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**Solar Design Tools –
Practical examples
of visible and colored
photovoltaics in
architecture**

HSLU – DFK
Research Group Products & Textiles

Prof. Tina Moor
Prof. Brigitt Egloff

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Changes in the landscape and cityscape

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Visualisation HSLU

Meggerhorn barn; Swiss Solar prize 2014
<https://www.benetz.ch/referenzen>

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Customised solutions for a wide range of requirements

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Case Study PEG52

- Visible PV systems**
- technically sophisticated and proven
 - uniform and technoid appearance
 - Aesthetically unsatisfactory

Customised solutions for a wide range of requirements

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Case Study PEG52

- One possible solution**
- Colour-matched ceramic printing
 - More efficient design processes with SDT
 - Precise predictions of aesthetics and energy yield
 - repeatable surface concepts
 - Visual integration into the built environment thanks to flexible color matching

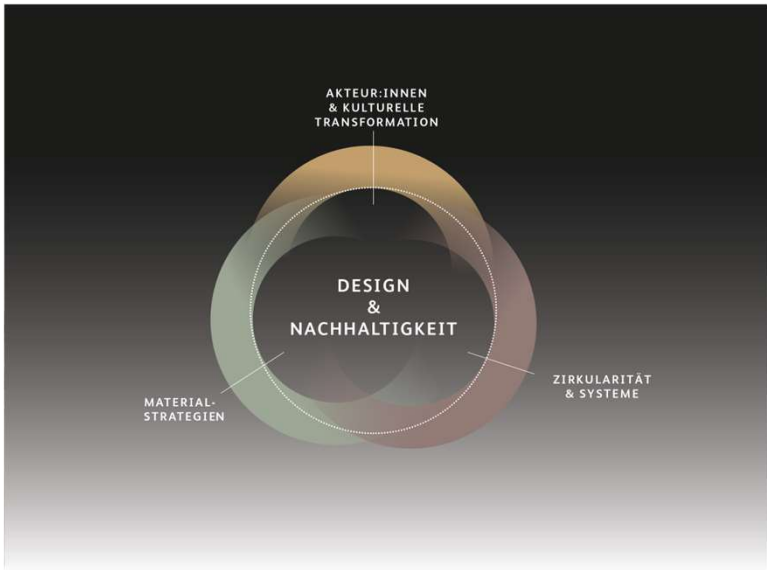


Foto: EM2N

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**Research Group
Product & Textiles**


Applied design research in the fields of
textiles, products and materials



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Strategy



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Material strategy

- Positioning PV as a new building material that is included in the planning at an early stage

Stakeholders and cultural transformation

- Promoting acceptance through good case studies and dissemination

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INNOSUISSE PROJECT

Solar Design Tools

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Limited color chart

Efficiency
– 32%



Efficiency
– 20%



Efficiency
– 10%



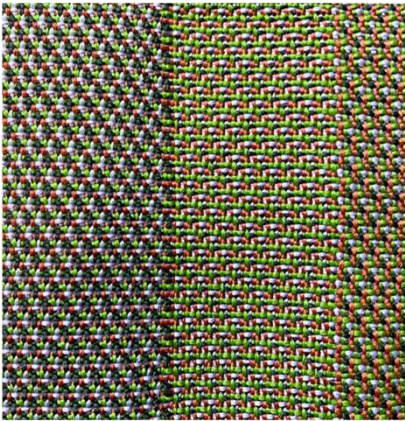
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Expansion of the color chart



Batavisches Bauernhaus, Johan Joseph Aarts (1895)



Atelier Object Project, Cenk Kivrikoglu, Brüssel



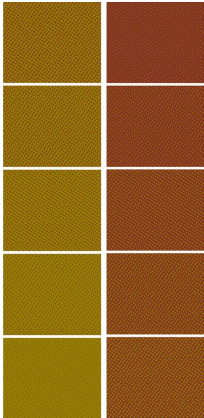
Bauhaus spintop, optical color mixing, Design Ludwig Hirschfeld-Mack

Focus «material colors»

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Stakeholder-Workshop



Color shades yellow/red



«material color» Rust

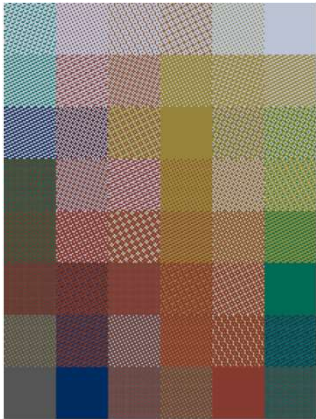
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Expansion of the color chart

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Combinations of colors, 75 RE



Color chart, 75RE

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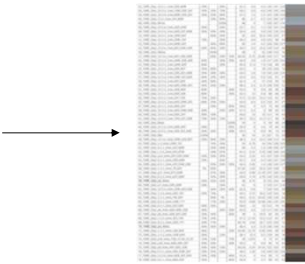
Comparison with NCS colors



