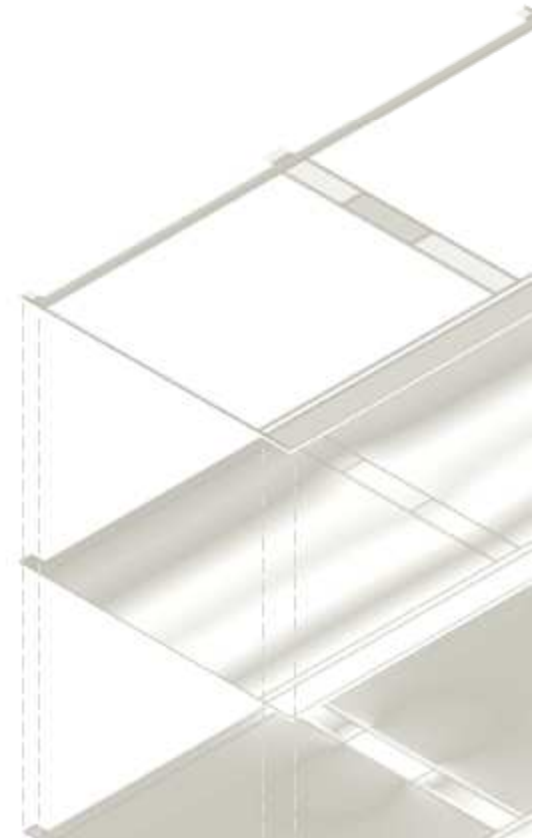




# Gaps in a Straw Bale Wall

## Impact on U-values

A Case Study With  
Software Modelling



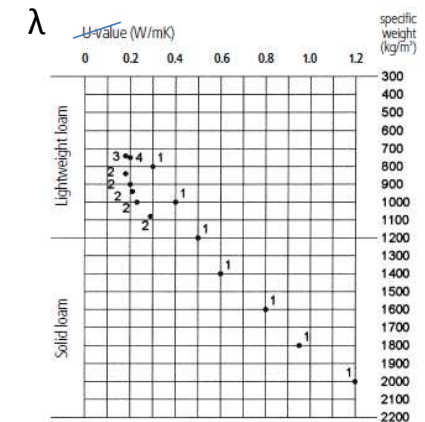
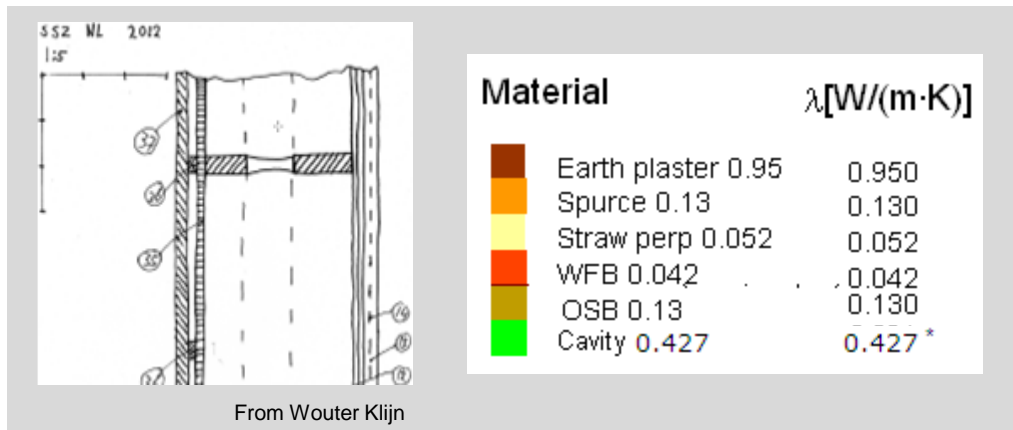
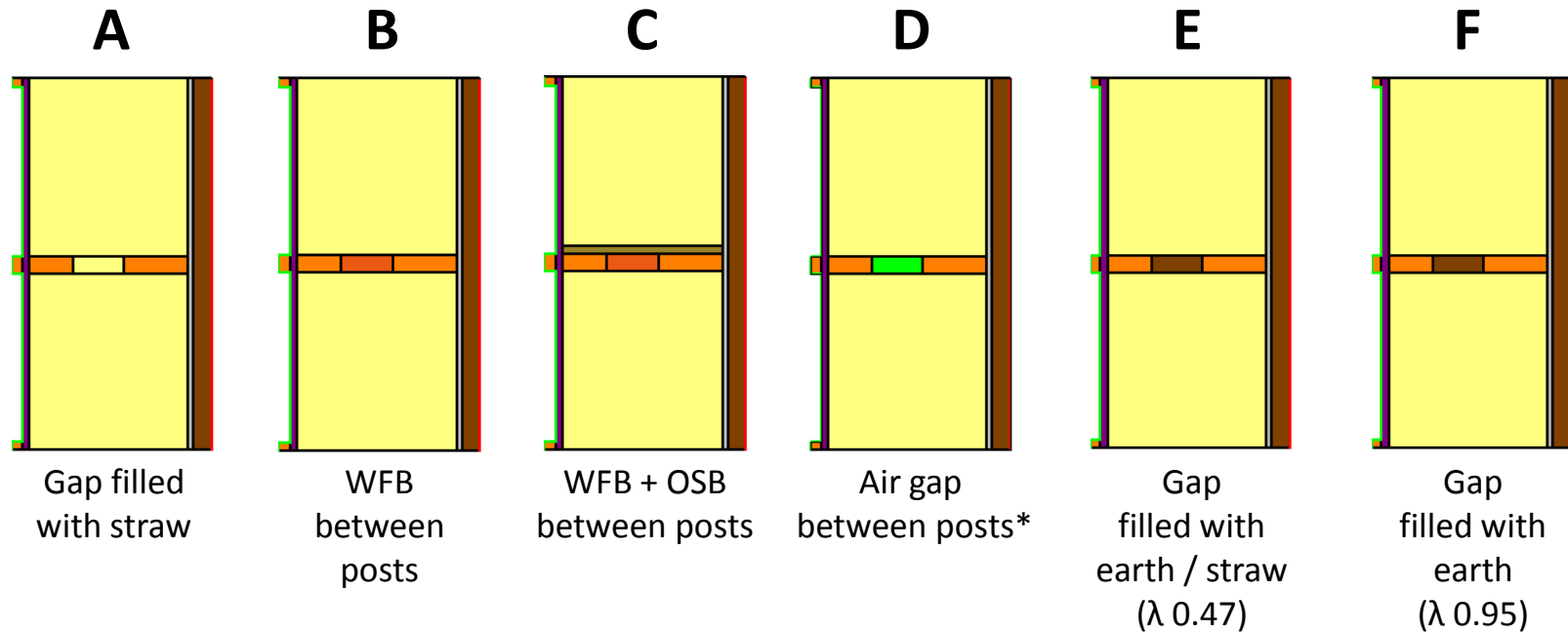
# Gaps in a Wall and the Wall's U-value

- When building with straw, unwanted gaps in a wall can appear due to the nature of construction (for example, building between fixed posts)
- This can have an impact on the wall performance (e.g. thermal)
- Variety of methods and materials are used to deal with the issue
- Which approach can be used with advantage, from a thermal performance point of view?



