



EC Project: Smart Elements for Sustainable Building Envelopes

<http://www.sesbe.eu>

Urs Mueller
CBI Betonginstitutet AB

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Overview

What is the project about?

- § Development of multifunctional façade sandwich elements for new buildings and refurbishment

What is new?

- § Thinner and more lightweight with same or better thermal performance, including sealant system
- § Multifunctional surfaces
 - Ø Easy-to-clean, self cleaning
 - Ø Heat reflective, improved fire resistance

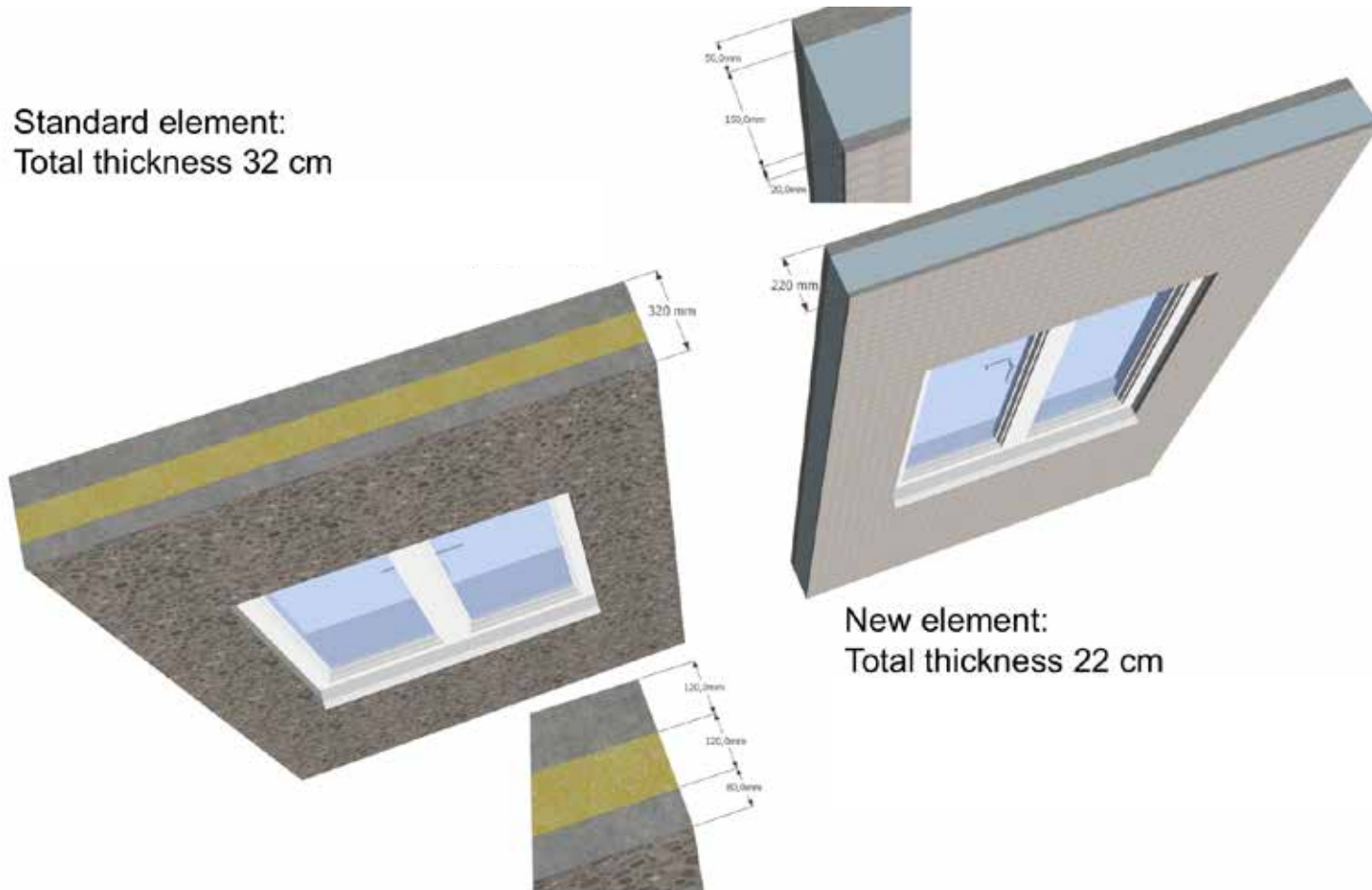
Duration of project

- § 3,5 years, project start 01. Aug. 2013

Goals of project

Geometry

Standard element:
Total thickness 32 cm



New element:
Total thickness 22 cm

Goals of project

Mass and thermal performance

	Standard/Old sandwich elements			New sandwich elements			New half panel on old concrete		
	Reinforced concrete RC	Insulation MW	Reinforced concrete RC	FRRPC	Insulation aerogel-foam concrete AFC	FRRPC	Reinforced concrete RC	Insulation aerogel-foam concrete AFC	FRRPC
Material	RC	MW	RC	FRRPC	AFC	FRRPC	RC	AFC	FRRPC