Demowall Proof-of-Concept



Visual comparison with colors NCS



Mathematical comparison with NCS colors

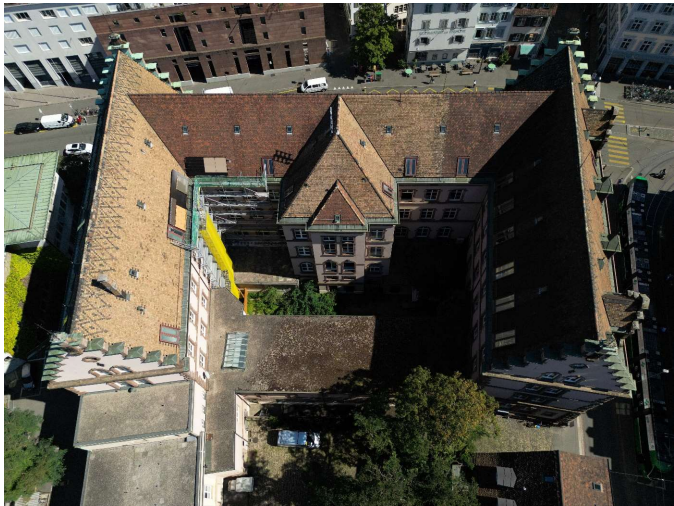


Summary

- The SDT color chart offers**
- Colours that are reminiscent of material colors
 - Many “warm” color nuances
 - Predictable energy performance

- Strengths**
- All colors of a defined efficiency can be mixed together

- Challenges**
- Only a few light and pastel ochre, pink, and orange shades are available



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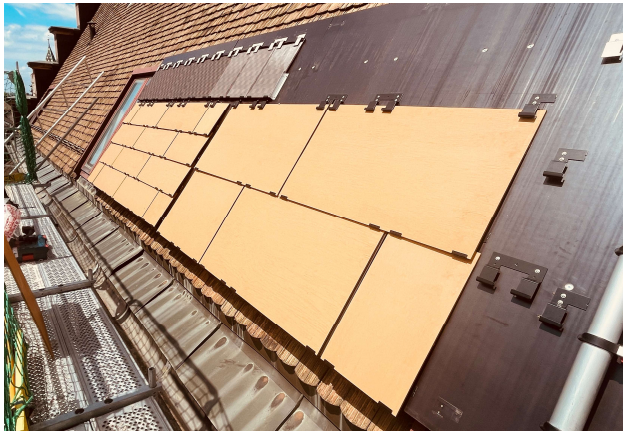
Case study
PEG52 - Petersgraben

- Historic building in the old town center
- Complete refurbishment
- High demands on visual integration
- Pilot project for the client of the city of Basel

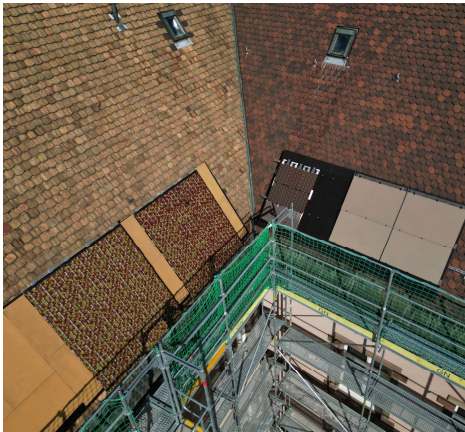
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Initial situation

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Plain-colored PV modules after color matching with the roof and tiles



Different stages of the patterned PV modules

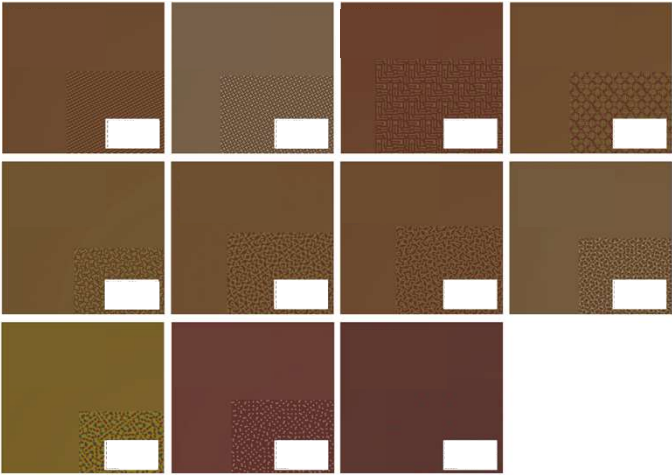
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Choice of colors

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Color matching with historic tiles



First color selection

Mock-up PEG52

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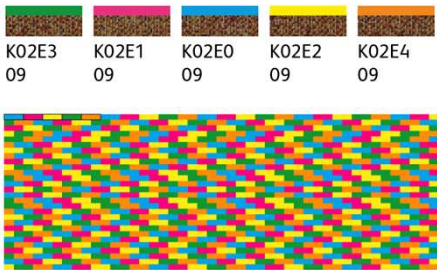


