Monologue or dialogue
– the design of industrial building envelopes made of metal sheet
Monologue or dialogue

- The design of industrial building envelopes made of metal sheet

- Introduction

- Lightweight façade systems

- Design of metal sheet envelopes

- Energetic façades
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?

5 50 500
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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
- Coffer 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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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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Sandwich elements

Insulates (PU-Foam, mineral wool) and bearies 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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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
Subconstruktion 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 and vertical orientation 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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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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What is the colour of steel?

Galvanized coils, a variety in strength, thickness and wide

Galvanization (zn) is applied 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 would have been the economical solution
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Monochrome
Polychrome

Realized 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 coffered 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 smoothening 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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Solarthermical 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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**Solarthermical 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. 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!