



Hva er nytt fra forskningen ?

Forskningsleder Berit Time,
SINTEF Byggforsk

Norsk bygningsfysikkdag
Oslo, 24 november 2009

Partnere:

NTNU
SINTEF
Skanska
Maxit
Isola
Glava
Protan
Hydro Aluminium
YIT
Multiconsult
Brødrene Dahl
Snøhetta
Bybo
Forsvarsbygg
Statsbygg
Husbanken
Byggenæringens landsforbund
Norsk Teknologi
Statens Byggetekniske Etat

ZEB The Research Centre on Zero Emission Buildings (2009 – 2016) Budget ~ 40 mill. Euros



Målsetning for ZEB

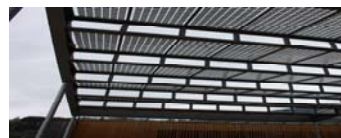
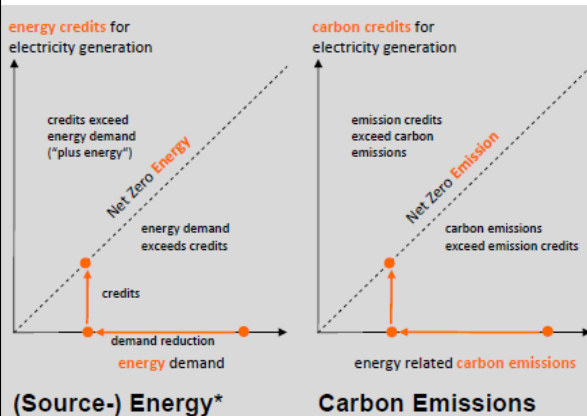


Hovedmålsetningen er å
- utvikle produkter og løsninger for eksisterende og nye bygninger, boliger så vel som næringsbygg, som vil lede til markedsgjennombrudd for bygninger med null klimagassutslipp knyttet til produksjon, drift og avhending.



Hva er "Zero Emission Buildings" (nullutslippsbygg) ?

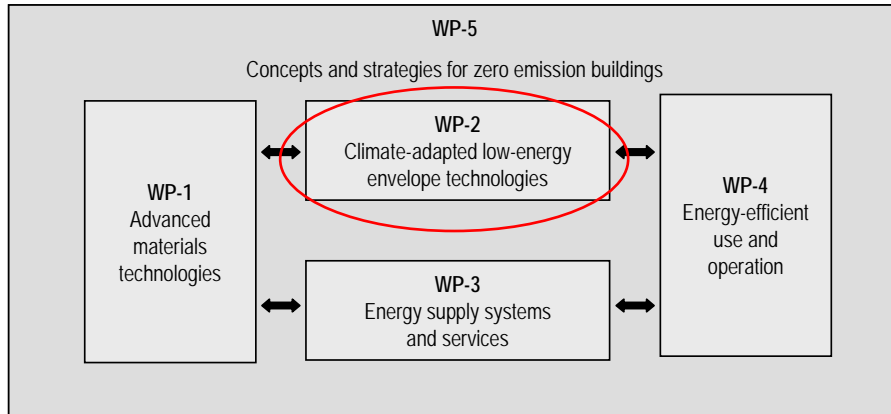
- Ingen entydig definisjon
- Eksempel på definisjon ("balanseprinsippet"):



Kilde: University Wuppertal, School of Architecture, Building Physics and Technical Building Services, Prof. Karsten Voss



ZEB - Arbeidspakker



WP 2: Teknologier for adaptive og energiproduserende klimaskall

- Hovedmålsetning: utvikle godt isolerte, adaptive/kontrollerbare og energiproduserende bygningsskall som er robuste i forhold til varierende klimapåkjenning, bygningstekniske krav og brukerbehov
- Eksempler på sentrale oppgaver:
 - integrere og tilpasse nye materialer i reelle konstruksjoner (og ved rehab.)
 - utvikle robuste byggedetaljer for nye løsninger/konstruksjoner
 - integrere energiproduserende elementer i bygningsskallet
 - labtesting i forhold til varmetekniske egenskaper, bestandighet, fuktproblematikk, klimapåkjenninger



