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EUROPEAN UNION

France ( Channel  
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CobBAUGE

Fonds européen de développement régional

# Density and Walls

Role of the wall in CobBauge buildings

The different possible wall configurations, different thicknesses,  
thermal layer inside or outside?



HUDSONArchitects

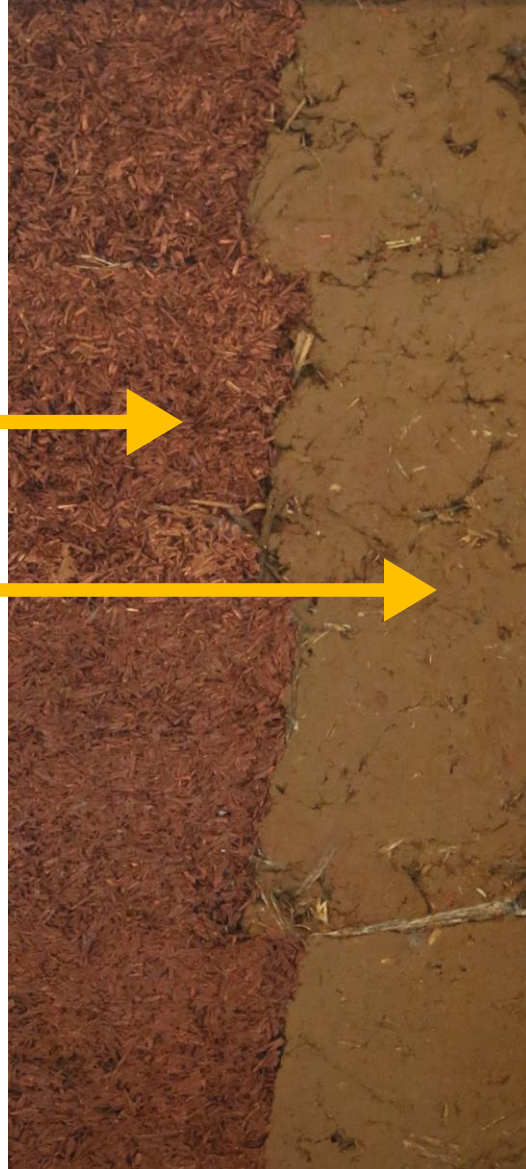
# The CobBauge wall

Two layers:

One insulating

One Structural

The insulating layer is lighter, with as much fibre as possible to lower conductivity

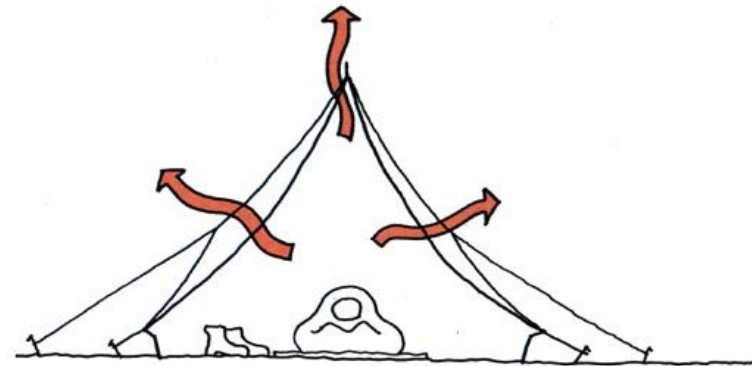
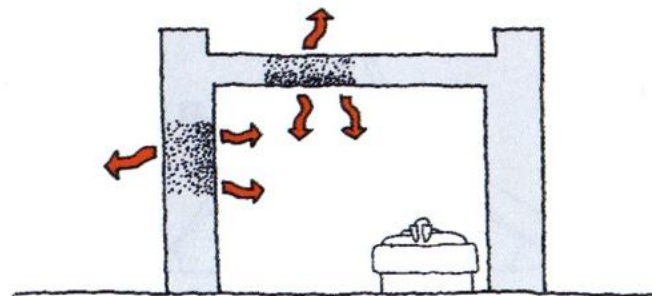
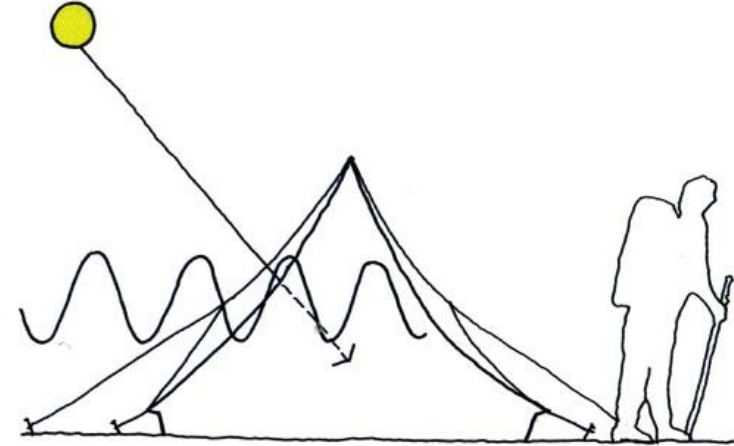
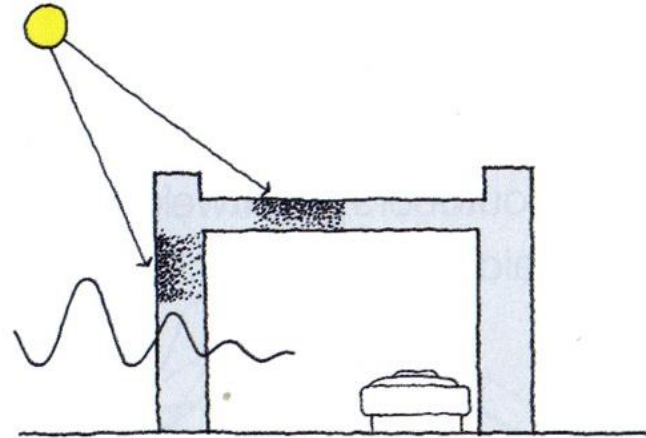


