

Monologue or dialogue

– the design of industrial building envelopes made of metal sheet



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– the design of industrial building envelopes made of metal sheet

- Introduction
- Lightweight façade systems
- Design of metal sheet envelopes
- Energetic façades

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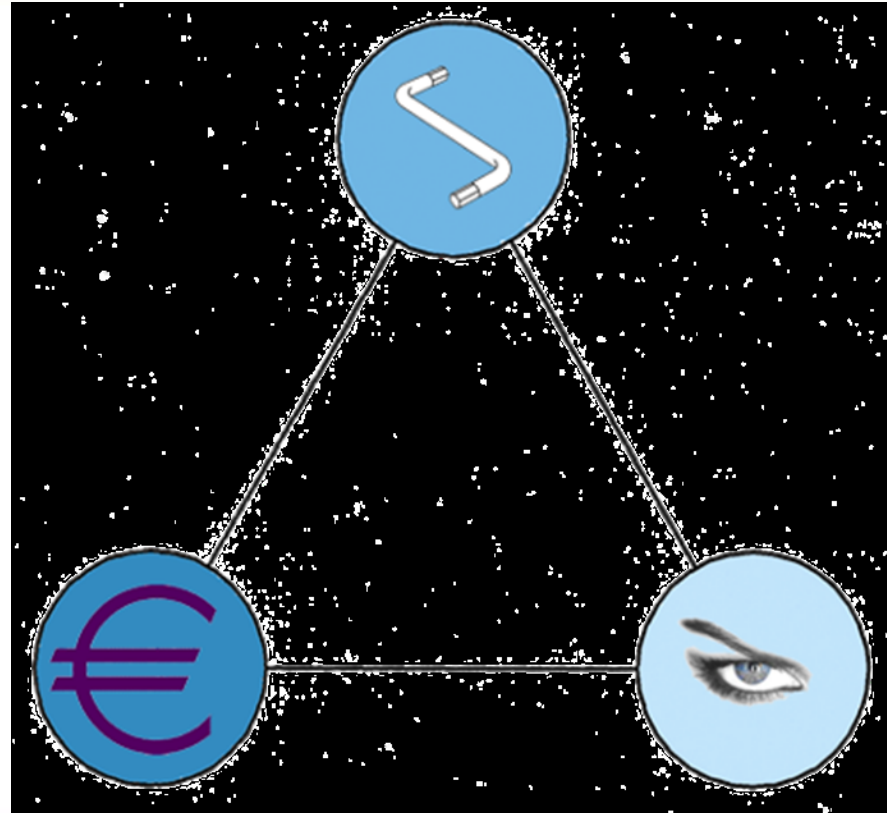
Introduction



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„Tension triangle“ of design



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Design – what for...?

Typical application area of metal sheet systems

Business park on outskirts of town
(Hagen)



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Design – what for...?

Economically, efficiently - and allegedly with silver the solution for building envelopes in the industrial and commercial (Wuppertal)



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Design – what for...?

Even round shapes can be realized, -
but where has the spirit of dynamic
gone? (Kerpen)



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Design – what for...?

Advertising is everything!

Corporate Identity in the façade design of a discount store, again Kerpen.
White as the perfect background.



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Design – what for...?

A 20 meter metal sheet façade in an urban situation.

Green means hope!, Maybe the hope, the wall will disappear somewhen...



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Design... a matter of capability and responsibility!

Large warehouse, large volume.

Trapezoidal wall profile and steel cassette panels are ideal construction elements for industrial façades.



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Scale and volume...

„Familiar environment“ for building planners:

1-2 stories

5-6 meters wide



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Scale and volume...

Small warehouse:

Height: 6m

Lengths: 50m



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Scale and volume...

Industrial buildings, power plants, etc.

Often 50meters high and up to 500 meters long

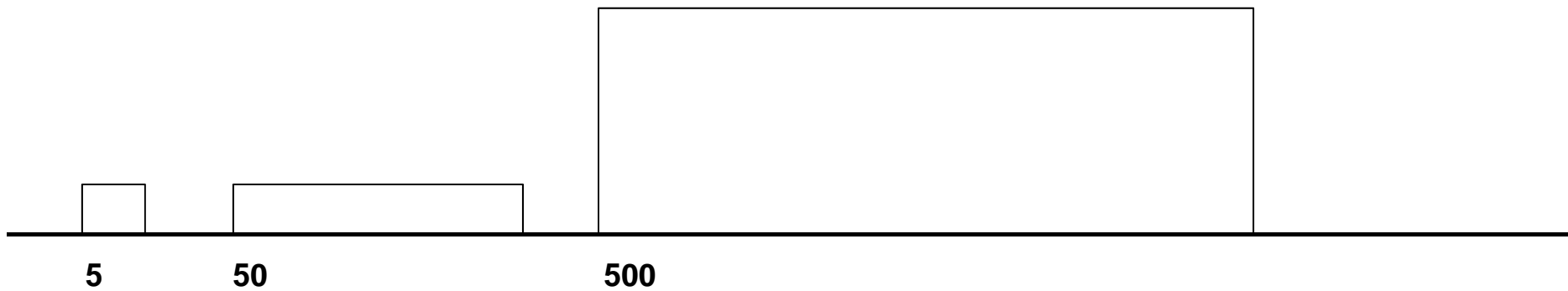


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Scale and volume...

How long walks the green man?



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Façade arrangement

- Restricted profiling...
- Restricted ornamentation...
- Restricted game with openings...
- No „classic“ floors...



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Is this the end... ?



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Lightweight façade systems

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Advantages:

- Synergy of load bearing and weather protection
- Minimizing secondary construction
- Low weight
- Great length
- Quick fitting
- Low tolerances
- Reliable construction systems
- Ideal protection against corrosion

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Overview:

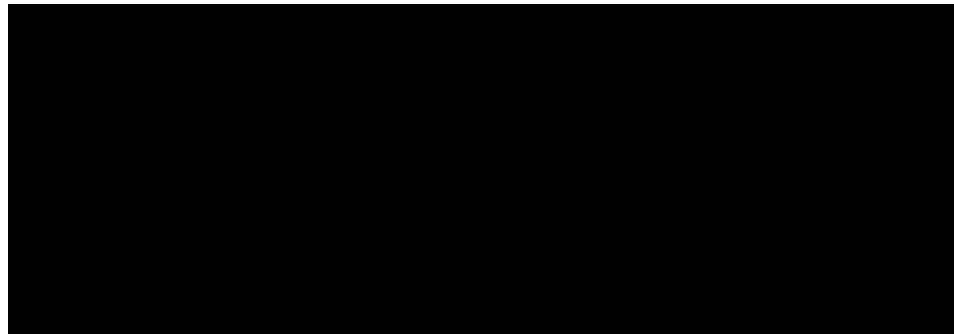
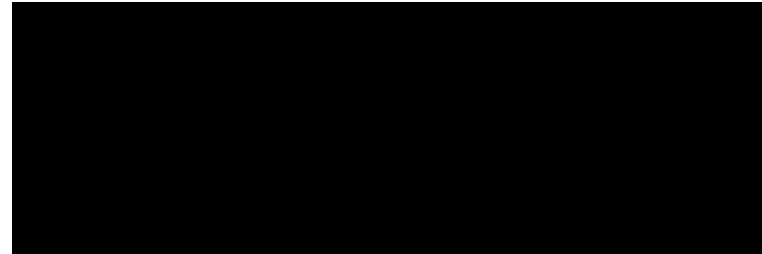
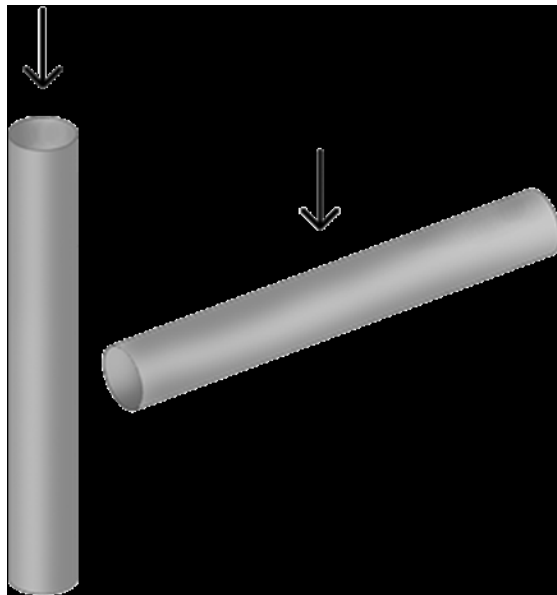
- Corrugated iron
- Trapezoidal profiles
- Steel cassetts
- Sandwich elements
- Coffered systems
- Panels
- Custom-made products

