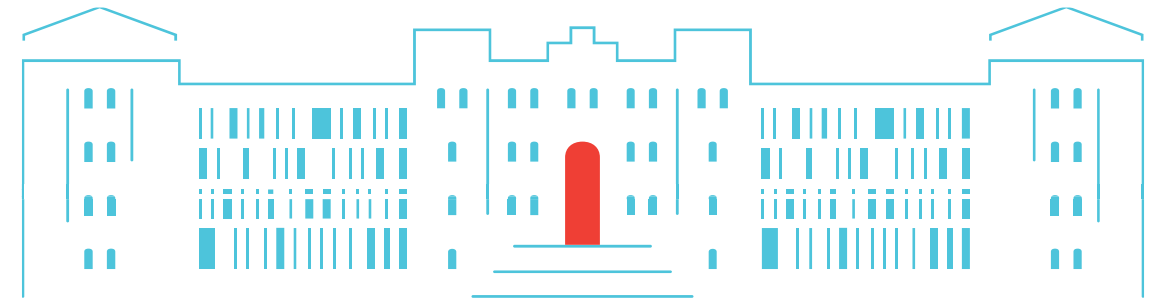
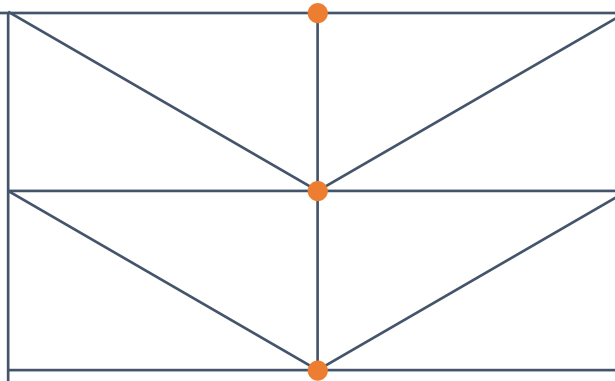


Sustainability & Circular Economy
Sustainable cities & mobility |
SDGs |
Sustainability in the Construction
sector



TUHH
Technische
Universität
Hamburg



Prof. Dr.- Ing Kerstin Kuchta

Why does sustainability matter in the construction sector?



