GREEN CONCRETE INFLUENCE ON SUSTAINABLE DEVELOPMENT IN THE BUILDING INDUSTRY – EXPERIENCES FROM THE DGNB WORKING GROUP

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IMPACT OF GREEN BUILDINGS IN THE SUSTAINABILITY TRANSITION

Source: Guide to sustainable building certifications
UNFOLDING SUSTAINABILITY CERTIFICATION
BUILDING CERTIFICATIONS IN DENMARK
THE DEVELOPMENT

BREEAM
United Kingdom 1990
Certifications  17

DGNB
Germany 2007
Certifications  45
Pre-certifications  32
Registered  40

LEED
United States 1993
Certifications  16
Registered  20
BUILDING CERTIFICATIONS IN DENMARK

THE DEVELOPMENT

Source: Byggefakta
“DGNB is a sustainability certification of buildings – **not** a product declaration”

- Great focus on developing products that burden the environment less than before.
- What positive effects does green concrete have for certification of a building, if the building is going to be certified by DGNB?
CONCRETES INFLUENCE ON DGNB
ENVIRONMENTAL QUALITY

Global- and Local Environment

- Life Cycle Impact Assessment (LCA)  
  ENV. 1.1  
  7.9%

- Local Environmental Impact  
  ENV. 1.2  
  3.4%

- Responsible Procurement  
  ENV. 1.3  
  1.1%

Resource Consumption and Waste

- Life Cycle Assessment (LCA) - Primary Energy  
  ENV. 2.1  
  5.6%

- Drinking Water & Waste Water  
  ENV. 2.2  
  2.3%

- Land Use  
  ENV. 2.3  
  2.3%

Minimum quality requirements in relation to DGNB’s ambition

DGNB  
14.6%  
11.3%  
7.9%
CONCRETES INFLUENCE ON DGNB
ECONOMICAL QUALITY

Life Cycle Cost

Economic Quality 22,5%

Flexibility and Adaptability
ECO. 2.1
6,4%

Commercial Viability
ECO. 2.2
6,4%

Minimum quality requirements in relation to DGNB's ambition

DGNB 14,6%
DGNB 11,3%
DGNB 7,9%

- Life Cycle Cost
  ECO. 1.1
  9,6%
CONCRETES INFLUENCE ON DGNB
SOCIAL QUALITY

Minimum quality requirements in relation to DGNB's ambition

Functionality

- Design for All SOC. 2.1 1,8%
- Cyclist Facilities SOC. 2.3 0,9%
- Public Access SOC. 2.2 0,9%
- Integrated Public Art SOC. 3.2 0,9%
- Design and Urban Planning SOC. 3.1 1,8%
- Layout Quality SOC. 3.3 1,8%

Health, Comfort and User Satisfaction

- Thermal comfort SOC. 1.1 4,5%
- User Control SOC. 1.5 1,8%
- Indoor Air Quality SOC. 1.2 2,7%
- Visual Comfort SOC. 1.4 2,7%
- Quality of Outdoor Spaces SOC. 1.6 1,8%
- Safety and Security SOC. 1.7 0,9%

Sociocultural and Functional Quality 22,5%
Minimum quality requirements in relation to DGNB’s ambition

- Life Cycle Cost
  - Commissioning TEC. 1.7
    - 3,0%
  - Documentation with Environmental Product Declarations (EPD)
    - TEC. 1.8
    - 1,5%

- Technical Quality
  - 22,5%

- Technical Execution
  - Fire Safety TEC. 1.1
    - 3,0%
  - Sound Insulation TEC. 1.2
    - 4,5%
  - Building Envelope Quality TEC. 1.3
    - 3,0%
  - Adaptability of Technical Systems TEC. 1.4
    - 3,0%
  - Cleaning and Maintenance TEC. 1.5
    - 3,0%
  - Deconstruction and Disassembly TEC. 1.6
    - 1,5%

DGNB
- 14,6%
- 11,3%
- 7,9%
CONCRETES INFLUENCE ON DGNB PROCESS QUALITY

Minimum quality requirements in relation to DGNB's ambition

- Environmental Impact of Construction
  - DGNB 6.5%
  - DGNB 5.0%
  - DGNB 3.5%

- Construction Quality Assurance
  - DGNB 1.7%

- Process Quality
  - DGNB 10%

Planning

- Comprehensive Project Brief
  - PRO. 1.1
  - 1.7%

- Integrated design
  - PRO. 1.2
  - 1.7%

- Design Concept
  - PRO. 1.3
  - 1.7%

- Sustainability Aspects in Tender Phase
  - PRO. 1.4
  - 1.1%

- Documentation for Facility Management
  - PRO. 1.5
  - 1.4%
CONCRETES INFLUENCE ON DGNB
SUMMARY

ECO1.1
LCC - Life Cycle Costs
9,6%

ECO2.2
Commercial Viability
6,4%

SOC1.1
Thermal Comfort
4,5%

SOC 1.2
Indoor Air Quality
2,7%

ECO2.1
Flexibility and Adaptability
6,4%

ENV1.1
LCA - Environmental Impacts
7,9%

ENV2.1
LCA - Primary Energy
5,6%

TEC1.1
Fire Safety
3,0%

TEC1.2
Sound Insulation
4,5%

TEC1.6
Deconstruction and Disassembly
1,5%

TEC1.8
Documentation with Environmental Product Declarations (EPD)
1,5%
LIFE CYCLE ASSESSMENT (LCA)
LIFE CYCLE ASSESSMENT IN DGNB
- CO2 IN BUILDINGS LIFE CYCLE

- Sharpened energy requirements from BR10 to BR15
- It is not economically feasible to decrease the energy consumption of buildings further.
- What is happening? The focus shifts from energy consumption to green building products to maintain the same DGNB score.
LIFE CYCLE ASSESSMENT
- THE IMPACT OF GREENER CONCRETE

MATERIALE BELASTER MILJØET MERE END DRIFTEN

Statens Byggeforskningsinstitut har regnet på miljøbelastningen og energiforbruget for driftsfasen og de øvrige faser (produktion af byggematerialer, opførelse, nedrivning og behandling af materialer) i seks bygningstyper. Alle eksempler viste, at materialerne vejede lige så tungt som eller tungere end driftsforbruget set over bygningernes levetid.

Kilde: SBI. Grafik: Lasse Gorm Jensen
“The environmental impact concrete account for approx. 40-65% of the total environmental impact of the building over a 50-year period incl. demolition and recycling.”
Buildings in Denmark requested approximately

4.7 million tons of concrete in 2017

Data: Dansk Beton at Dansk Byggeri
LIFE CYCLE ASSESSMENT - THE IMPACT OF GREENER CONCRETE

Upcycle House

Data: “Livscyklusvurdering af MiniCO2-husene i Nyborg”
LIFE CYCLE ASSESSMENT
- THE IMPACT OF GREENER CONCRETE

If concrete CO₂ footprint alone is reduced by 30 %, it equals the same CO₂ reduction as 3448 Upcycle Houses pr. Year in Denmark (compared to an reference single family house)

CONCLUSION FOR GREEN CONCRETE
FROM DGNB WORKING GROUP

Increasing demand for sustainable buildings.

The materials and the embodied energy will gain increased focus due to the green transition.

Green concrete has a significant effect on the DGNB score.

The design solution will always have an impact on sustainability and the sustainability certification.

The preparation of EPDs is positive for the transparency in the industry and contributes positively to the DGNB certification.

Fabriksbetonforeningen are currently working on developing a EPD-calculation tool for different concrete types.
THANK YOU