Climate Adapted Buildings - CAB

ARILD GUSTAVSEN, JAN VINCENT THJE, PETER BLOM, ARVID DALEHAUG,
TORMOD AURLIEN, STEINAR GRYNNING OG SIVERT UVSLØKK

Kuldebroer – Beregning, kuldebroverdier og innvirkning på energibruk

Prosjektrapport 25 2008

www.sintefbok.no

SINTEF Byggeforsk

TOR HELGE DOKKA, MICHAEL KLINSKI, MATTHIAS HAASE OG MADIS MYSEN

Kriterier for passivhus- og lavenergibygging – Yrkesbygg

Prosjektrapport 42 2009

SINTEF Byggeforsk

TOR HELGE DOKKA (SINTEF), TORE WIGENSTAD(SINTEF), KRISTIAN LIEN (CEOTO)

Fremtidens energiløsning i større boligutviklingsprosjekter – Jåtten Øst II som case

Prosjektrapport 35 2009

www.sintefbok.no

8

ROBUST



SINTEF Byggeforsk

ROBUST

HANS BOYE SKOGSTAD, TOR EVEN PEDERSEN OG ØYSTEIN HOLMBERGET

Regntetthet til vindspærre og tette- metoder rundt vindu

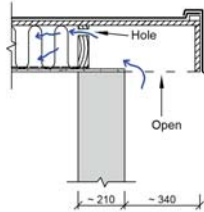
Laboratorieundersøkelse

Prosjektrapport 41

2009



SINTEF



SINTEF Building and Infrastructure

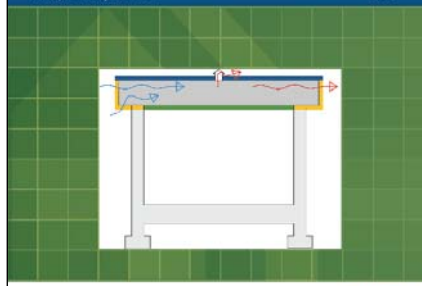
STIG GEVING AND JONAS HOLME

Compact wood frame roofs with built-in-moisture

Test house measurements of the drying potential and risk of mould growth

Project report 38

2009



SINTEF

Climate Adapted Buildings - CAB

SINTEF Byggeforsk

BERIT TIME, STIG GEVING, KATHINKA L. FRIQUIN, STEINAR GRYNNING,
KNUT NØRENG OG KNUT M. SANDLAND

Tak basert på massivtreelementer

Klimapåkjenninger, bygningsfysiske og bygningstekniske forhold

Prosjektrapport 30 2008



SINTEF




www.sintefbok.no

NTNU
11
SINTEF

Climate Adapted Buildings - CAB

ARTICLE IN PRESS

Solar Energy Materials & Solar Cells (2009) 33, 11–22

Contents lists available at ScienceDirect

Solar Energy Materials & Solar Cells

journal homepage: www.elsevier.com/locate/solmat

ELSEVIER

Review

Properties, requirements and possibilities of smart windows for dynamic daylight and solar energy control in buildings: A state-of-the-art review

Ruben Baetens^{a,b}, Bjørn Petter Jelle^{a,c,*}, Arild Gustavsen^d

^a Department of Building Materials and Structures, SINTEF Building and Infrastructure, NO-7465 Trondheim, Norway
^b Department of Civil Engineering, Catholic University of Leuven (KU), B-3001 Heverlee, Belgium
^c Department of Civil and Transport Engineering, Norwegian University of Science and Technology (NTNU), NO-7491 Trondheim, Norway
^d Department of Architectural Design, History and Technology, Norwegian University of Science and Technology (NTNU), NO-7491 Trondheim, Norway

ARTICLE INFO

Article history:
Received 11 June 2009
Accepted 15 August 2009

Keywords:
Transparent conductor
Smart window
Electrochromic window
Gasochromic window
Liquid crystal window
Suspended-particle window
Electrochromic window
Daylight control
Solar energy control

ABSTRACT

A survey on prototype and currently commercial dynamic (stable smart windows) has been carried out. The technologies of electrochromic, gasochromic, liquid crystal and electrophoretic or suspended-particle devices were examined and compared for dynamic daylight and solar energy control in buildings. Presently available products for dynamic daylight and solar energy control in buildings are reviewed. Presently available products for dynamic daylight and solar energy control in buildings are reviewed. Presently available products for dynamic daylight and solar energy control in buildings are reviewed.

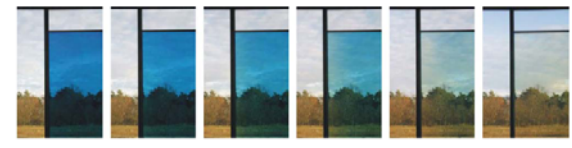


Fig. 1. Switching sequence of an electrochromic laminated glass [46].