ρ (kg/m ³)	2400	60	2400	2300	130	2300	2400	130	2300
d (m)	0,12	0,12	0,08	0,05	0,15	0,02	0,12	0,12	0,02
d_{tot} (cm)		32,0			22,0			26,0	
m (kg/m ²)	288	7	192	115	20	46	288	16	46
m_{tot} (kg/m²)		487			181			350	
λ (W/(m·K))	2,3	0,045	2,3	2	0,025	2	2,3	0,025	2
R_n (m ² ·K/W)	0,052	2,667	0,035	0,025	6,000	0,010	0,052	4,800	0,010
R_s+R_{se} (m ² ·K/W)		0,170			0,170			0,170	
R_{tot} (m ² ·K/W)		2,924			6,205			5,032	
U_{tot} (W/(m²·K))		0,34			0,16			0,20	

Goals of project

Advantages

- § Less transport costs
- § Easier mounting of panels
- § Better thermal performance
- § Better durability
- § Better fire resistance due to the use of mineral based insulation material
- § Functional surfaces



Project approach and partner consortium

Approach

Component development: Façade elements with integrated insulation

Component testing

Material development: Reactive powder concrete, mineral based insulation, sealing tapes, intumescent coating

Component modeling

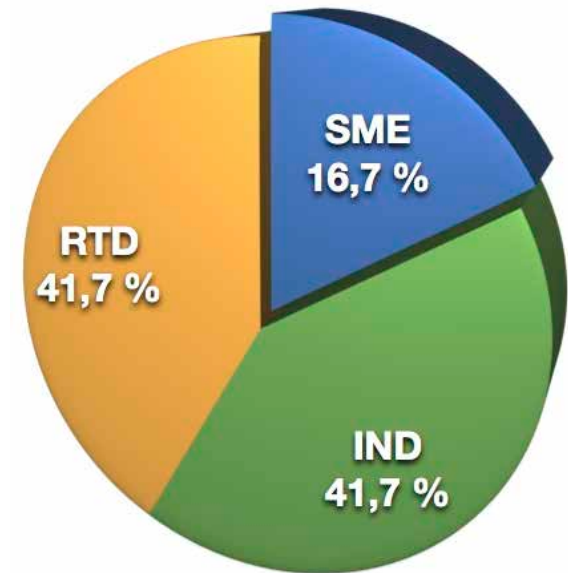
Material functionalization: Easy-to-clean/self-cleaning, heat reflectivity, moisture buffering

