The Research Centre on Zero Emission Buildings

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ZEB's Main Objective

is to develop competitive products and solutions for existing and new buildings that will lead to market penetration of buildings with zero greenhouse gas emissions related to their production, operation, and demolition.

The centre will encompass both residential, commercial, and public buildings.

www.zeb.no


Illustration: Snøhetta/MIR

ZEB Facts

- ZEB is a Centre for Environment-friendly Energy Research (FME), funded by the Research Council of Norway (RCN) and 25 partners.
- Host institution is NTNU with SINTEF Building and Infrastructure and SINTEF Energy Research as research partners.
- Centre started in November 2009, and RCN funds the Centre for 8 years.
- Total budget: ca. 300 MNOK (+ additional to research infrastructure)

ZEB – A National Team

- Users (the reference group)
- Contractors
- Producers of materials and products for the building industry
- Consultants, architects
- Trade organizations
- Property managers
- Public administration
- University and research institutions
- The Research Council

Skanska
Caverion
Weber
Isola
Glava
Protan
SAPA
NorDan
Velux
DuPont
Brødrene Dahl
Multiconsult
Snøhetta
ByBo
Entra Eiendom
Forsvarsbygg
Statsbygg
Enova
Husbanken
Direktoratet for byggkvalitet
Byggenæringens landsforening
Norsk Teknologi
NTNU
SINTEF, SINTEF Energiforskning
Norges forskningsråd

Other Institutions Cooperating with ZEB

International partners

- VTT (Finland)
- Chalmers (Sweden)
- Fraunhofer (Germany)
- TNO (The Netherlands)
- LBNL (USA)
- MIT (USA)
- University of Strathclyde (Scotland)
- Tsinghua University (China)

Other new
- Politecnico di Torino
- Shanghai JiaoTong University
- EMPA

Reference group

- Lavenergiprogrammet
- NBBL
- NVE
- Forbrukerrådet
- EcoBox
- Driftsforum
- Arkitektbedriftene

Research Activities

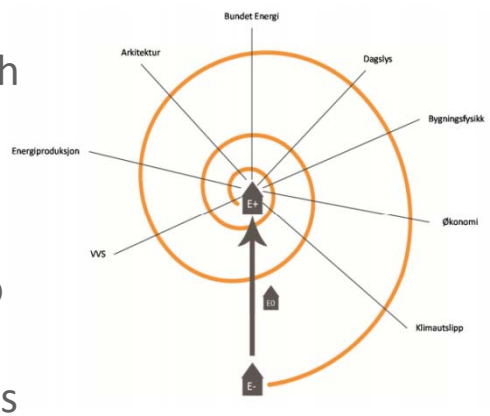
ZEB focus its work in five areas that interact and influence each other:

- WP1 Advanced materials technologies
- WP2 Climate-adapted low-energy envelope technologies
- WP3 Energy supply systems and services
- WP4 Use, operation, and implementation
- WP5 Pilot buildings, concepts and strategies

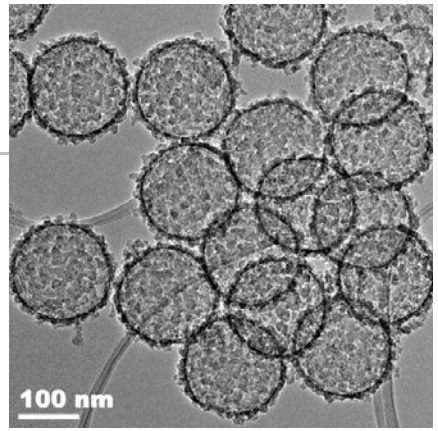
ZEB Innovations - Summary

- Development of a new insulation material – patent applied for
- Weber has developed a new Leca Isoblokk with Vacuum Insulation Panel – patent applied for
- NorDan has developed a solar collector system that can be easily integrated in the façade (with Aventa Solar)
- Develop a prototype for a membrane-based heat exchanger
- Developed the ZEB Design Method with our partners
- Developed ZEB Definition and method for material emission accounting
- Has been part of realizing the first Zero Emission Buildings
- Educated the first 4 ZEB PhD candidates
- Educated 20 MSc Candidates