SINTEF

Energy efficiency and comfort of concrete structures Thermal Mass Concepts State-of-the art report



<http://www.coinweb.no/>

SINTEF REPORT																		
<p>SINTEF Building and Infrastructure COIN - Concrete Innovation Centre</p> <p>Address: NO-2007 Trondheim Location: SORSTAD 7 Telephone: +47 73 82 22 34 Fax: +47 73 87 71 36 E-mail: NO-2007 TRONDH. SINTEF</p>		<p>TITLE COIN P5 Energy efficiency and comfort of concrete structures SP 5.1 F Energy efficient buildings Thermal Mass Concepts State of the art</p>																
		<p>CLIENTS Mathias Haase, Sager Andreassen Alan Kvarnø Engineering and Technology, Boregard LignoTech, mastGroup, Norcem AS, Norwegian Public Roads Administration, Ramme Mønst AS, Spennet AS, Usson AS, Veidekke ASA and The Regional Council of Trondheim</p>																
REPORT NO. SINTEF BK, AS/1034	CLASSIFICATION Unrestricted	CLIENT REF. Torge F. Rønning	NO. OF PAGES/FIGURES 43															
CLASS. TECHNIQUE Unrestricted	ISSUE 878-82-138-8895-8	PROJECT NO. SD006212																
ELECTRONIC FILE CODE		PROJECT MANAGER NAME, SIGN. Ole Morken	CREATED BY NAME, SIGN. Ole Morken															
FILE CODE	DATE 2007.06.17	APPROVED BY NAME, POSITION, SIGN. Tor Arne Høstmark, Centre Manager																
<p>SYNOPSIS Thermal mass (TM) is defined as the mass of the building that can be used to store thermal energy for heating/cooling purposes. TM can be effectively used to reduce the wide outdoor temperature fluctuations and offers the engineers and architects a powerful opportunity to manage energy flows in the building efficiently. This state-of-the-art review gives a brief overview of concepts for activation of thermal mass for enhancing the energy efficiency of buildings focusing on Passive Thermal Mass System, Thermo Active Building Systems (TABS), Ground Coupled Systems, Phase Change Materials (PCM) Systems, and Dynamic sunshading walls (DSW). The review includes a brief description of the concepts, their reported energy performance, and cost data if available. The most promising concepts were identified and it was concluded that different concepts regarding activating thermal mass for enhancing the energy efficiency of buildings have different levels of development. While passive thermal mass is very well developed today some of the new design strategies were developed by combining passive and active techniques together, such as activation of the thermal mass or utilization of phase change materials in building construction. Further research should focus on optimizing costs, construction time and buildability. Also, improved control strategies should be developed and tested. Design guidelines could be developed focusing on practical applications of integrated thermal mass systems in buildings. The needs for research for further development of the different concepts are discussed in more detail.</p>																		
<table border="1"> <thead> <tr> <th>KEYWORDS</th> <th>ENGLISH</th> <th>NORWEGIAN</th> </tr> </thead> <tbody> <tr> <td>keyword 1</td> <td>Energy</td> <td>Energi</td> </tr> <tr> <td>keyword 2</td> <td>Concrete</td> <td>Betong</td> </tr> <tr> <td>related key phrases</td> <td>Thermal Mass</td> <td>Termisk masse</td> </tr> <tr> <td></td> <td>Energy efficient building</td> <td>Energi-effektive bygninger</td> </tr> </tbody> </table>				KEYWORDS	ENGLISH	NORWEGIAN	keyword 1	Energy	Energi	keyword 2	Concrete	Betong	related key phrases	Thermal Mass	Termisk masse		Energy efficient building	Energi-effektive bygninger
KEYWORDS	ENGLISH	NORWEGIAN																
keyword 1	Energy	Energi																
keyword 2	Concrete	Betong																
related key phrases	Thermal Mass	Termisk masse																
	Energy efficient building	Energi-effektive bygninger																

Noen nye prosjekter

- **Rehabilitering av fuktskadede kjelleryttervegger**
 - Brukerstyrt innovasjonsprosjekt finansiert av Forskningsrådet
 - Prosjekteier: Isola as
 - Prosjektledelse: SINTEF Byggforsk
 - Øvrige prosjektdeltakere: Isodren Norge as og EPT as
- **Sustainable refurbishment of building facades - (SUSREF)**
 - Prosjekt I EU 7.rammeprogram
- **Prefabricated multifunctional façade systems for building renovation (PREFAB)**
 - Samarbeidsprosjekt mellom 4 forskningsinstitutter I Europa (ÆRTO)