SESBE
Smart Elements for Sustainable Building Envelopes

SEVENTH FRAMEWORK PROGRAMME

Energy efficient building element
- Lessons learned from SESBE project

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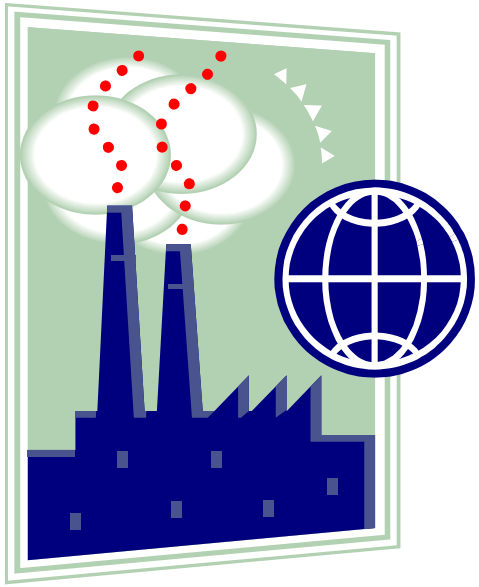
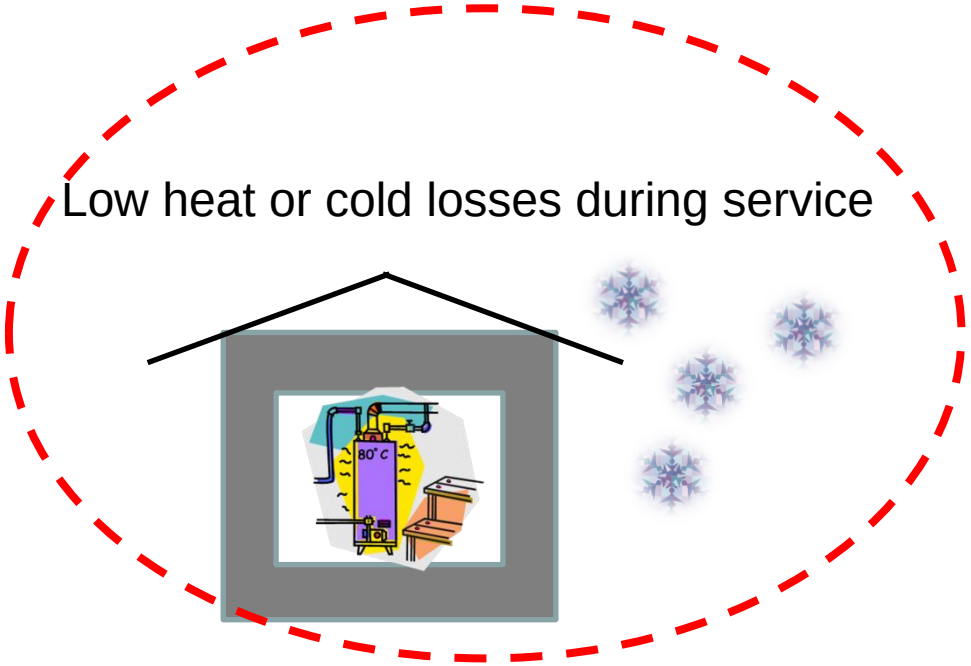
An energy efficient building element

What is it?

Low energy to produce

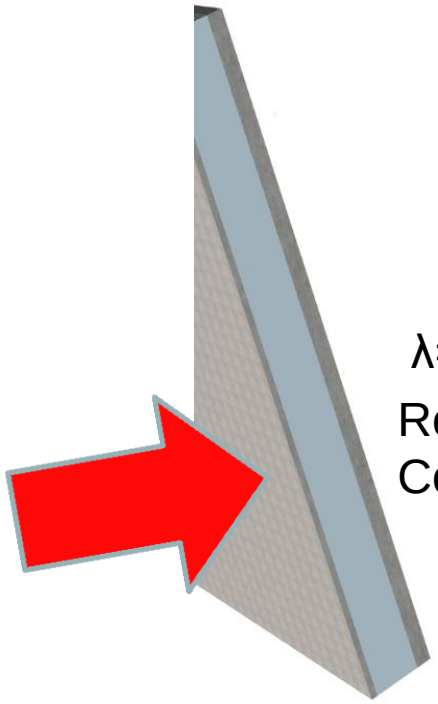


Low heat or cold losses during service

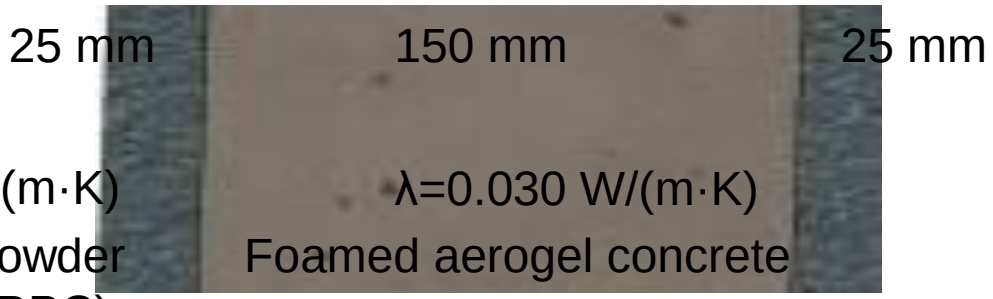


Long service life
with little need
of refurbish

Low heat transfer through the building element



Thermal resistance, R (m^2K/W):