# Six Scenarios - Space Between Posts - SSS Wall Section

Plan view

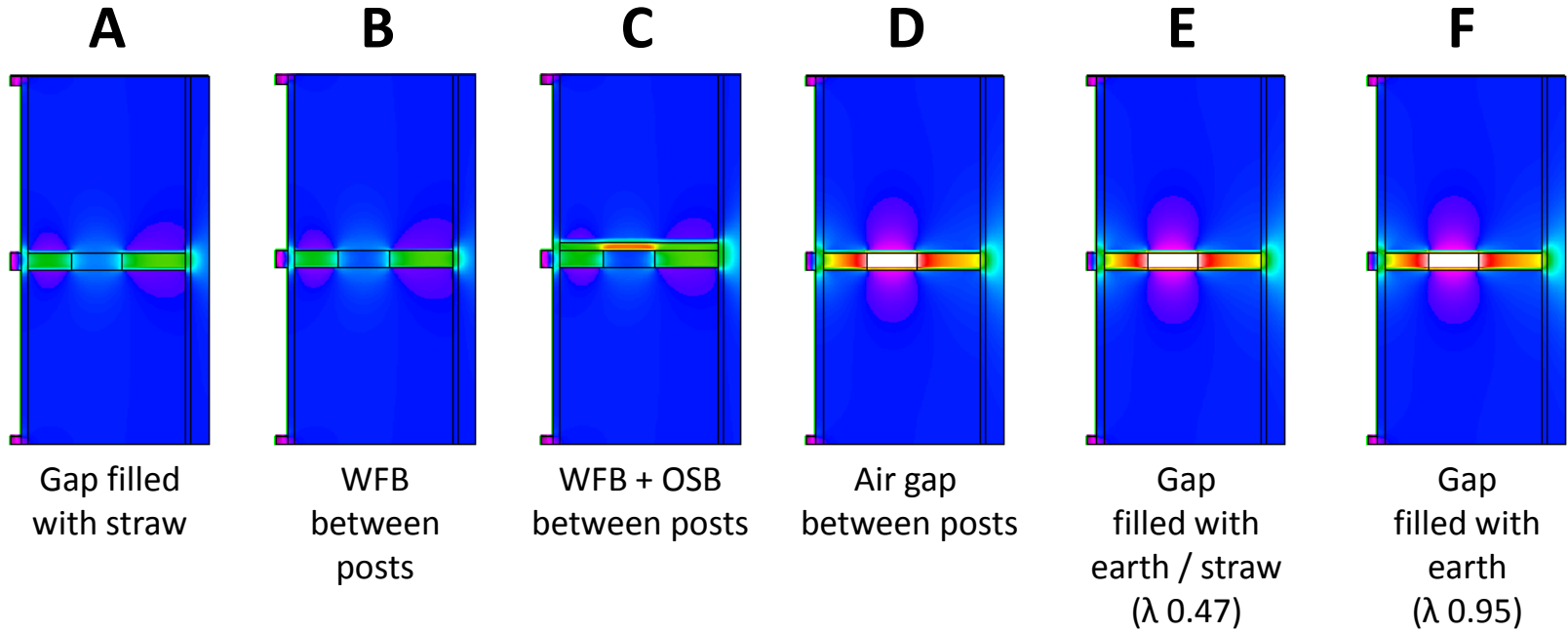
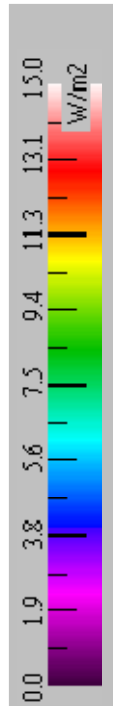


Minke, 2006

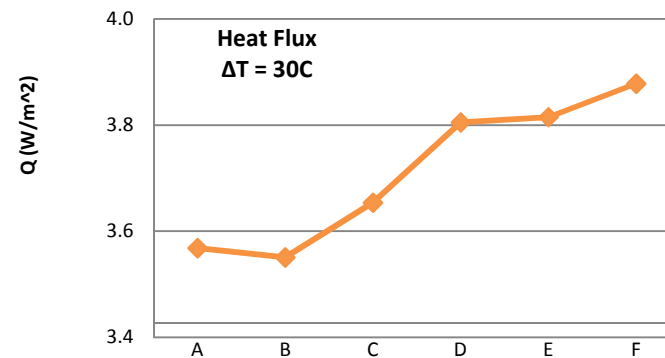
\* Air cavity thermal resistance calculated following ISO 6946