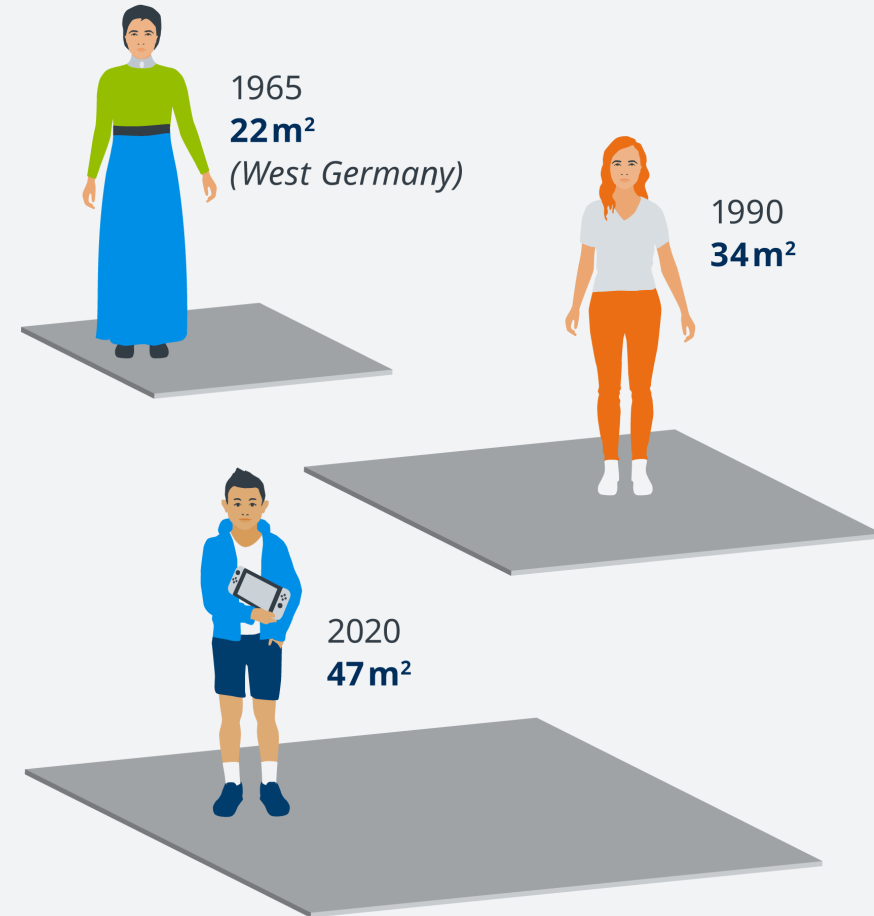
Increased living space

Increased living space results in:

- More natural resource consumption
- More energy consumption
- More land consumption
- More Waste generation

Increase in living space in Germany

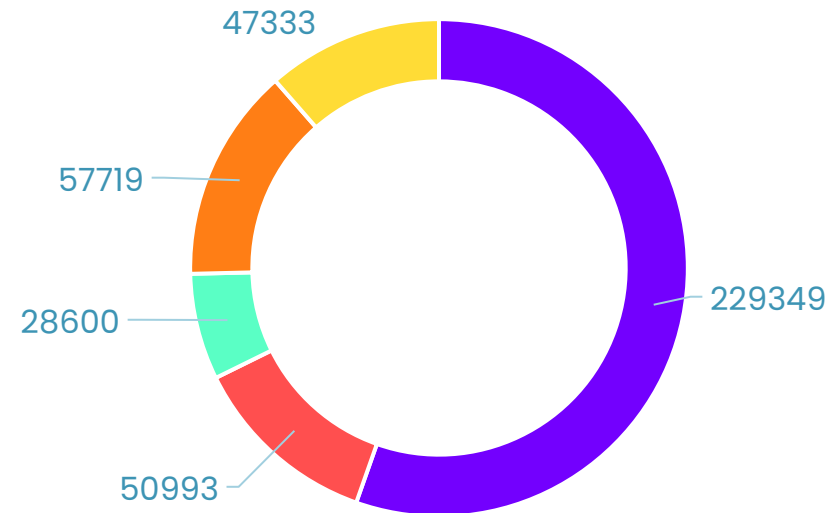
Average living space in square meters per person



Source: Federal Statistical Office of Germany

Waste generation in Germany 2020 by Waste Streams

[kt]



■ Construction and Demolition Waste

The highest portion in generated waste!!

