to a voluminous, expensive and rapidly out-of-date product.

Moreover, it would not challenge or tempt students or young professionals to design their own constructional solutions because many solutions are already given. Thus, the concept is to describe problem types and solution types on an abstract level, suitable for a technical understanding. The main task is to identify and describe the typology of problems and solutions in a systematic manner. The aim is not to describe as much as possible, but as little as possible, to give the reader a theoretic foundation, that can be used for his/her own design.

A series of books was developed that organizes the principle of construction according to different themes and perspectives.

The following books are published:  
Meijs, Knaack: Components and Connections  
Knaack, Klein, Bielow, Auer: Facades

The following books are planned:  
Knaack, Chung-Klatte, Hasselbach: Systems  
Knaack, Teichert: Structures and function  
Knaack, Klein, Bielow, Meijs: Material and Detail

Publisher:  
Birkhäuser – Basel, Berlin Boston  
All books are published in German and English



PROJECT INFORMATION  
Project leader: Ulrich Knaack  
Edited by: Ulrich Knaack, Martin Haja, Thomas Klein, Harald Bielow  
Printed: 2008 + 2014  
Editor: -  
Printed by: Ober Design of Conductor

RELATED PUBLICATIONS  
Knaack, Klein, Bielow, Auer: Facades – Birkhäuser – Basel Berlin Boston 2008  
Haja, Knaack: Components and Connections – Birkhäuser – Basel Berlin Boston 2009



Imagine 01 - Facades - 2008

Imagine 02 - Deflateables - 2008

Imagine 03 - performance driven envelope - 2011

Imagine 04 - rapids - 2009

Imagine 05 - energy - 2011

Imagine 06 - Reimagine facades - 2012

Imagine 07 - Reimagine housing - 2012

imagine



## imagine book series

Topic related inspiring books with background information and concept ideas

The **Imagine Book Series** investigates technology and materials developments to provide architects and designers ideas for their design.

Out now: facades, deflateables and rapids.

In preparation: energy, performance driven envelope, friends in mind....




### PROJECT INFORMATION

Edited by: Ulrich Knecht, Tiborján Kón, Harald Stiefel  
 Authors: Ulrich Knecht, Tiborján Kón, Harald Stiefel and guest authors related to the book topics. To be named up to four: Mijger Steen, Raymond van Sellen, Lida Bolamoh, Ann Borgema, Linda Hildbrand, Dean Koljonen, Thomas Kästli and others.  
 First started in 2008  
 Funded by: TU Delft

### RELATED PUBLICATIONS

- Knecht, Kón & Stiefel: imagine 01 Facades, 222 Pagina's, Rotterdam, 2008
- Knecht, Kón & Stiefel: imagine 02 Deflateables, 222 Pagina's, Rotterdam, 2008
- Knecht, Stiefel & Kón: imagine 04 rapids, 222 Pagina's, Rotterdam, 2009





## facades – a roadmap:

Prof Dr.-Ing Ulrich Knaack

TU Delft / Faculty of Architecture – The Netherlands

TU Darmstadt / Faculty of Civile Engineering – Germany

Imagine envelope bv. – The Netherlands @ imagine group

<http://facadeworld.com/>

<http://imagineblog.tumblr.com>