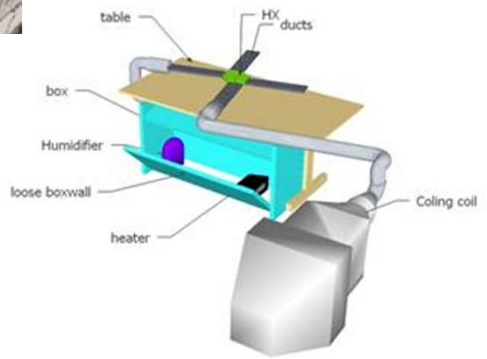
VIP Leca Isoblokk



ZEB Design Process



Nano Insulation Material



Membrane Heat Exchanger

Powerhouse Kjørbo

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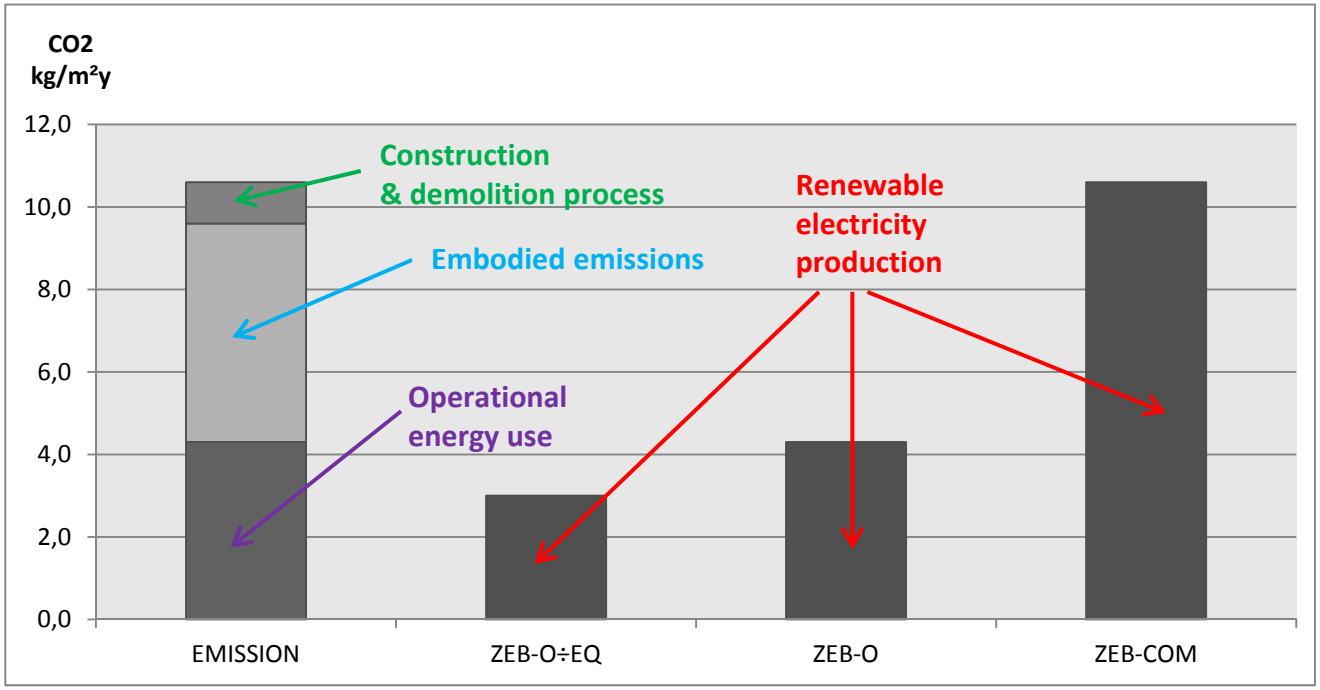
ZEB-Definition