0.04+0.029+5.0+0.029+0.13

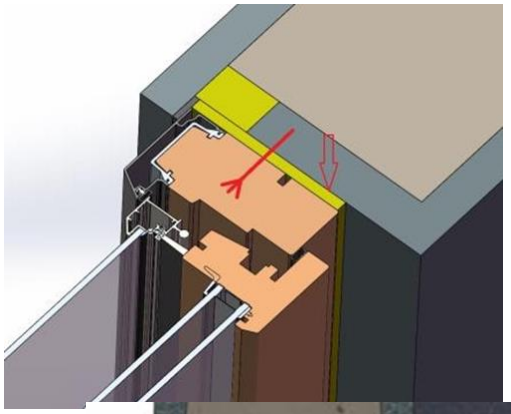
=5.23 m^2K/W

U-value: 0.19 W/m^2K

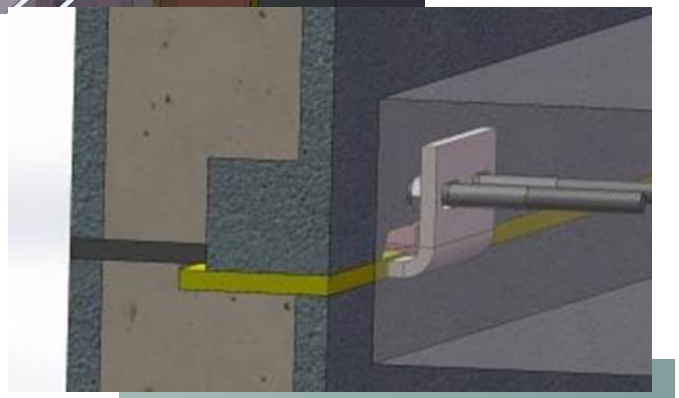
without any influence of thermal bridges