■ Municipal Waste

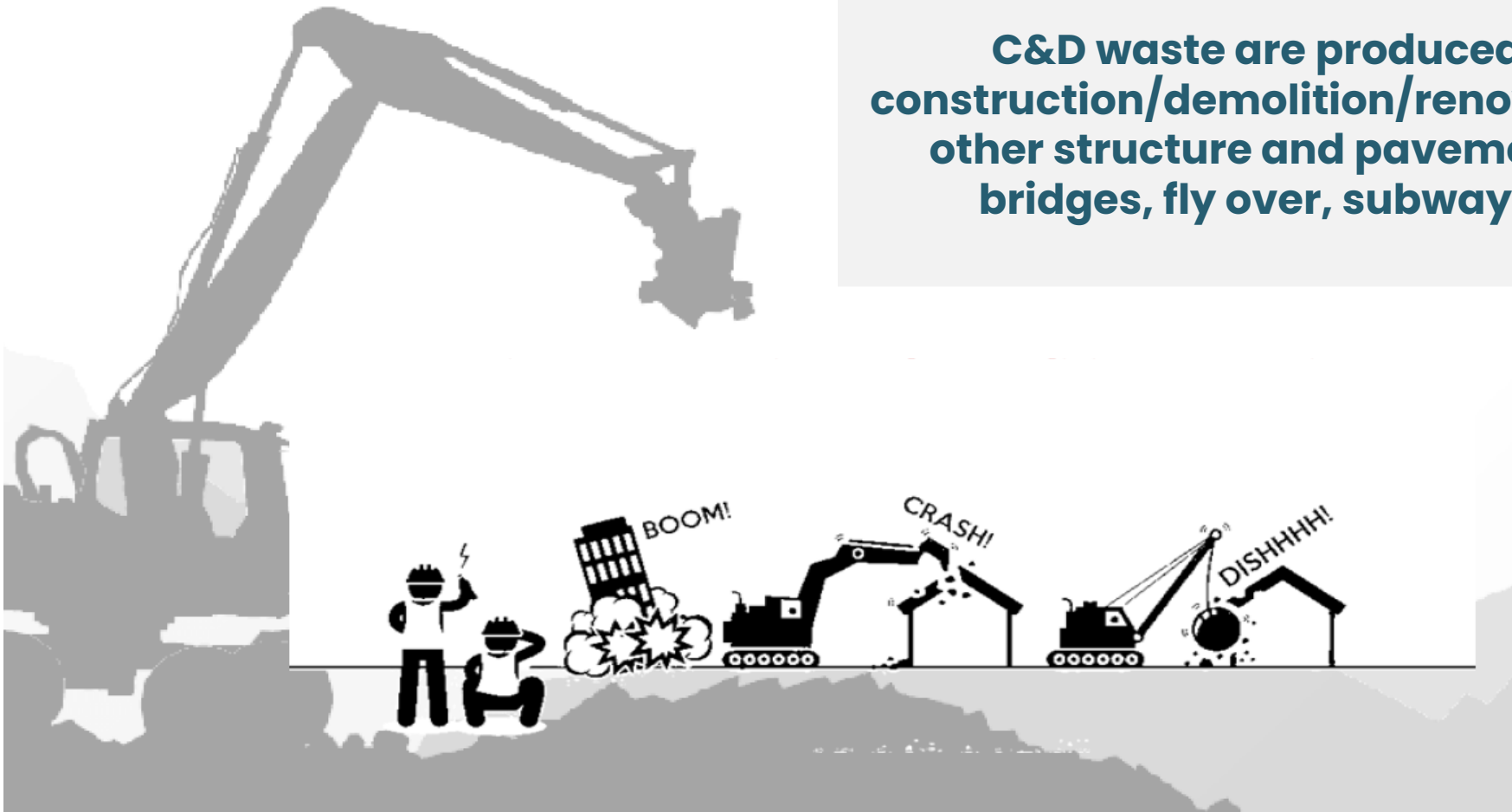
■ Wastes from extraction and Treatment of mineral resources

■ Secondary waste

■ Other waste (especially from production and industry)