ZEB-DEFINITION:

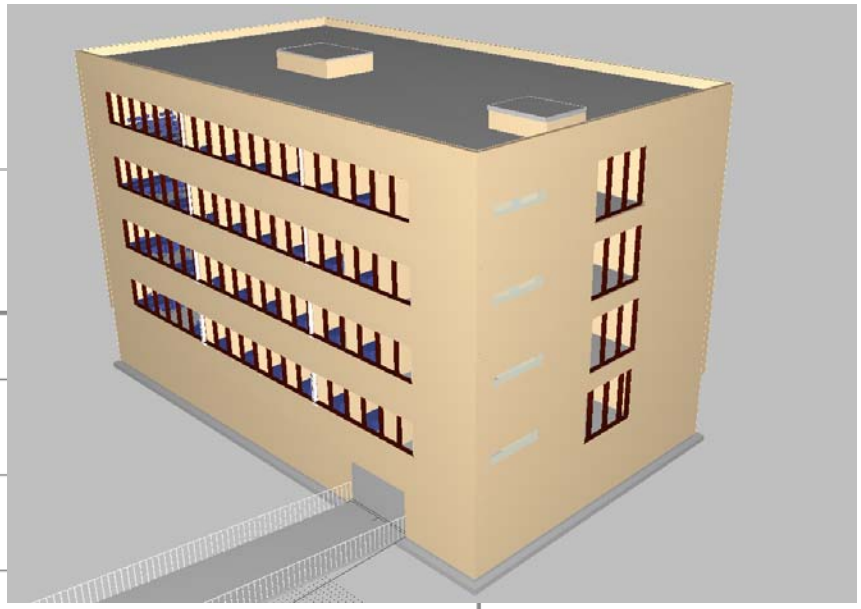
1. Ambition level
2. Rules for calculation
3. System boundaries
4. CO2-factors
5. Energy quality
6. Mismatch production and demand
7. Minimum requirement energy efficiency
8. Requirement indoor climate
9. Verification in use