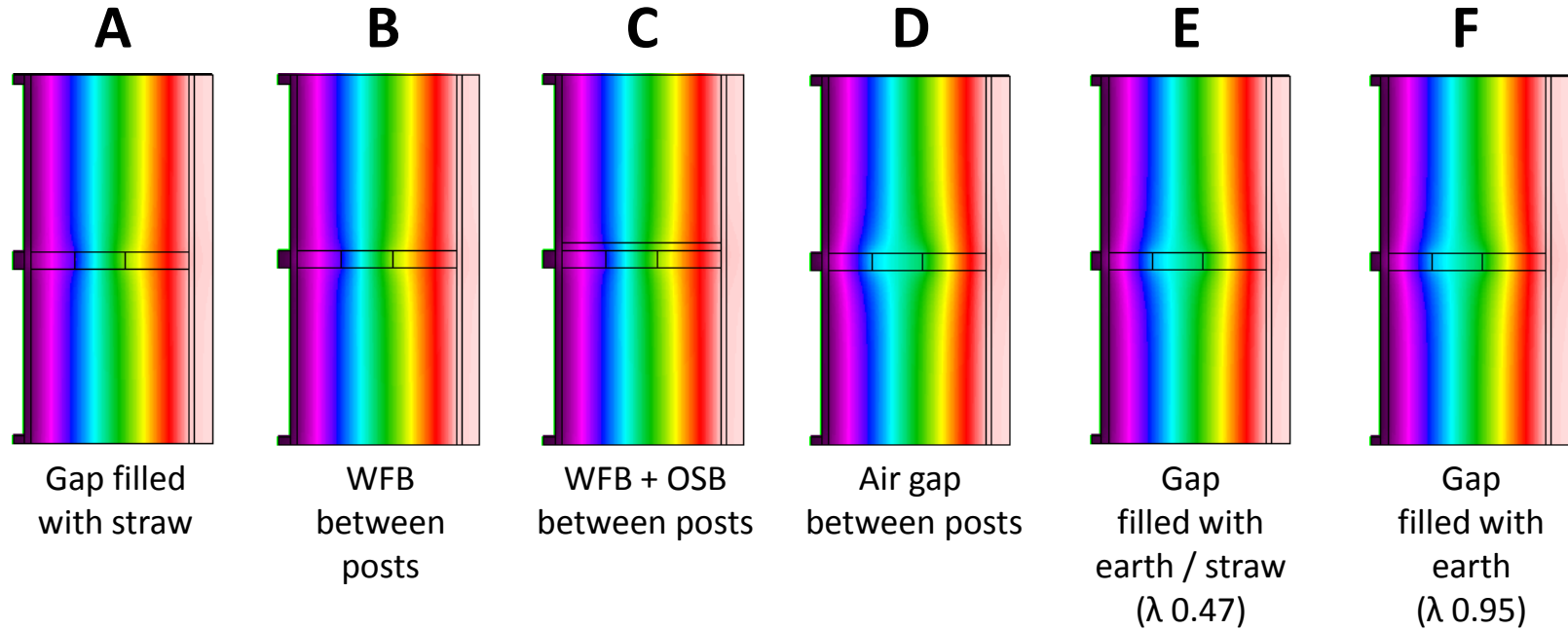
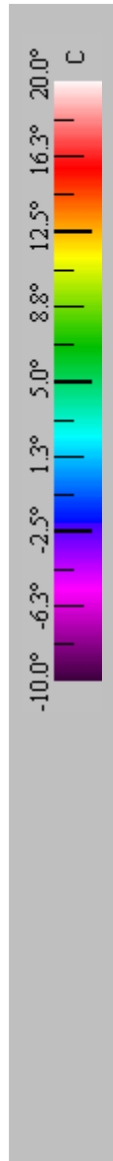
# Heat Flux



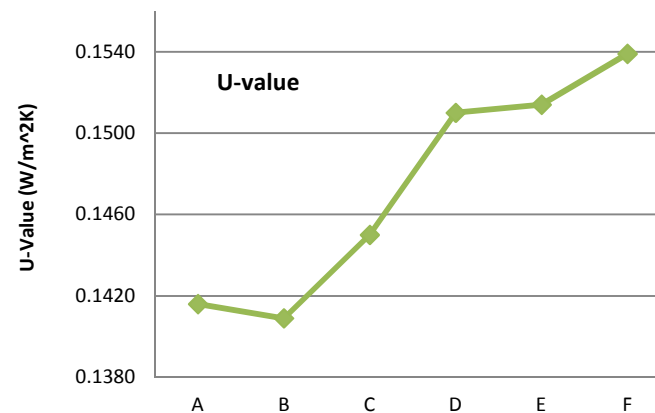
	Heat Flux (W/m <sup>2</sup> )		
<b>A</b>	3.57	100	%
<b>B</b>	3.55	100	%
<b>C</b>	3.65	102	%
<b>D</b>	3.81	107	%
<b>E</b>	3.82	107	%
<b>F</b>	3.88	109	%