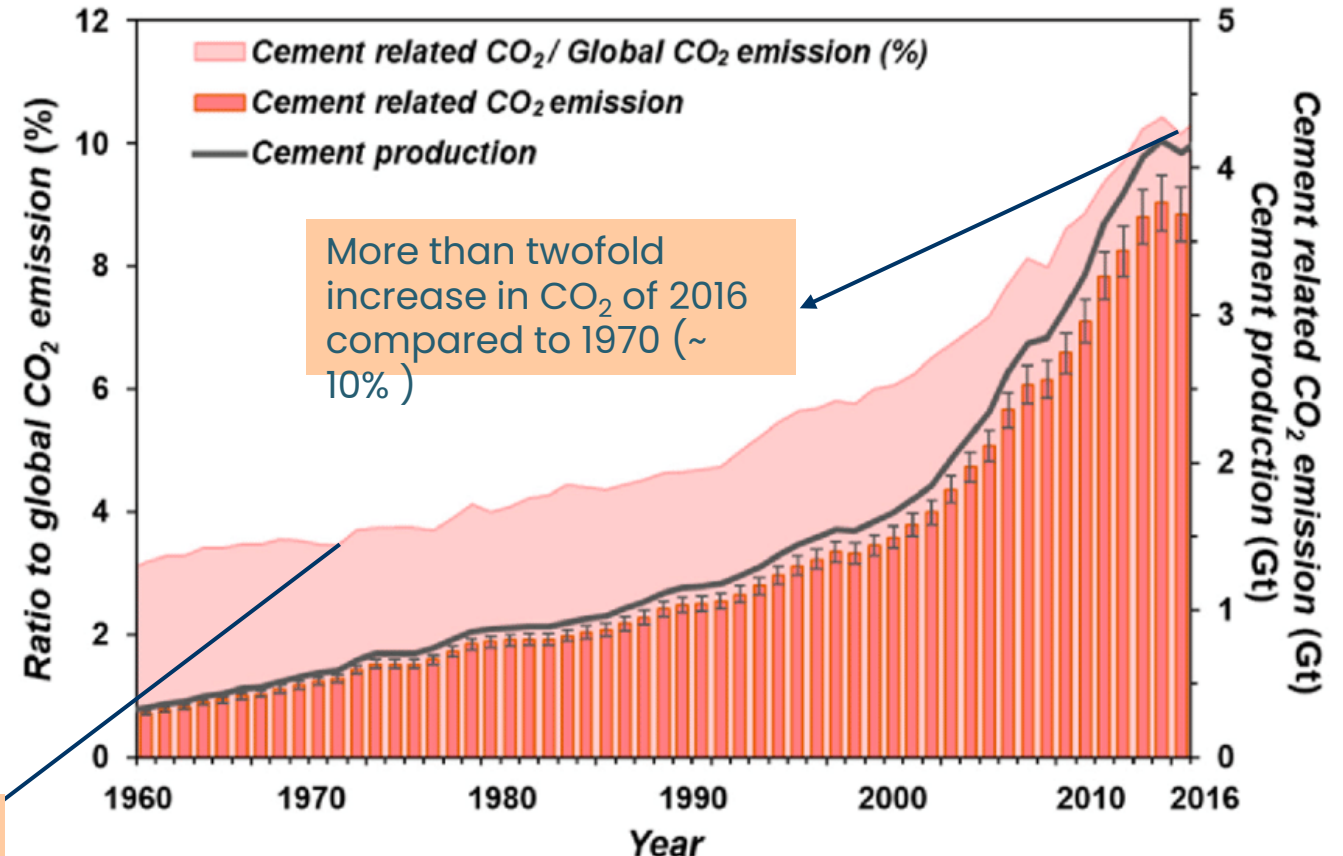
Definition of C&D waste

C&D waste are produced in the process of construction/demolition/renovation of buildings and other structure and pavements, building roads, bridges, fly over, subway, remodelling, etc.



Concrete as a C&D Waste

- Concrete is the most consumed substance on Earth after water [1].
- The bulk of the waste is often sent to landfills, while less than **one-third** is either reused or recycled [2]!



CO₂ emissions related to the production of cement and its ratio to total CO₂ emissions

Image ref.: United States Geological Survey (USGS), 2015

[1] Gao, T., Shen, L., Shen, M., Liu, L., & Chen, F. (2016). Analysis of material flow and consumption in cement production process. Journal of Cleaner Production, 112, 553–565.

[2] Mehta, P. K. A. M., & Monteiro, P. (2014). Concrete: microstructure, properties, and materials. McGraw-Hill Education.