Demonstration mock-ups

Project approach and partner consortium

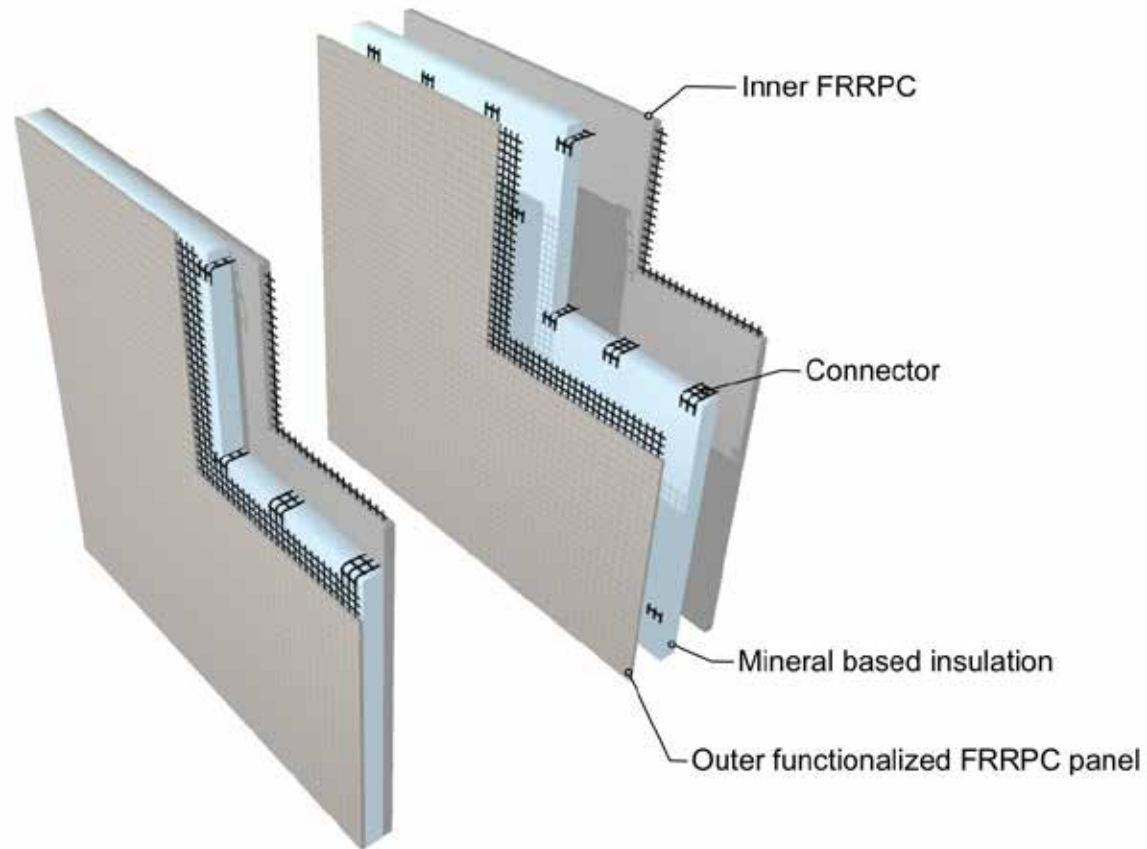
Partner consortium

- § Coordinator: CBI Swedish Cement and Concrete Research Institute
- § Four material producers
 - Svenska Aerogel
 - Aercrete
 - Tremco illbruck GmbH
 - Tremco illbruck Coatings, Ltd.