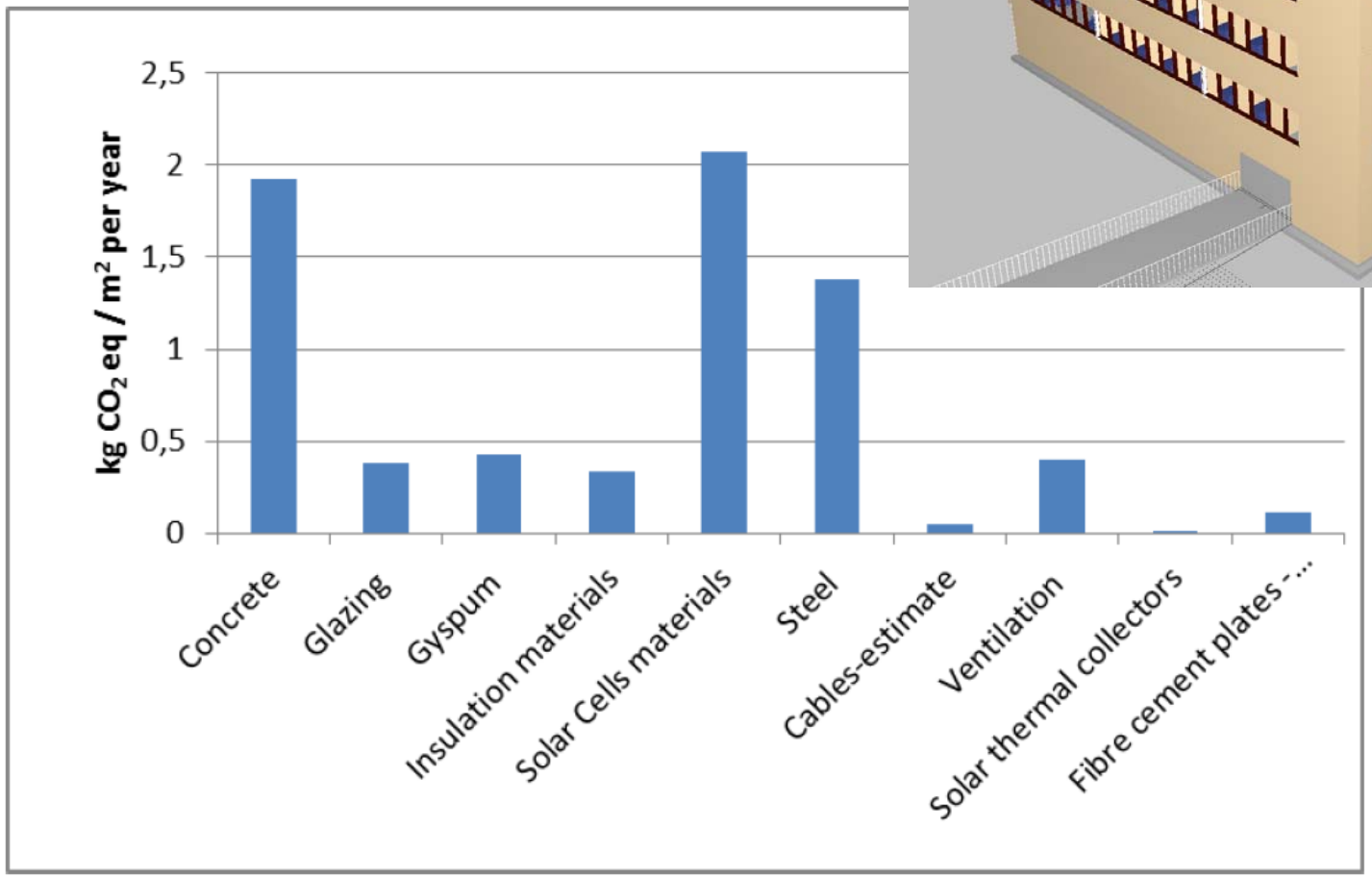


ZEB-O÷EQ: Balancing operational energy use exclusive equipment.
ZEB-O: Balancing operational energy use inclusive equipment.
ZEB-COM: Balancing operational energy, embodied emissions , construction and demolition processes

The main concept of a zero emission building is that renewable energy sources produced or transformed at the building site have to compensate for CO2 emissions from operation of the building and for production, transport and demolition of all the building materials and components during the life cycle of the building.

Concept Work – Office Building





ZEB-Pilot Buildings

ZEB PILOT BUILDINGS:

1. Skarpnes Arendal: 37 dwellings, ZEB-O.
2. Powerhouse Kjørbo – Sandvika. Renovation of 2 office blocks to Plus energy.
3. Mulitkomfort-Larvik: Single family house, ZEB-COM.
4. Ådland: 500 dwellings, ZEB-O.
5. Powerhouse Brattørkaia – Trondheim. Large office building, Plus energy.
6. Admin office Haakonsvern – Bergen. ZEB-O÷EQ.
7. ZEB Living Lab

PowerHouse Kjørbo

PowerHouse Alliance:

Skanska, Entra, Snøhetta, Zero,
Asplan Viak, Hydro, SAPA

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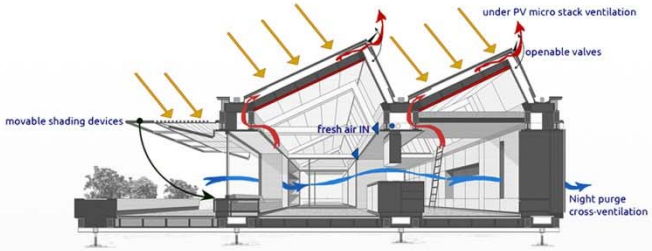
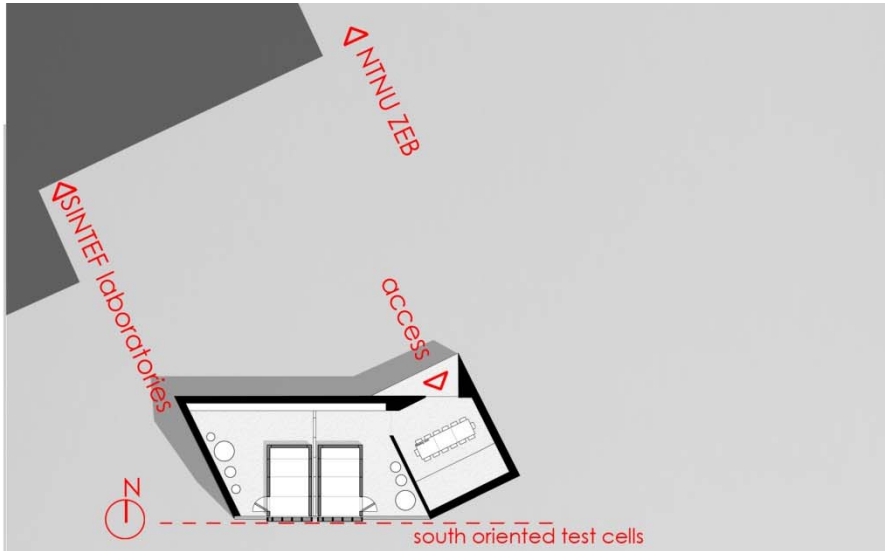
ZEB _ Living LAB and TEST cell