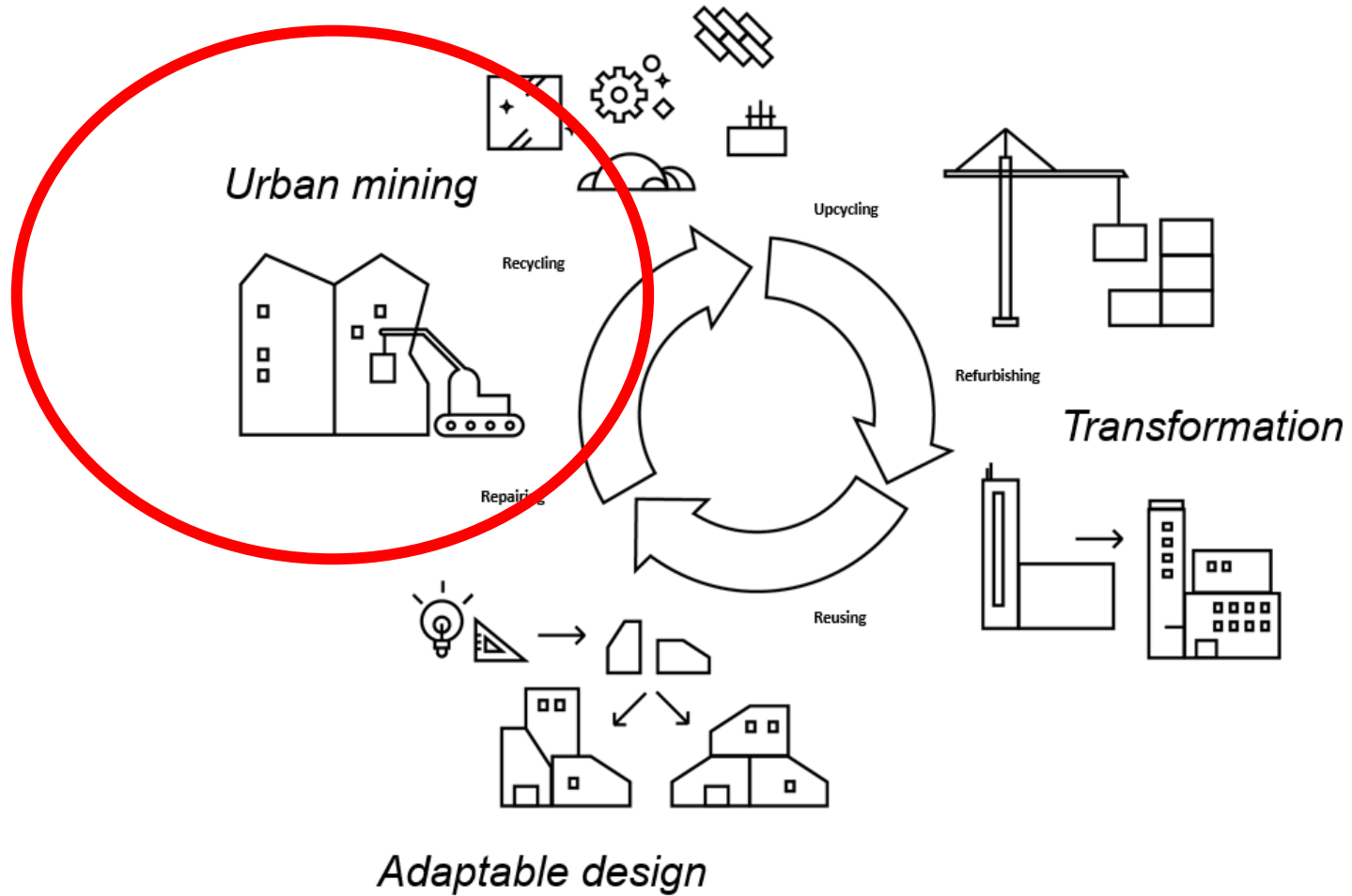
How to apply sustainability in the construction sector?



Waste hierarchy

TUHH





Pre-demolition Audit, the path to the sustainable construction

PDA generates knowledge on the building level and material level about:

- Potential hazardous material and how this has been identified
- Quantity
- Dimensions
- Building elements (doors, kitchen, wall elements,...)
- Extractability

- Gives knowledge about the building and the used materials before the actual demolition.
- Enables better planning of the demolition, as it is known which materials will be generated and in what quantities.
- Enables a clean separation of materials.
- Enables the development of a new market:
 - to directly reuse materials (like tiles, doors, radiators,...)
 - for increasing the recycling quota

DIN SPEC 91484 published in September 2023

Procedure to record building materials as a base to evaluate the potential for a high-quality reutilization prior to demolition and renovation work (pre-demolition audit)

Current challenges in C&D waste management

- Little time for the demolition
- Little or no space for additional containers
- Demolition should not be more expensive
- Little knowledge about the to-be-demolished building



Digitalization as a solution!



Digitalization as a solution!



What is the next step?