Influence from thermal bridges

1. Window sill



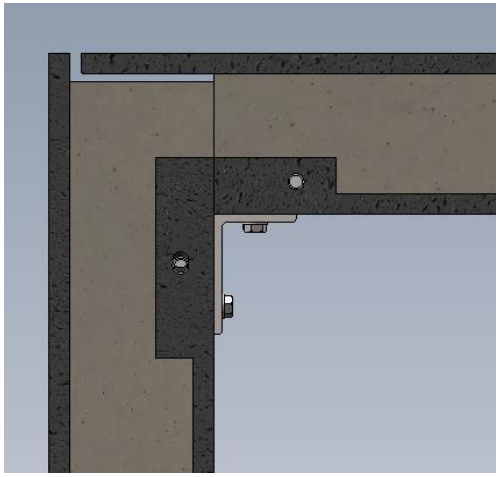
2. Horizontal joint



3. Vertical Joint

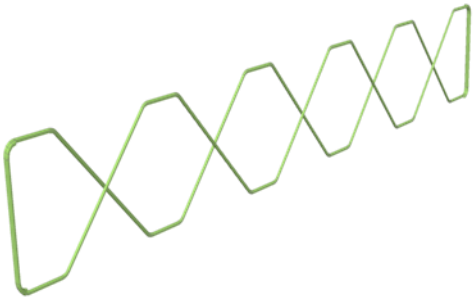
Influence from thermal bridges

4. Exterior Corner

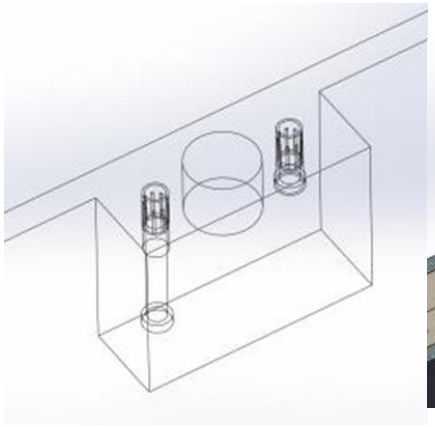


5. Interior wall

6. Glass Fiber Connectors (double)



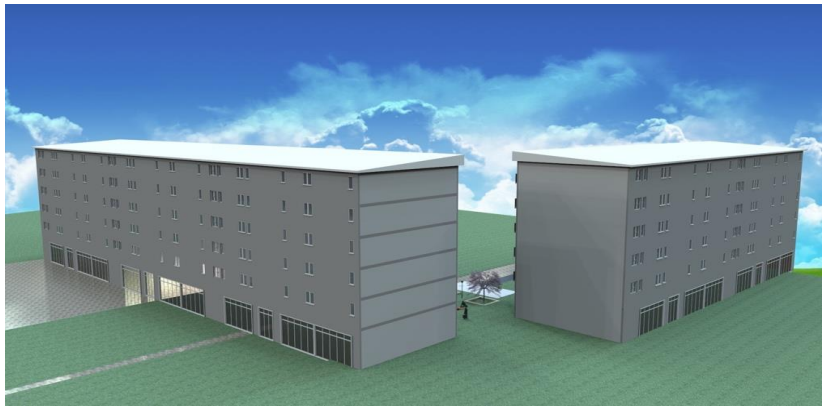
7. Point amplification

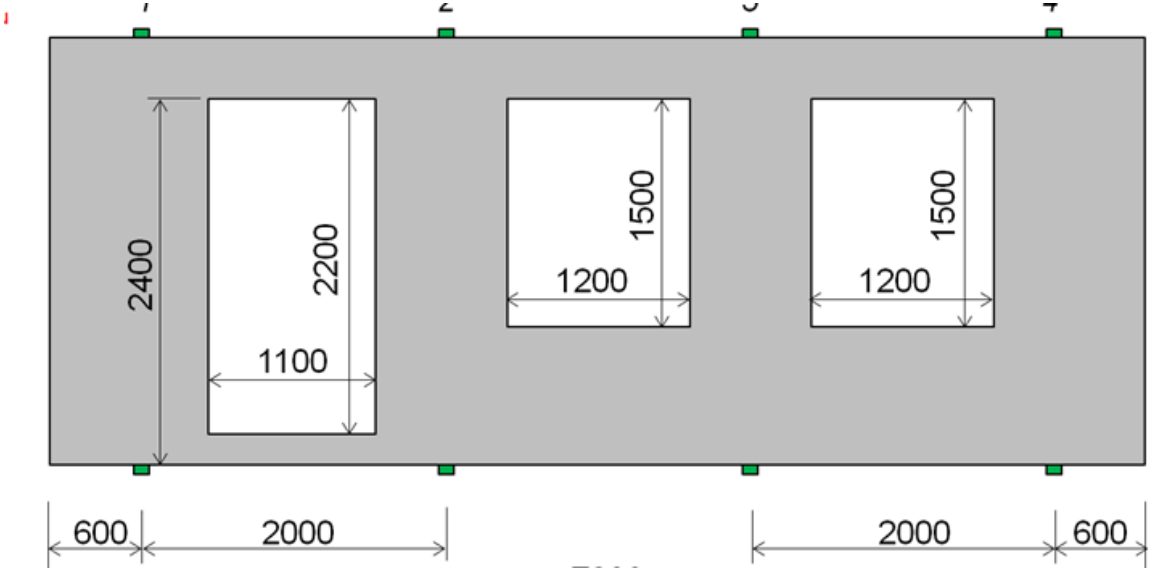


Thermal bridges

	Internal	Overall Internal	External	
	Ψ_i	Ψ_{oi}	Ψ_e	
Window Sill	**0.033**	**0.033**	**0.033**	
Horizontal Joint	**0.069**	**0.022**	**0.022**	
Vertical Joint	0.026	0.026	0.026	
Exterior Corner	0.078	0.078	0.001	
Interior Wall	0.048	0.000	0.000	
Glass Fibre Connector (double)	0.0005	0.0005	0.0005	
	χ_i	χ_{oi}	χ_e	
Point Amplification	0.0057	0.0057	0.0057	

In the case of a concept building





3 m

10 m and 6.5 m

Result for the concept building

1. 0.284 W/m^{2}K (1191m^2 Internal Area) (+49%)
2. 0.249 W/m^{2}K (1358m^2 Overall Internal Area) (+30%)
3. 0.245 W/m^{2}K (1382m^2 External Area) (+28%)

Without thermal bridges U=0.191 W/m^{2}K

What could we change in order to get a lower U-value?

- **Building element size**
- **Window area**
- **Window format**

A parametric study show
that it possibly to lower the U-value with roughly 0,03 W/m2K by chosen few large windows instead of many small

Result of changing window size

0.284 W/m²K (1191m² Internal Area) (+49%)

0.253 W/m²K (1191m² Internal Area) (+32%)

0.249 W/m²K (1358m² Overall Internal Area) (+30%)

0.226 W/m²K (1358m² Overall Internal Area) (+18%)

0.245 W/m²K (1382m² External Area) (+28%)

0.223 W/m²K (1382m² External Area) (+17%)

Lessons learned

- Big influence from thermal bridges
- Different way to present the size of the thermal bridges (internal area, overall internal area and external area)
- Amount of windows and its size have big influence

Lessons learned

- Effect of moisture

If the surface aren't protected from driven rain the U-value could change from 0,191 W/m^{2}K for a single panel to 0,38 W/m^{2}K = 99 %

(in Swedish and Norwegian climate)

Another way to see it