NTNU
Det skapende universitet

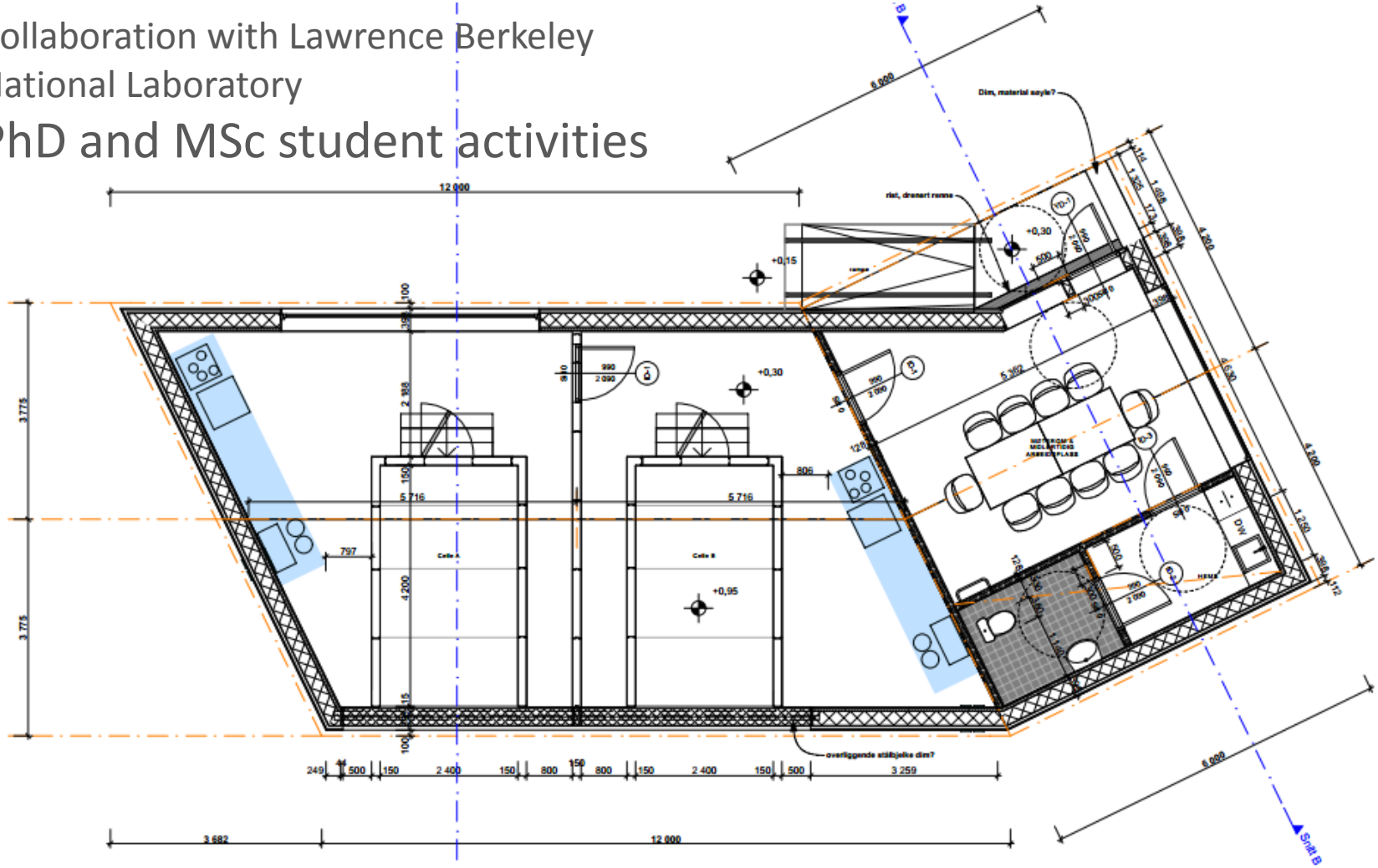




ZEB Test Cell

Collaboration with Lawrence Berkeley National Laboratory

PhD and MSc student activities



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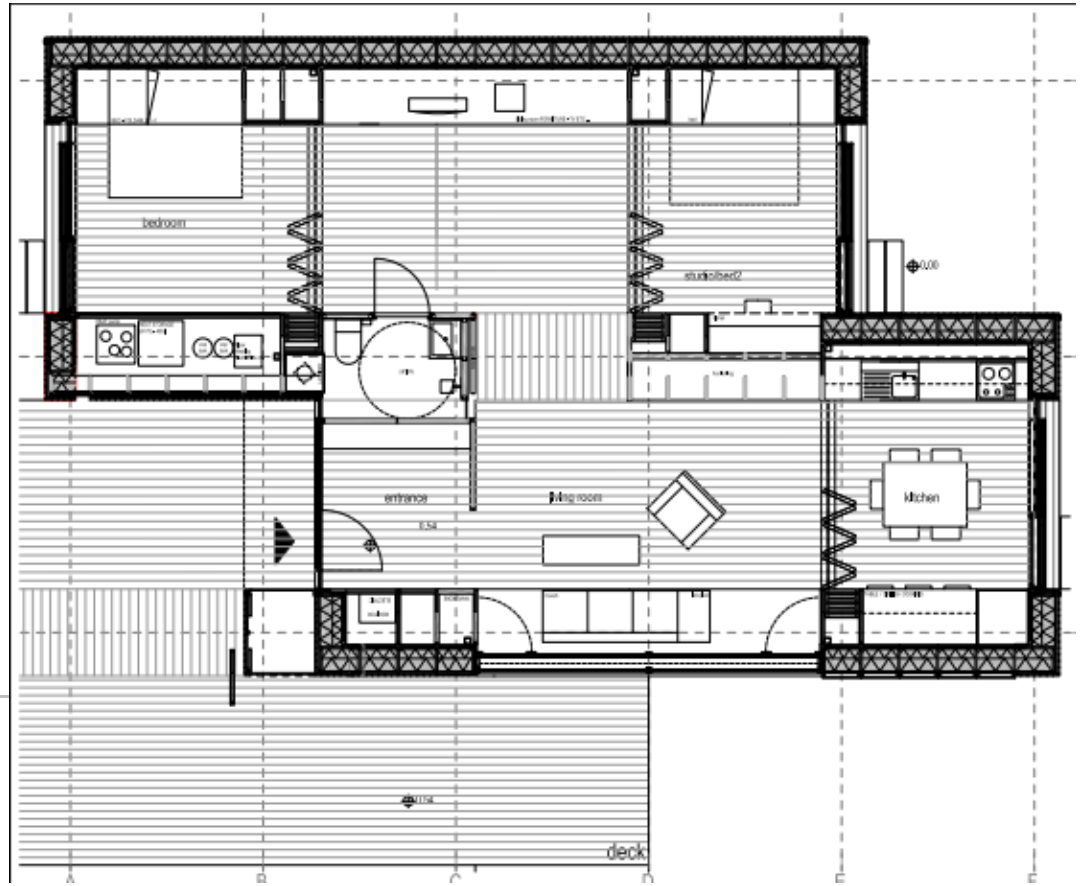
ZEB Living Lab