- § Three element producers and constructors
 - Acciona
 - Mostostal
 - Projektengagemang
- § Five research institutes: CBI, SP, ITB, ITE, University of Uppsala



Examples of ongoing work

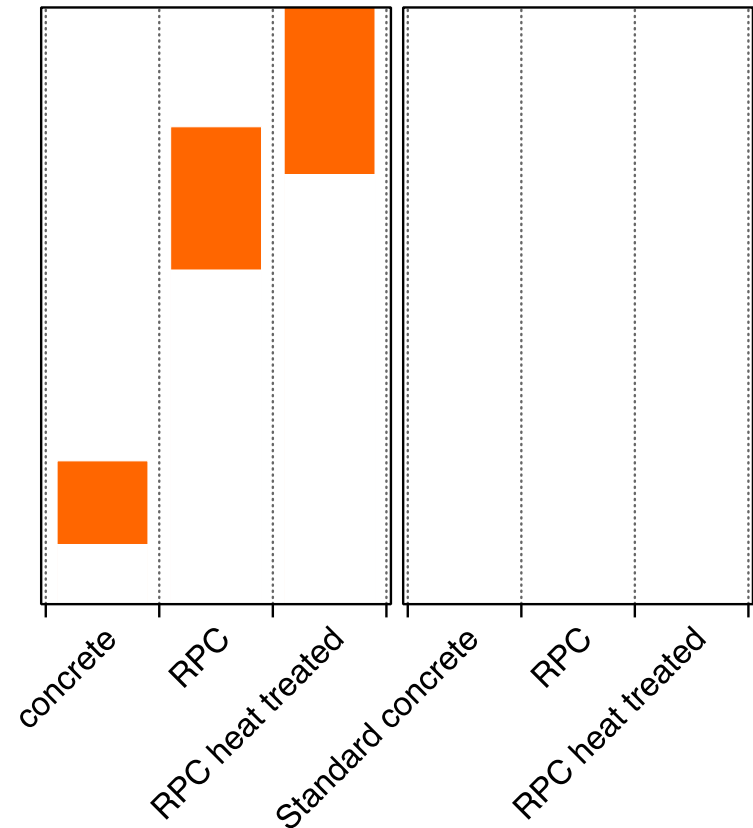
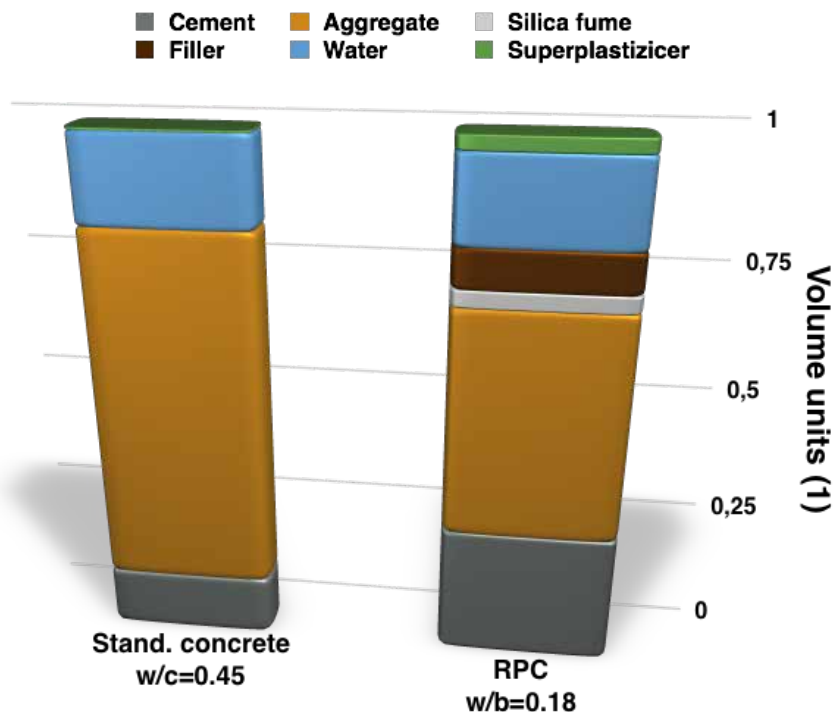
Reactive powder concrete and foam concrete