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Corrugated iron

Origin of the metal sheet
construction systems



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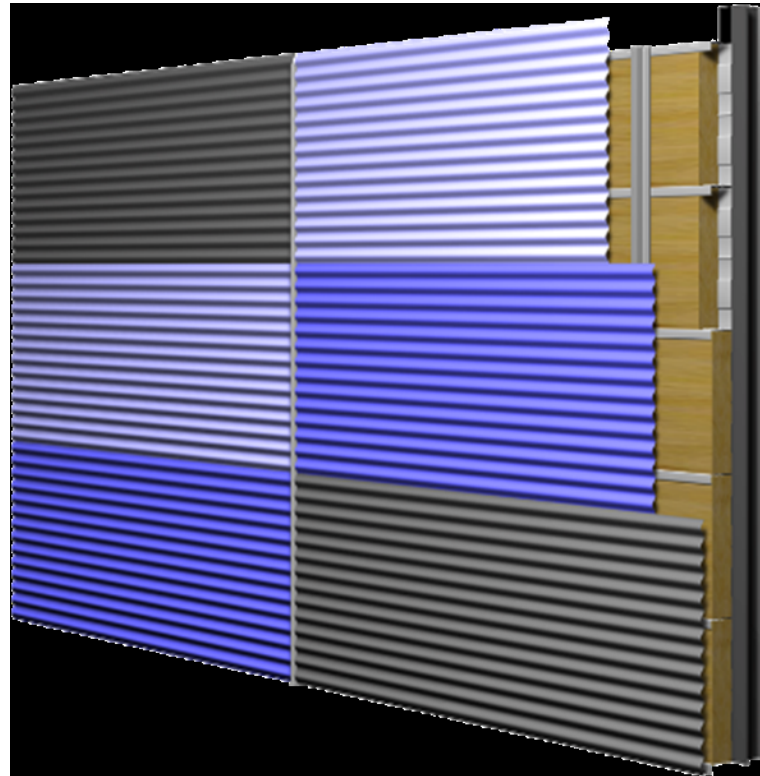
Corrugated iron

Outer shell of steel cassette systems or sandwich elements

Horizontal und vertical application possible

Separation profiles bridge joints

80-106cm wide



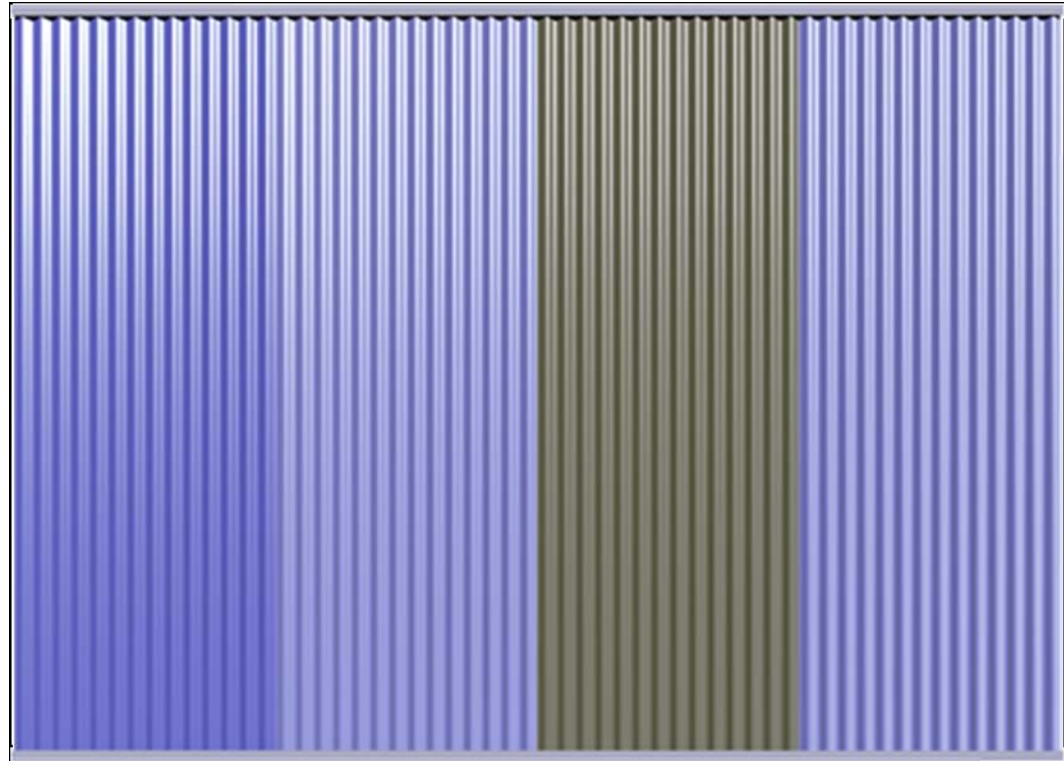
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Corrugated iron

Continuous waveform produces smooth transition between the upper and lower chords.

Light and shadow areas are approximately equal.



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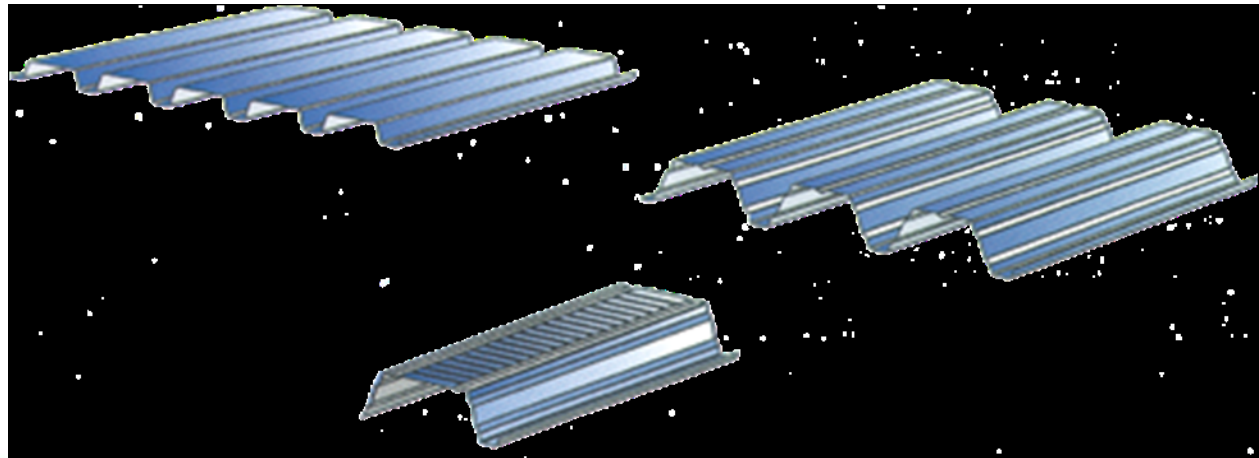
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Trapezoidal profiles

Static coherent development of
the wave profiles

Span up to 10 meter

Wide approx. 75-107 cm



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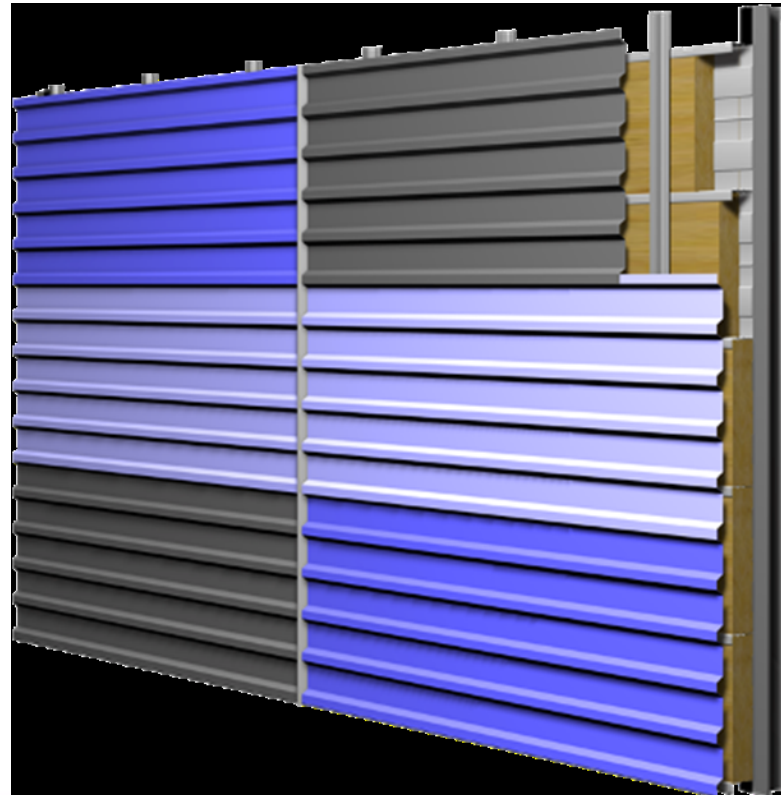
Trapezoidal profiles