Designs as mock-ups with functioning PV modules



Long-distance effect

Final Design



Final realisation with 5 module types and corresponding installation strategy

Visualization



Finale Visualisation PEG52



Hotel Drei Könige: View from Klosterstrasse, top view of the roof

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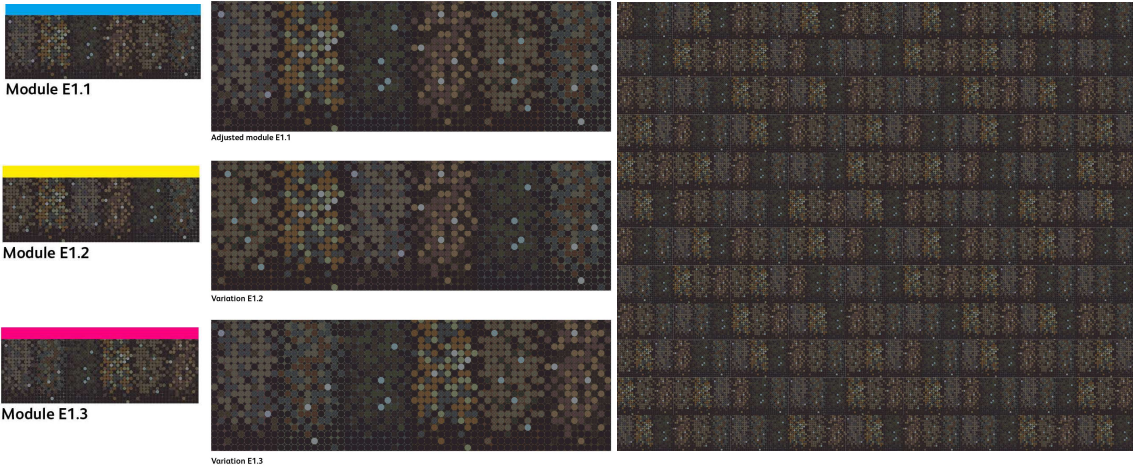
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Case study
Hotel Drei Könige

- Building worthy of protection in the center of Lucerne
- High demands on visual integration
- The owner wants renewable energy production

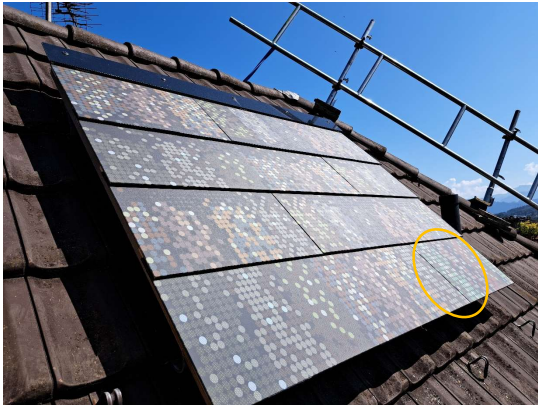
Design for the roof of Hotel Drei Könige

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Installation



Mock-up H3K



Visualisation HK3

Summary

- Roof design with only three modules
- Energy loss -10%
- Involvement of monument preservation in the design process
- Building application in progress



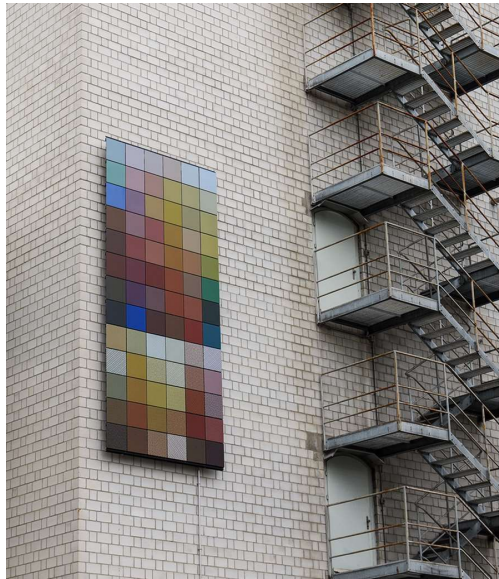
Outlook

Follow-up project Innosuisse

- Establishing colored PV as a common building material
- Refining (textile) design methods and processes
- Expansion of the color palettes
- Optimised processes for higher energy efficiency and minimized costs

Design services

- Patent application for solar color system
- Establishment of a spin-off for design services
- «à la carte» design solutions



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Survey on the „Solar Design Tools“ project



Presentation and exhibition at HSLU in Emmenbrücke on 28 May 2025 at 3.15pm

Thank you very much for your
attention!

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Plan-E

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Bau und Energie

verkehrshaus

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University of Applied Sciences and Arts
of Southern Switzerland

SUPSI

**FLUM
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DREI KÖNIGE
STADTHOTEL LUZERN CITYHOTEL LUCERNE



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