# U-Value and Temperature Profile



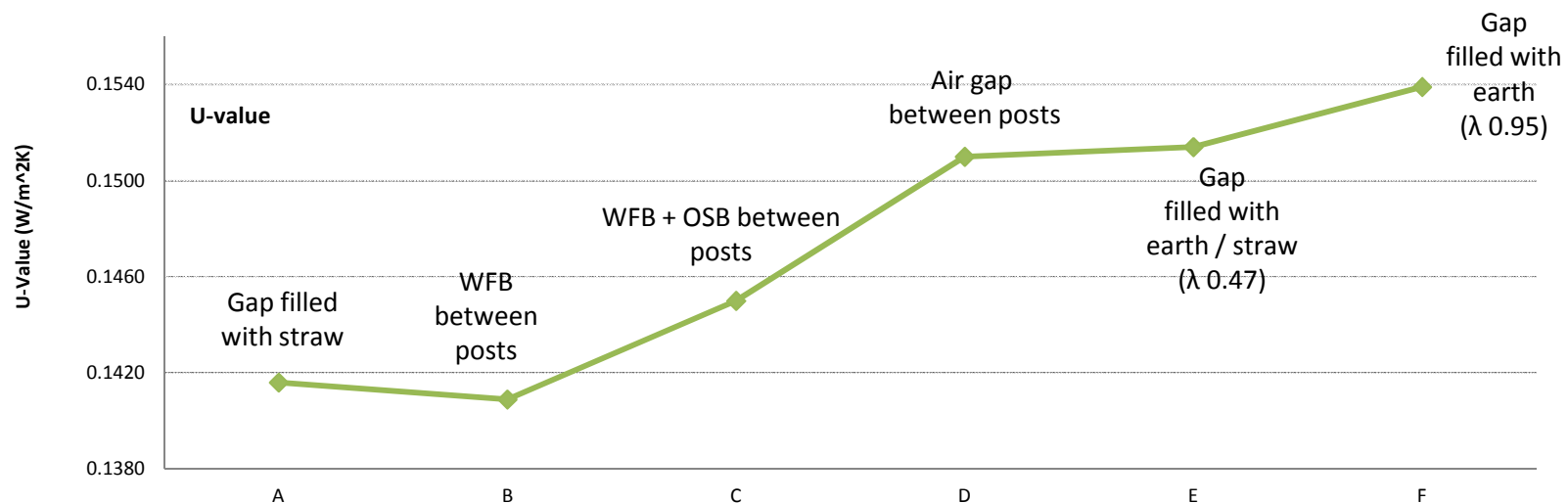
	U-Value (W/m <sup>2</sup> K)		
A	0.1416	100	%
B	0.1409	100	%
C	0.1450	102	%
D	0.1510	107	%
E	0.1514	107	%
F	0.1539	109	%



# Conclusions – Thermal Performance

## Design decisions and thermal performance

- Filling gaps with loam (earth) is the least advantageous option, even if mixed with straw
- Straw, wood wool or wood fiber board represent better solutions than loam
- For the given geometry, the equivalent thermal conductivity of the air cavity is similar to the conductivity of the loam / straw mix



# Conclusions – Wider Context

## What about moisture?

- Thermal properties are just one aspect of the wall's overall performance
- From a moisture behavior point of view, it can be assumed that loam performs better than the air gap:
  - Loam acts against potential convection currents within / through the wall. Next to reducing thermal performance, moving air can bring humidity into the fabric, leading to an increased danger of interstitial condensation
  - Loam acts as a moisture buffer, it is hydrophilic = can absorb more moisture than air at the same temperature and RH
- Hygrothermal simulations (i.e. WUFI) can explore this question further

**Aim for design without gaps. To fill any gaps, use thermally insulating materials rather than dense materials**



# Q & A