Outer shell of steel cassette system or sandwich elements

Positiv- and negativ positions possible

Horizontal und vertical application possible

Wide approx. 75-107 cm



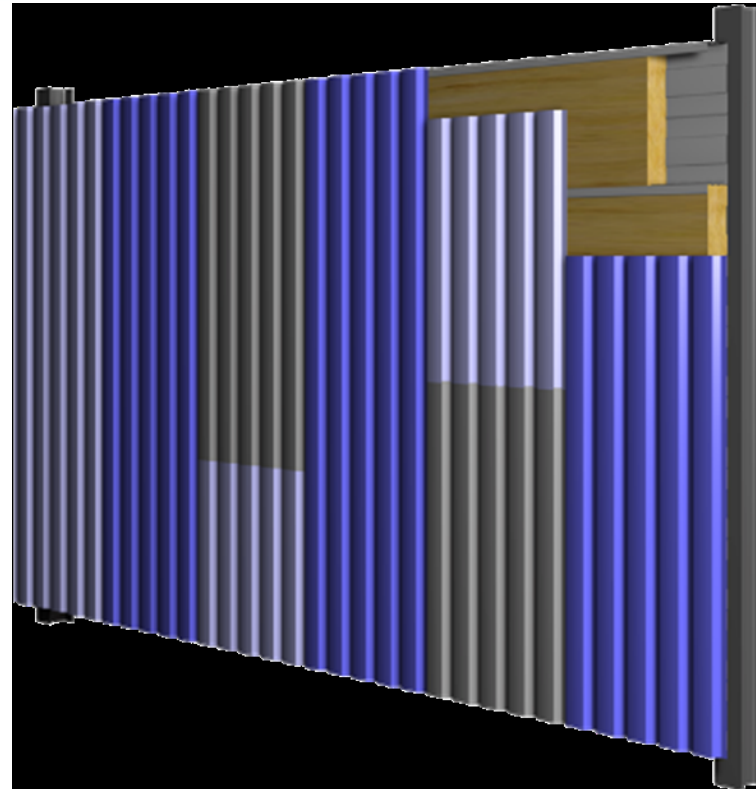
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Trapezoidal profiles

Classic use:

Positive position in vertical
direction

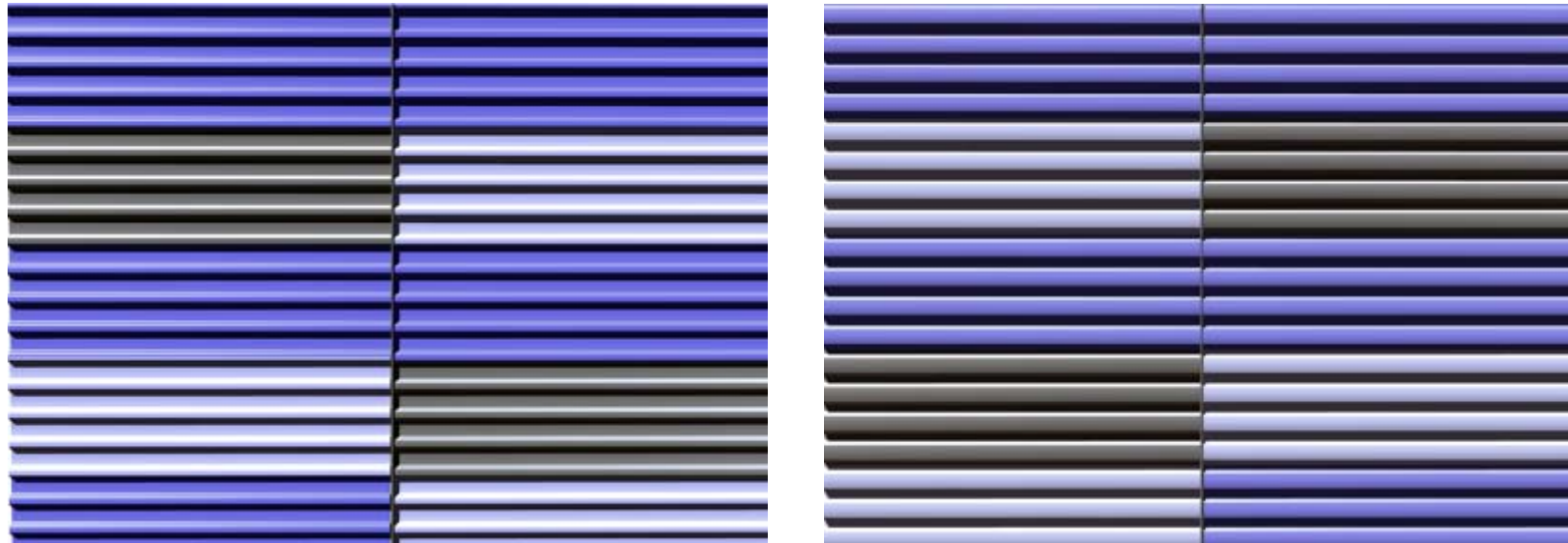


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Trapezoidal profiles

Horizontal views. In negative position shaded areas can be larger.



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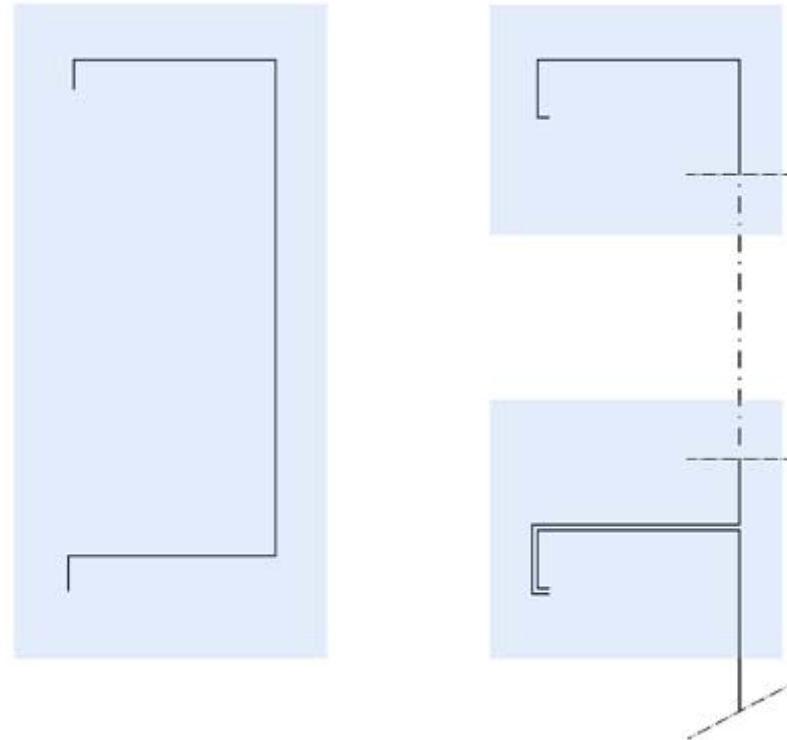
Steel cassetts