- 100 m² living area
- Building Integrated Photo-voltaics: 80 m2
- Solar panel in the facade
- Ground to water heat pump
- Heat recovery system

A part of student work



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Multikomfort Larvik - demonstration home

Owner: Brødrene Dahl and Optimera
Architects: Snøhetta
Illustration: MIR

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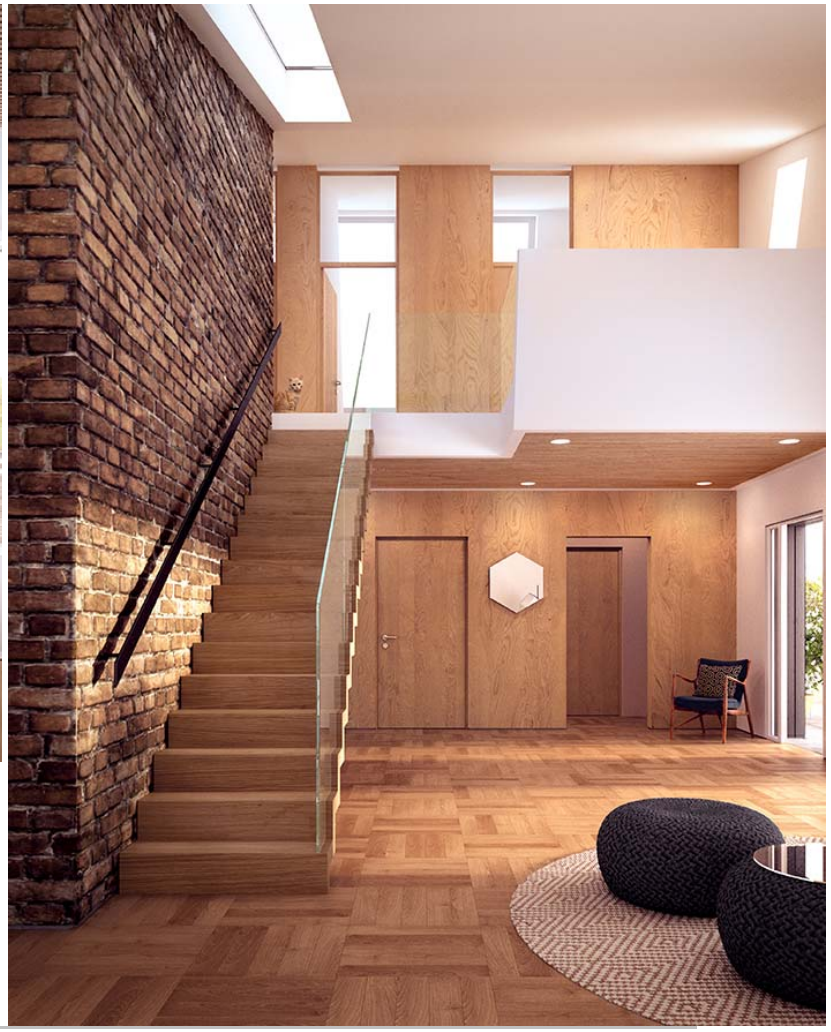
Multikomfort Larvik - demonstration home



Owner: Brødrene Dahl and Optimera
Architects: Snøhetta
Illustration: MIR

Thank you for your attention ☺