Examples of ongoing work

Reactive powder concrete

§ Composition and Strength

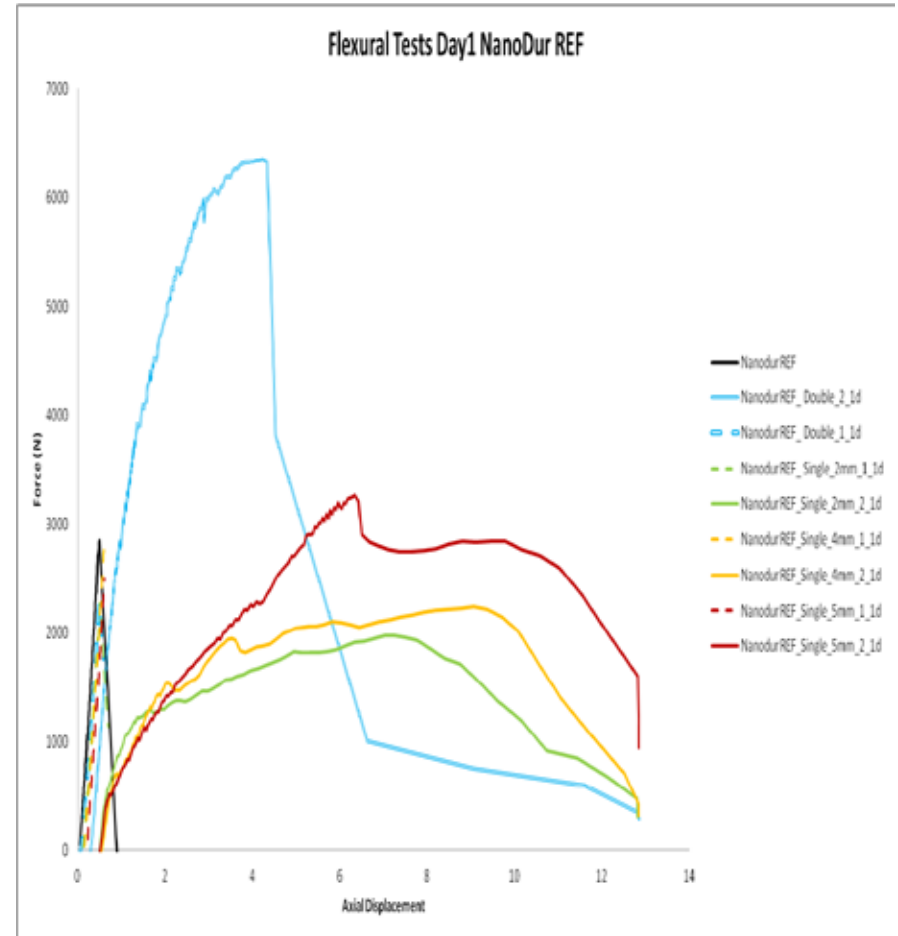


Examples of ongoing work

Textile reinforced reactive powder concrete

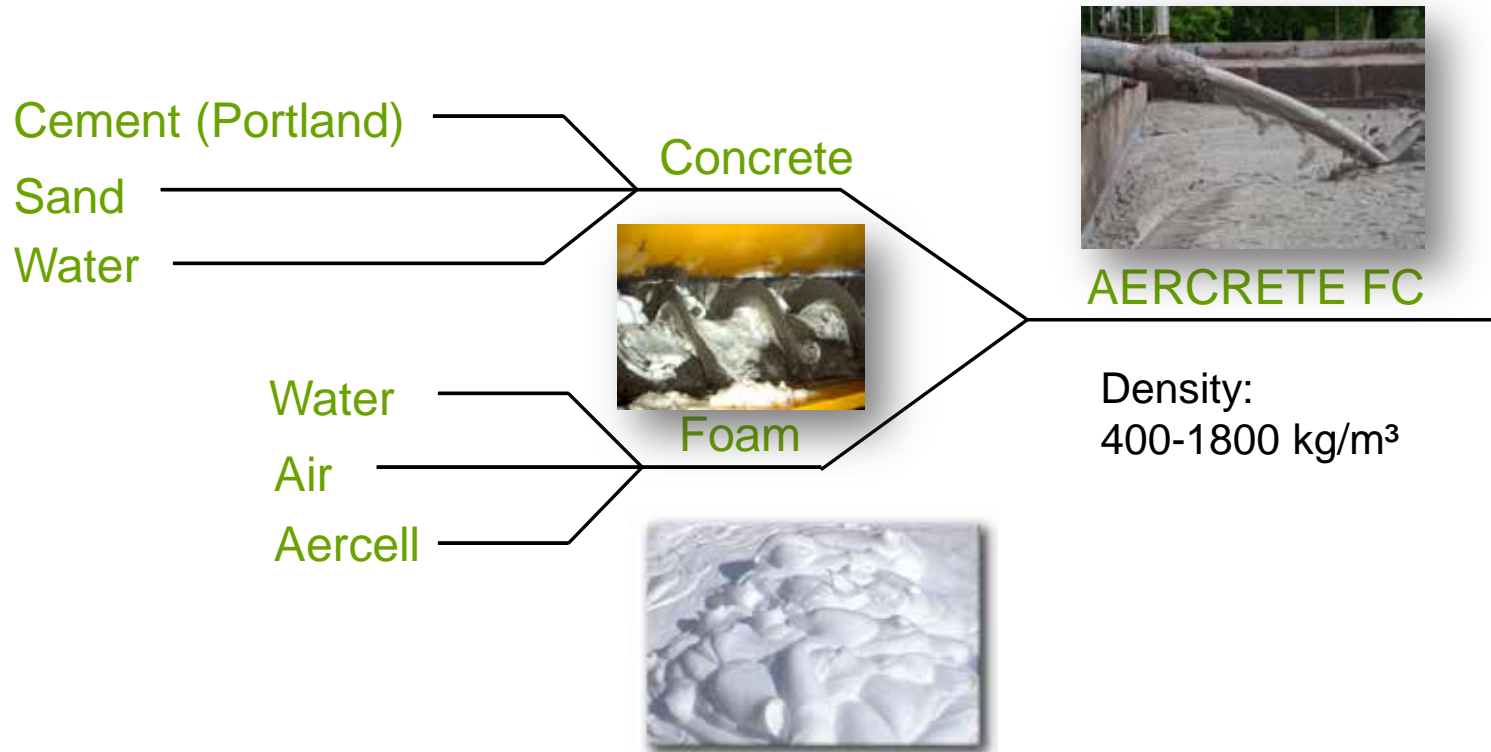
§ Textile mesh à Carbon grids

3d-grid



Examples of ongoing work

Foam concrete



Examples of ongoing work

Foam concrete

- § Goal: densities $\leq 200 \text{ kg/m}^3$
- § Incorporation of nano material for improving I

220 kg/m³

450 kg/m³

750 kg/m³



Future challenges

Material

- § Meet the goals for the proposed materials
- § Reach suitable setting/curing times

Sandwich elements

- § Find optimal casting/assembling process
- § Define optimal and possible design for the panels
- § Meet the goals concerning thermal transmittance in conjunction with minimized mass and width of the panels

Acknowledgements

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 <p>tremco illbruck</p>	 <p>acciona Infraestructuras</p>		
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