Load bearing structure for vertical and horizontal loads

Insulation must be positioned over the carving



Quelle: Deutsche Rockwool / SFS intec

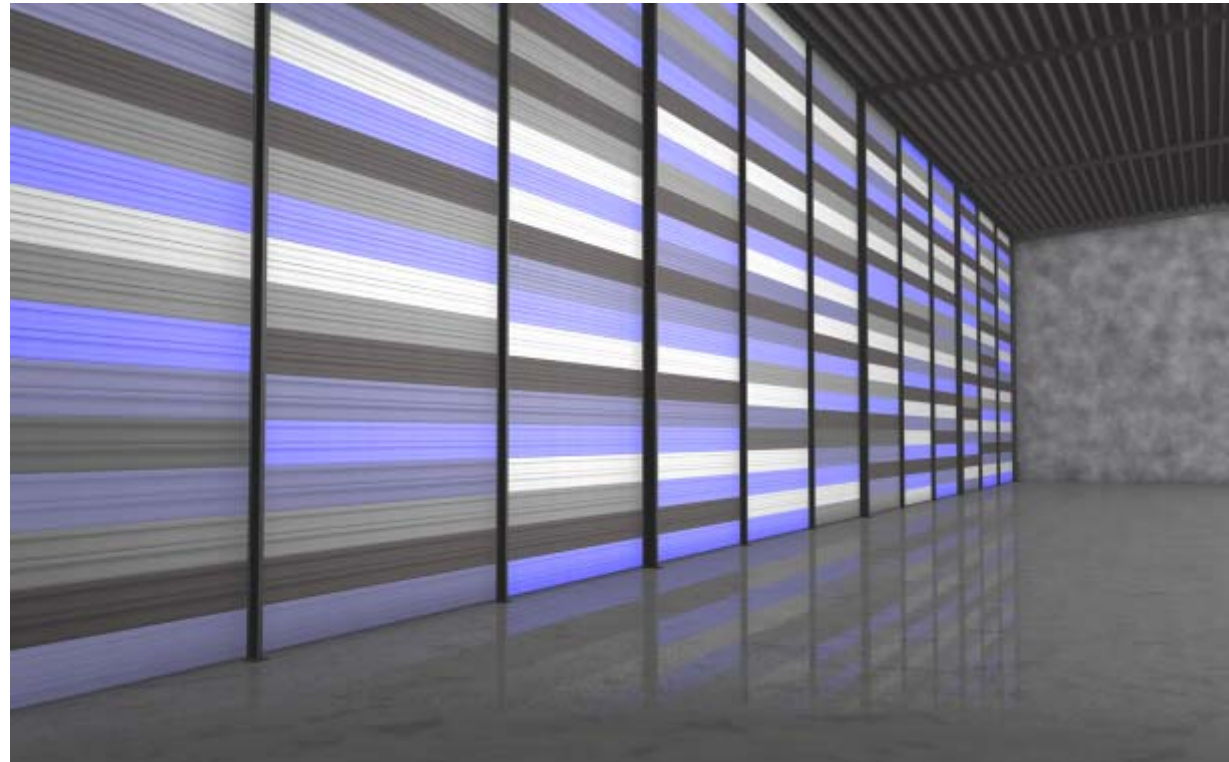


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Steel cassetts

Design idea: interior is a façade too!



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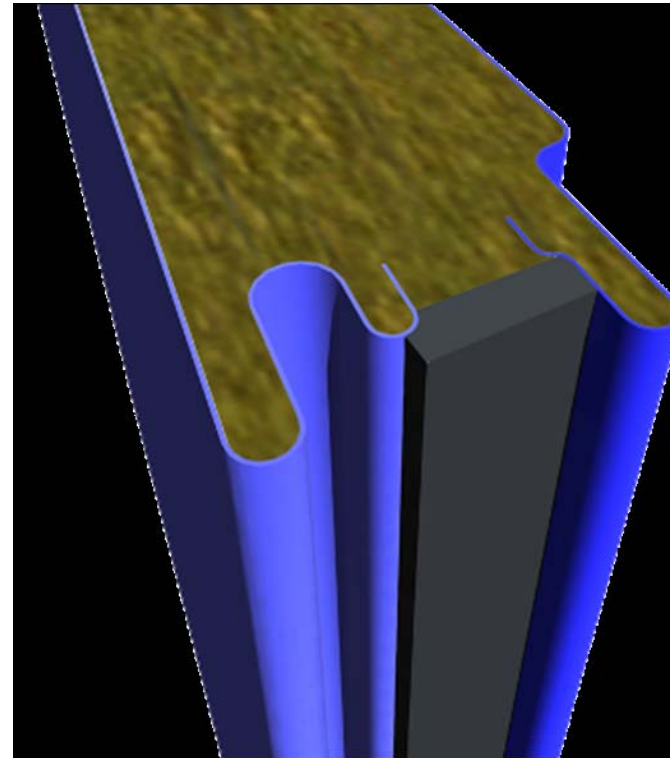
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Sandwich elements

Insulates (PU-Foam, mineral wool) and bears loads in one element

Load capacity is generated by internal lever arm

Cover sheets are weather skin and serve the load transfer



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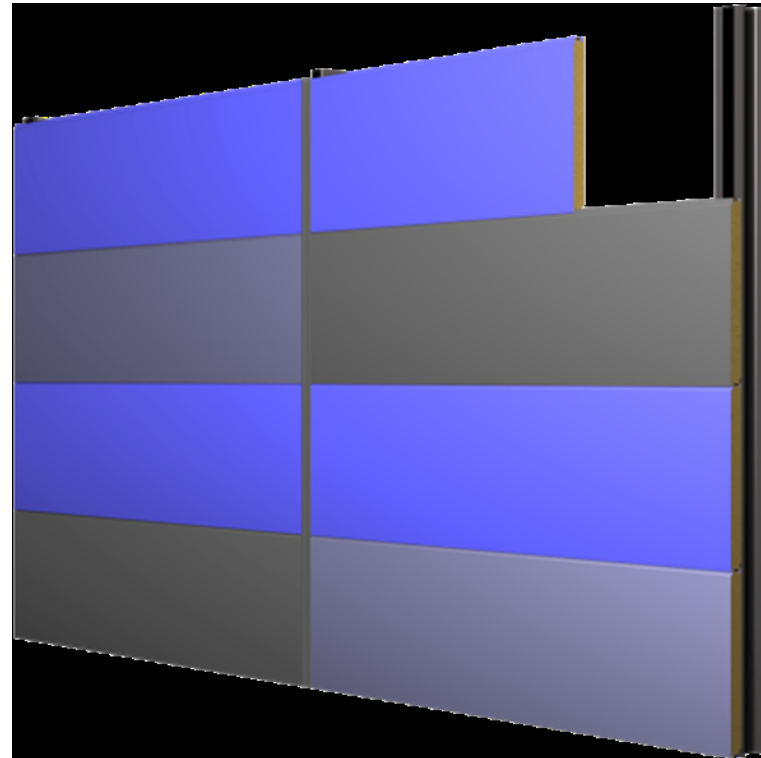
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Sandwich elements

Outer cover sheet may be profiled or just plan

Horizontal and vertical installation possible

Cover strip over transverse joints in the horizontal position (no tongue and groove system)



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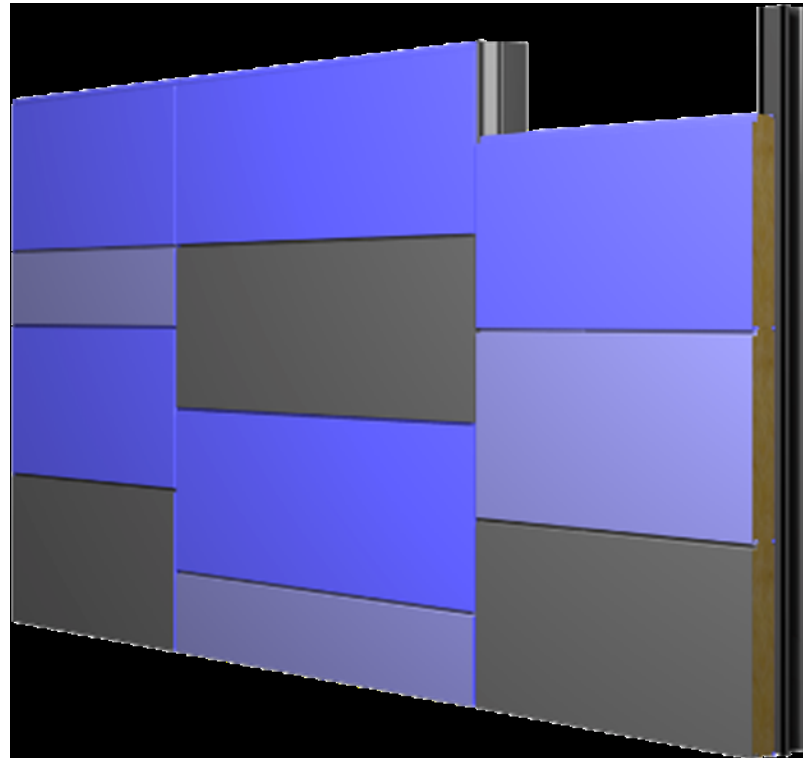
Coffered systems