Reusing and recycling

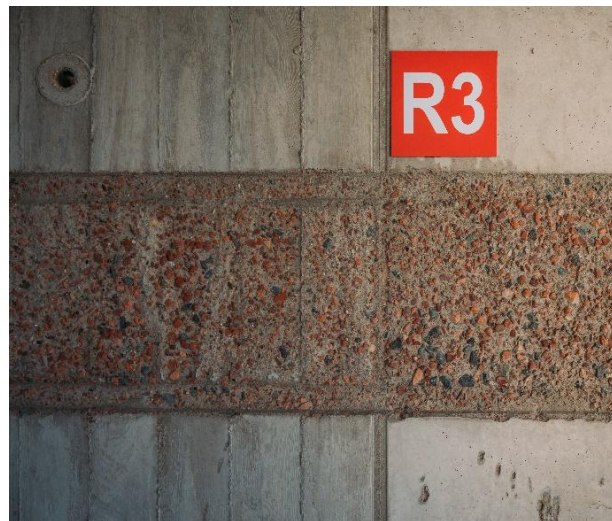
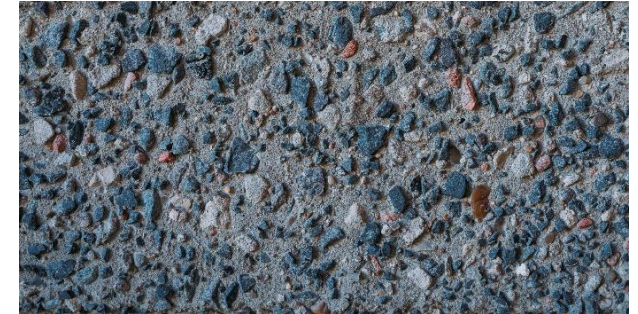


Musterbude, an example of recycled concrete!



For more information visit:
<https://www.otto-wulff.de/news/circuit-musterbude>

Musterbude, an example of recycled concrete!

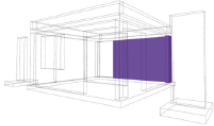


Musterbude, an example of recycled concrete!

REZEPTE

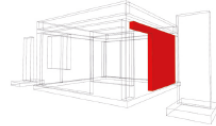
R1

45 % RC
(Korn 2-16 „Typ 1“, Fa. Eggers)



R3

60 % Ziegelsplitt
(Korn 2-16, Fa. Manzke)



REZEPTE

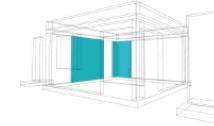
R4

45 % RC
(17 % Korn 0-2, 28 % 2-16 „Typ 1“, Fa. Eggers)



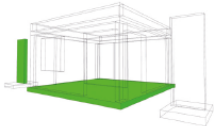
R5

35 % RC
(Korn 2-16, „Typ 2“, Fa. Eggers)



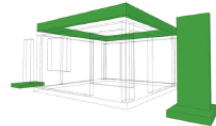
R6

100 % RC
(„Hamburger Mische“, Fa. Eggers)



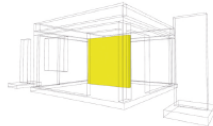
R7

100 % RC
(„Hamburger Mische“, Fa. Dörner)



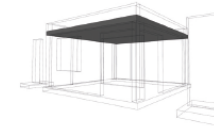
R8

45 % RC
(Korn 2-16 „Typ 1“, Fa. Dörner)



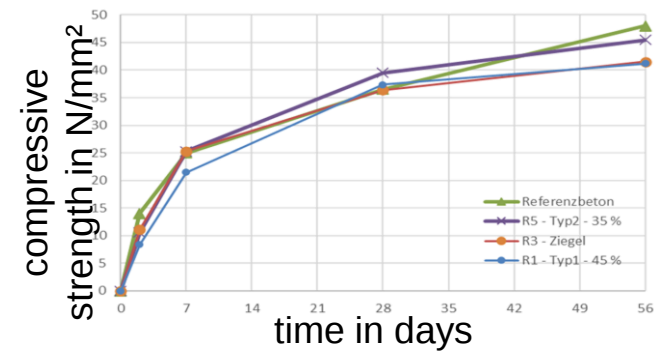
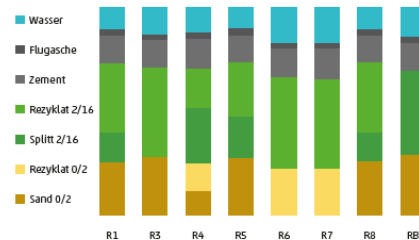
RB

0 % RC
(Referenzbeton)



BS Bretterschalung SS Saugende Schalung NS Nicht saugende Schalung S3 S3 Schalung

ZUSAMMENSETZUNGEN



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