Small-piece construction system

Joint disposition and variable arrangement possible

Subconstruction necessary

Insulated and uninsulated systems



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Paneels

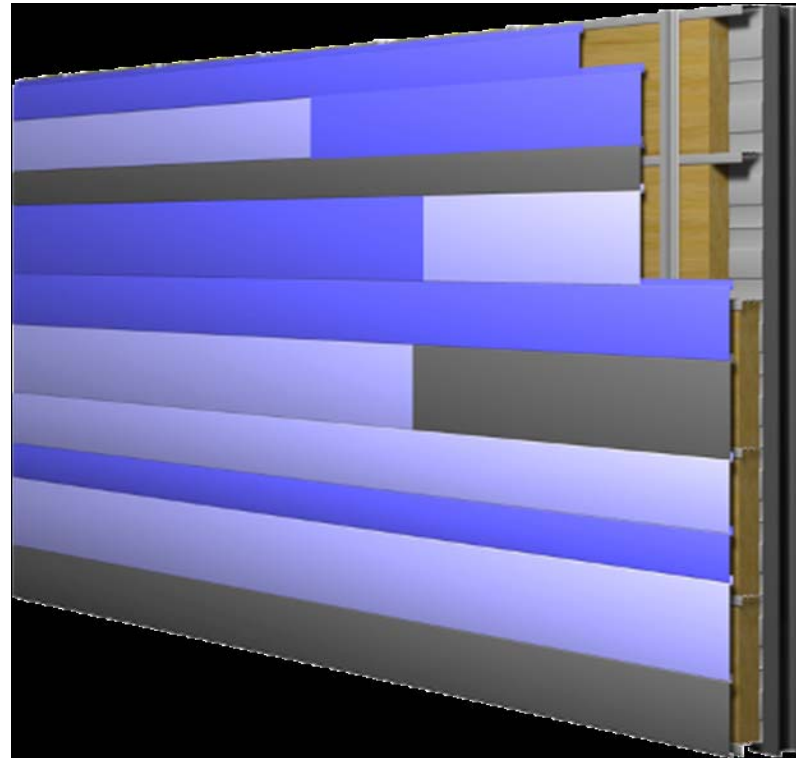
Outer shell on steel cassetts

Manufactured by rollforming

Different profiles and widths possible
(approx. 20-40 cm)

Horizontal und vertikal orientantion possible

Finer lining of the envelope

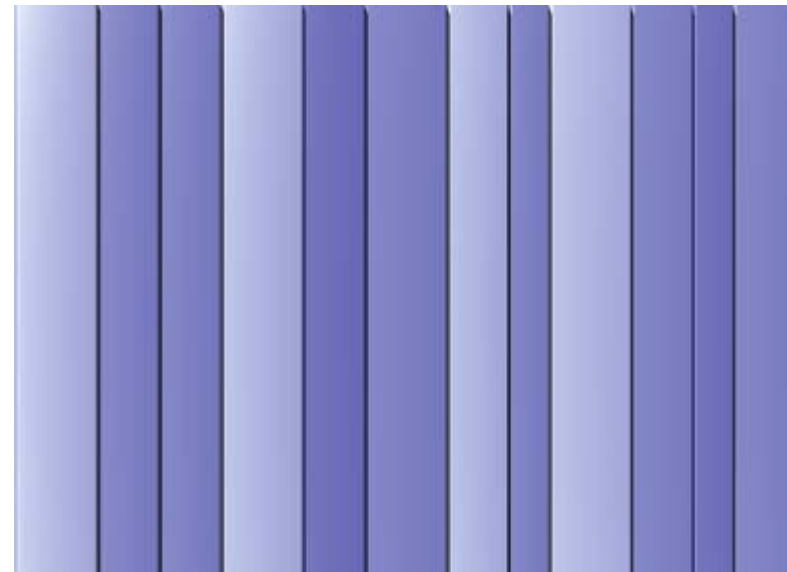
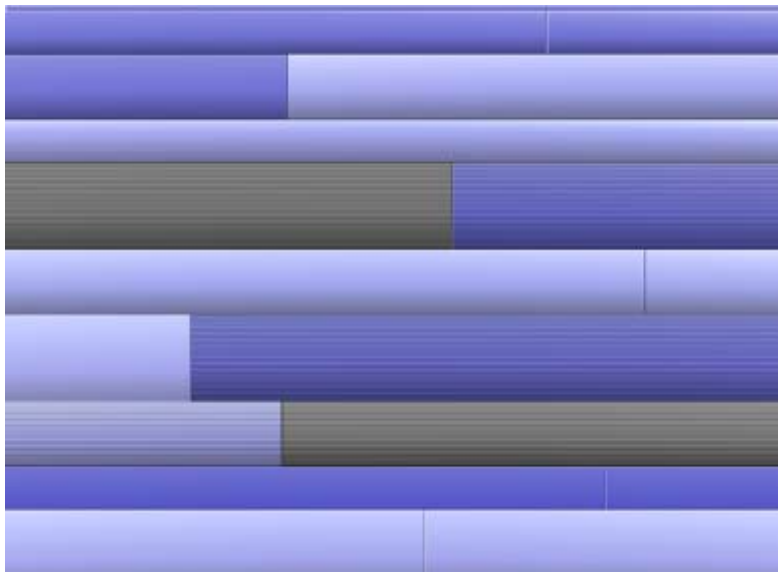


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Panels

Views of the profiles, the combination of different heights in rows or columns is possible.



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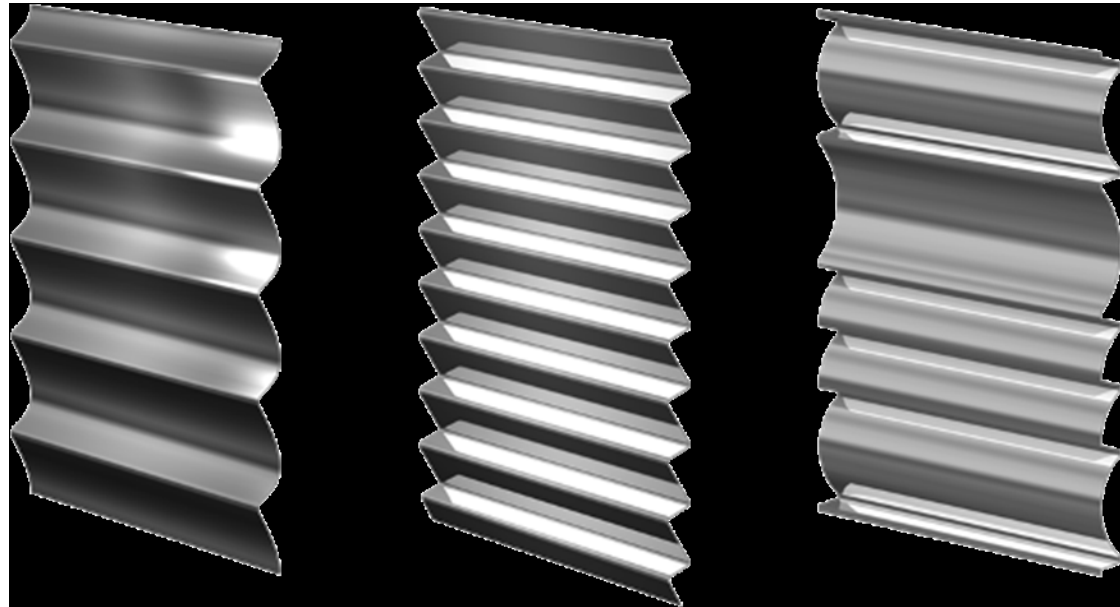
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Custom-made products

Individual geometries can be formed in

Individual production by stamping press (limitation 6 meters)

For larger capacities rollforming is a better opportunity



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The design of sheet metal envelopes

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What is the colour of
steel?

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What is the colour of steel?

Iron ore: Chemical connection of iron, oxygen and other additions.
Iron content from 30-70%

The affinity to oxygen is cause of rust

Colour: a tendency to brown...



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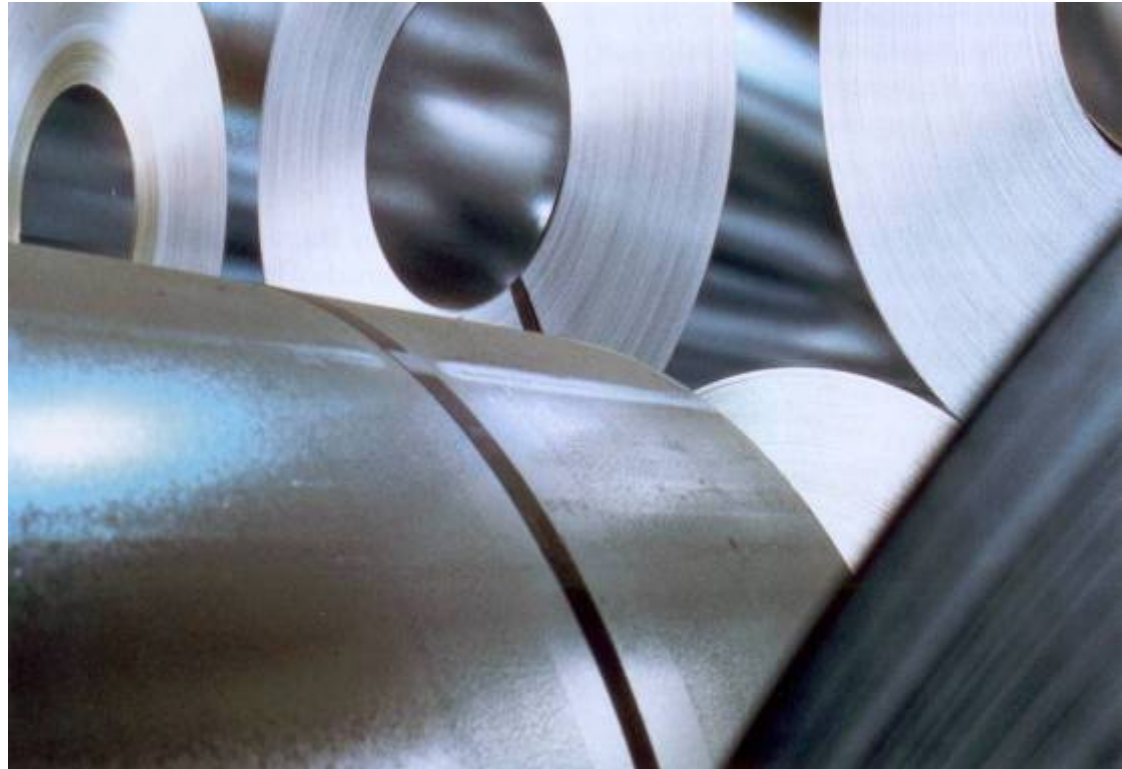
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What is the colour of steel?

Galvanized coils , a variety in strenght, thickness and wide

Galvanization (zn) is appllied individually and part of the complex corrosive system

Colour: a tendency to light grey



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What is the colour of steel?

Roll-painting plant:
an economical solution for color
coating and improve corrosion
protection

Both sides can be painted different

Colour: any colour you want (even
black)



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Coulourdome, Aachen 2002

Outside: assembly instruction –
one colour ,one part

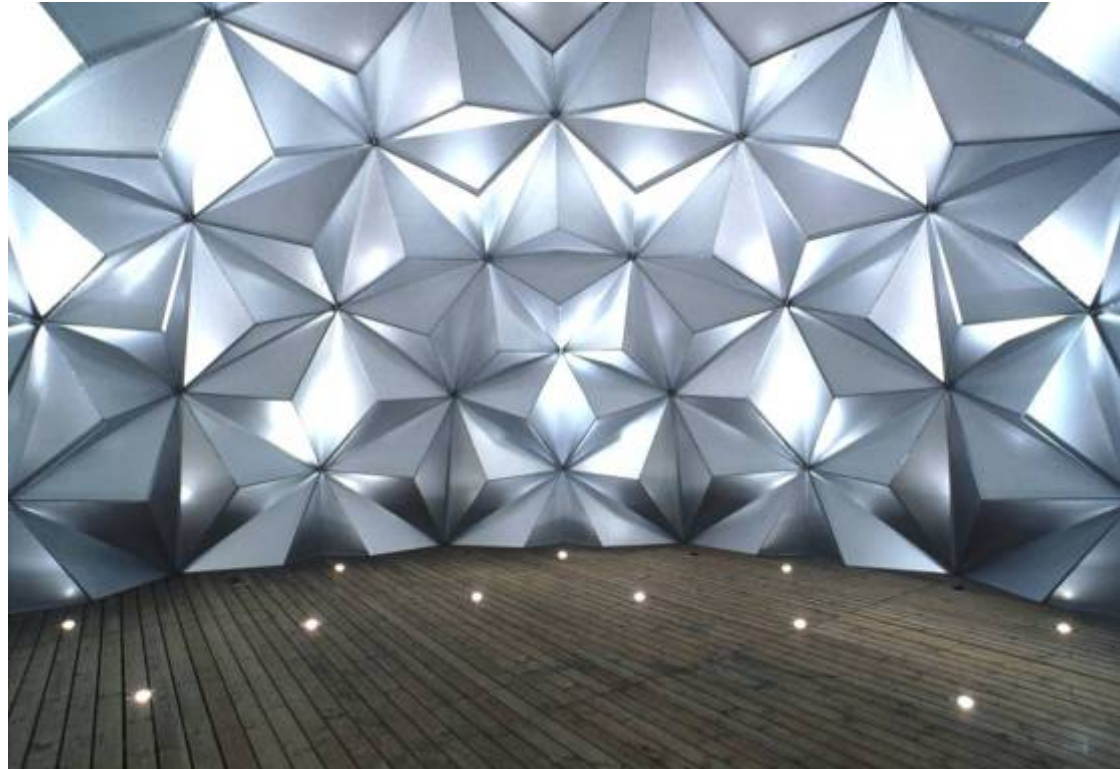


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Coulourdome, Aachen 2002

Inside: neutral / crystalline – one colour, silver



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Monochrome
Polychrome

Volkswerft Stralsund:
300 x 108 x 75 meters.
An monochrome envelope whould have
been the economical solution



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Monochrome
Polychrome

Realiced envelope after design of
Friedrich Ernst v. Garnier.

Differentiated and lighter in color -
Polychrome



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Colour work

Thesis:

Colour scenes from the striking image can also be transferred to another context.

The picture goes, the mood of the picture remains.



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Colour work

Design: M. Smyk



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Colour work

Design: B. Mense (image template: Eduardo Chillida)



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Colour work

Design: S. Auer



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Colour work

Design: B. Schlösser



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Colour work

Design: K. Moehring



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Colour work

Design: J. Heininger (image template: Edward Hopper)



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Colour work

Starting an exercise with the help of PC: Is an increasing of quality possible?



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Silver/grey horizontal elements



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Vertical trapezoidal profiles in positive position



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Vertical sandwich elements, monochrome



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Coloured trapezoidal profiles (expensive)



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Coloured trapezoidal profiles (expensive)



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Coloured trapezoidal profiles (expensive)



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Small part covered systems in grey and green



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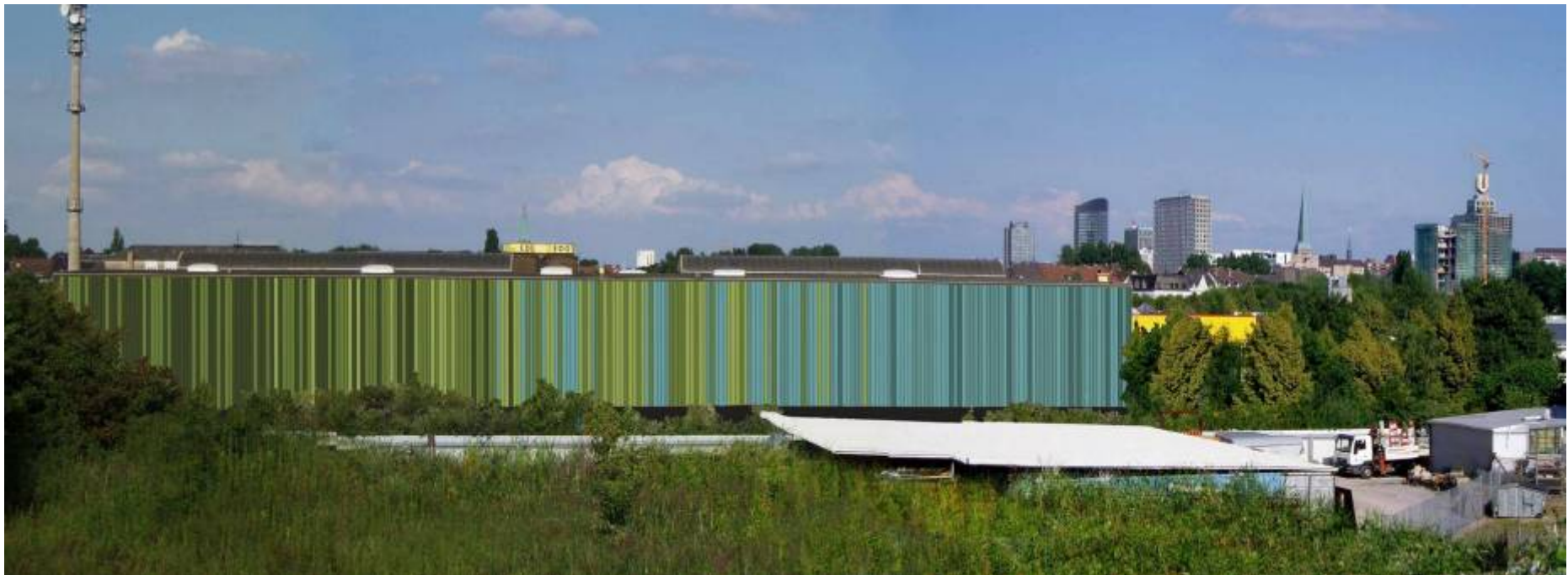
Finer division by horizontal panels



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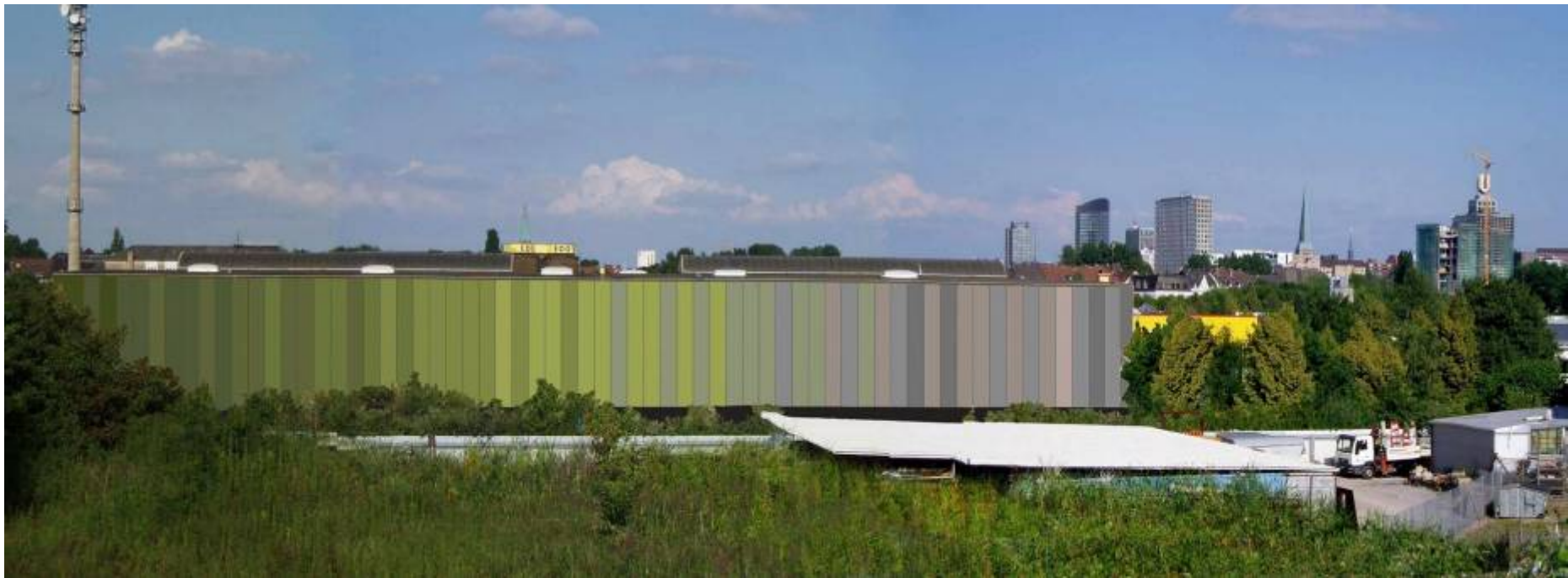
Panels vertical



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Sandwich elements, vertikal



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Individual formed stainless steel metal sheets, acting as a reflector (expensive)

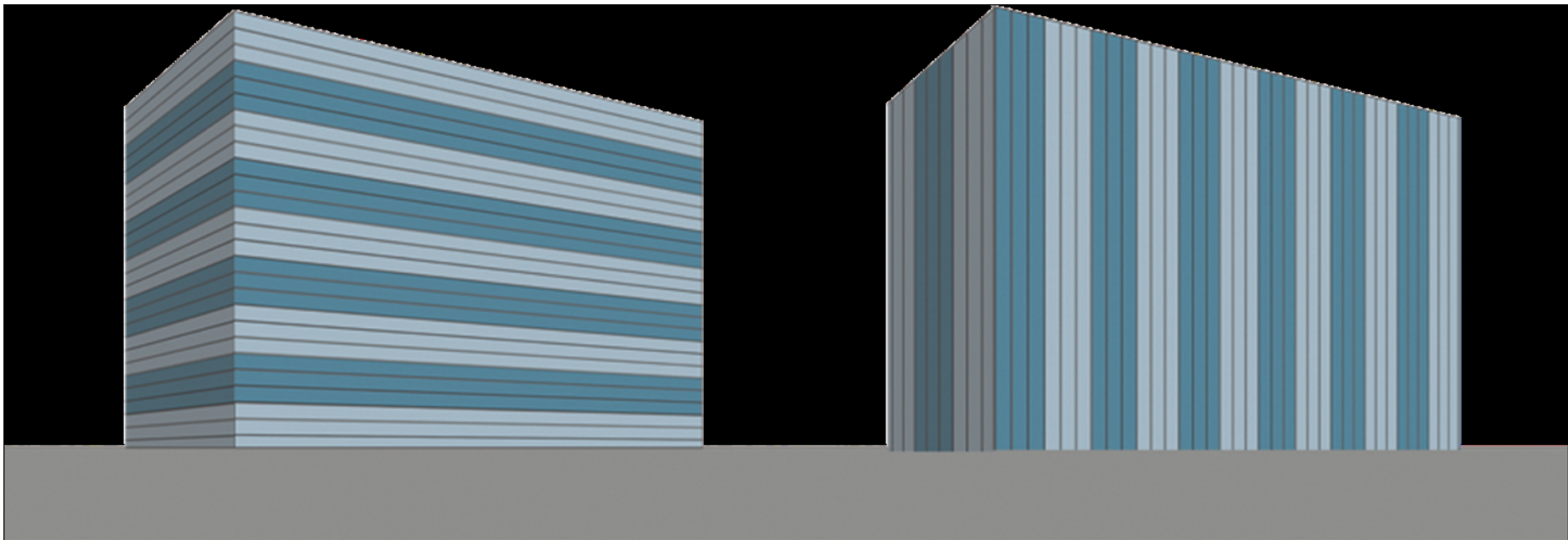


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Horizontal and vertical

One cube, two directions of structural positioning

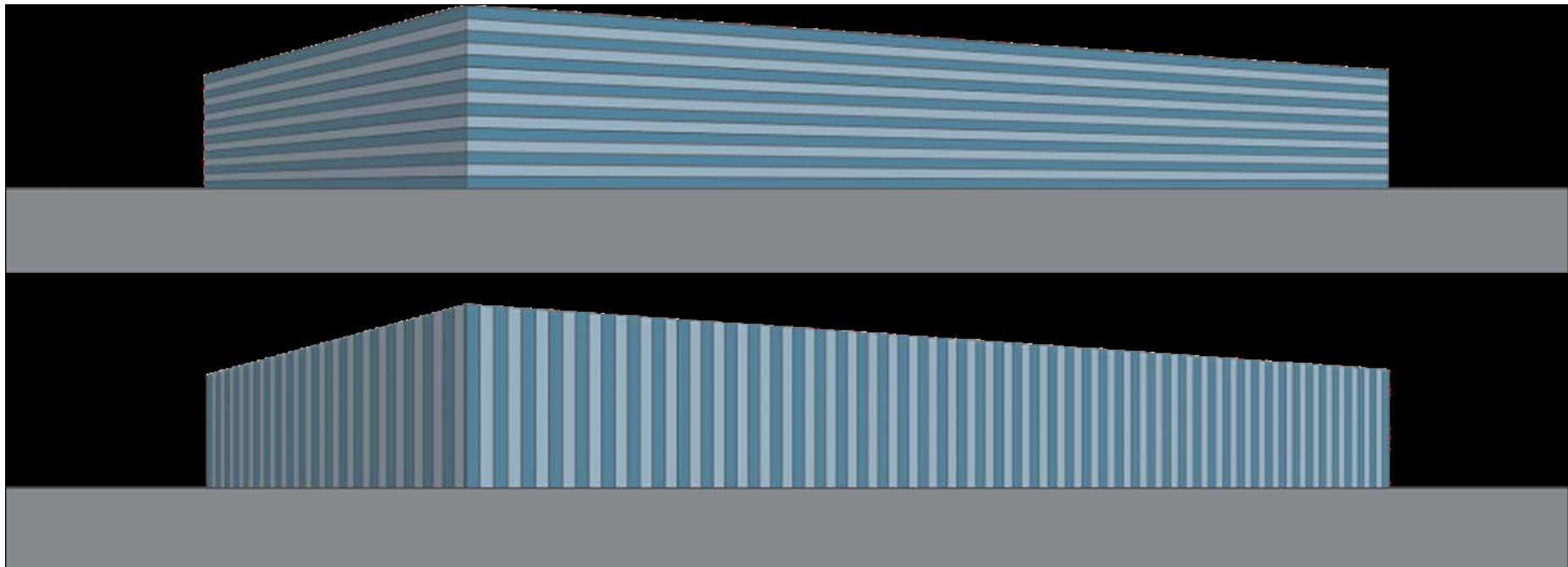


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Horizontal and vertical

One cube, two directions of structural positioning



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Coins & patterns

Optical smothering and protection against bulging– coins stabilize the metal sheet.
Patterns offer a greater visual deepness.



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Coins & patterns

A good example for visual differentiation:

Corrugated iron with applied zinc-pattern.

Different tonation and shadows against monochrome boredom

(Ville Verdi, Vienna)



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Foreground and background



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Foreground and background



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Energetic façades

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Roof

Photovoltaic as additive (left) or integrated system (right) .

The roof provides extra energy as a bonus.



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Façade

Also on the facade of the application of PV elements is possible. Variations do not affect the energy input.

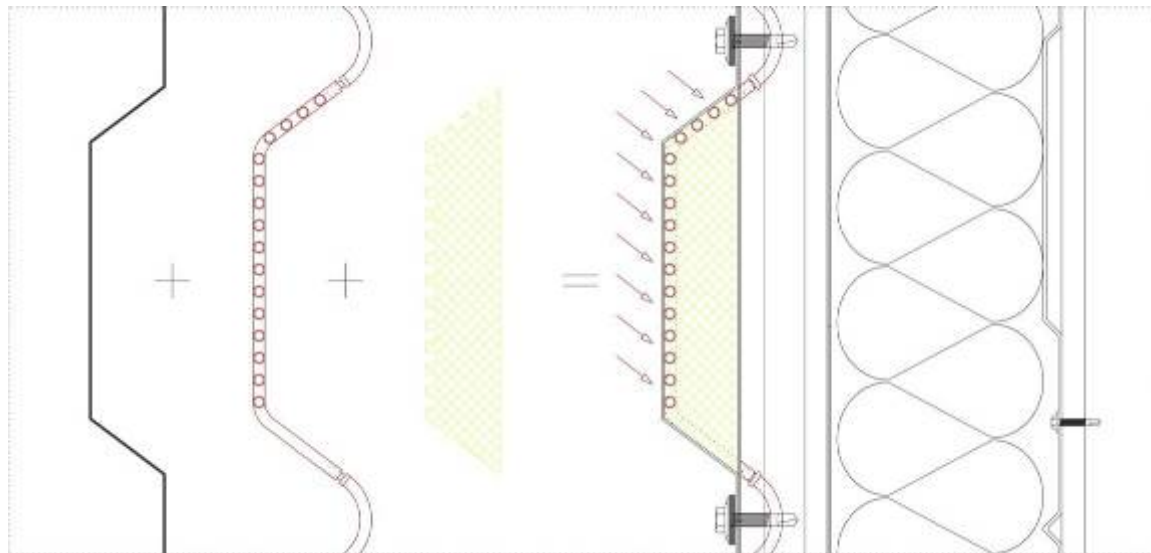


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Solarthermal activation for building tempering: energy profit with industrial building envelopes. Target is system-integration (in combination with PV).

AIF-Project: Prof. Dr. Hachul CO Prof. Rogall

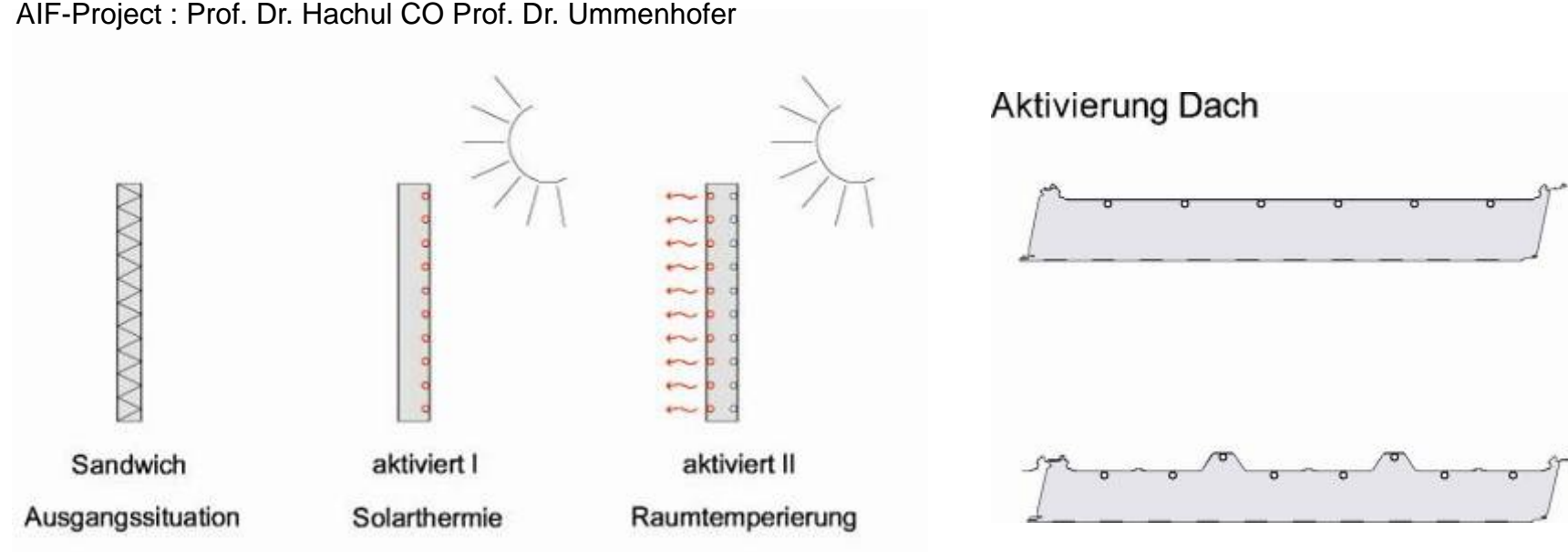


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AIF-Project : Prof. Dr. Hachul CO Prof. Dr. Ummenhofer



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The design of industrial building envelopes made of metall sheet–

Make it better!

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Many thanks for your attention!