The structural layer is denser, with reduced fibre to improve strength  
This results in a higher thermal mass

# The role of mass in buildings

**MASS**

*lightweight*



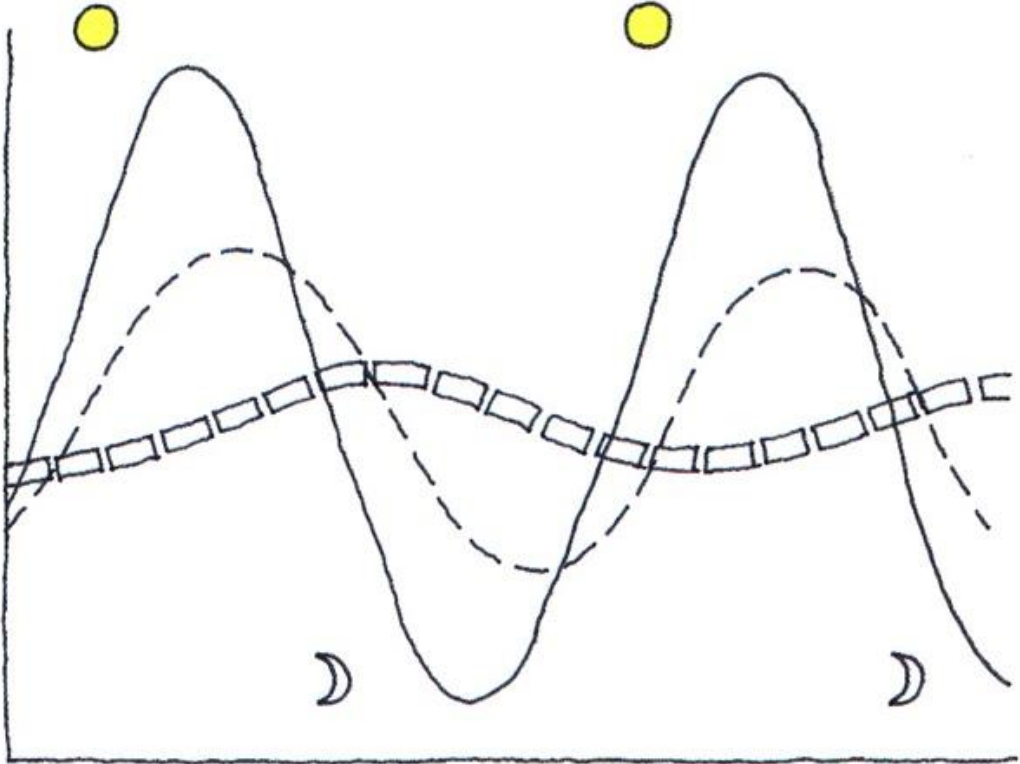
Should the mass be on the inside or the outside of the building?

Having the mass on the inside will slow the rate at which the temperature changes in the building

The mass on the inside can absorb solar gains directly

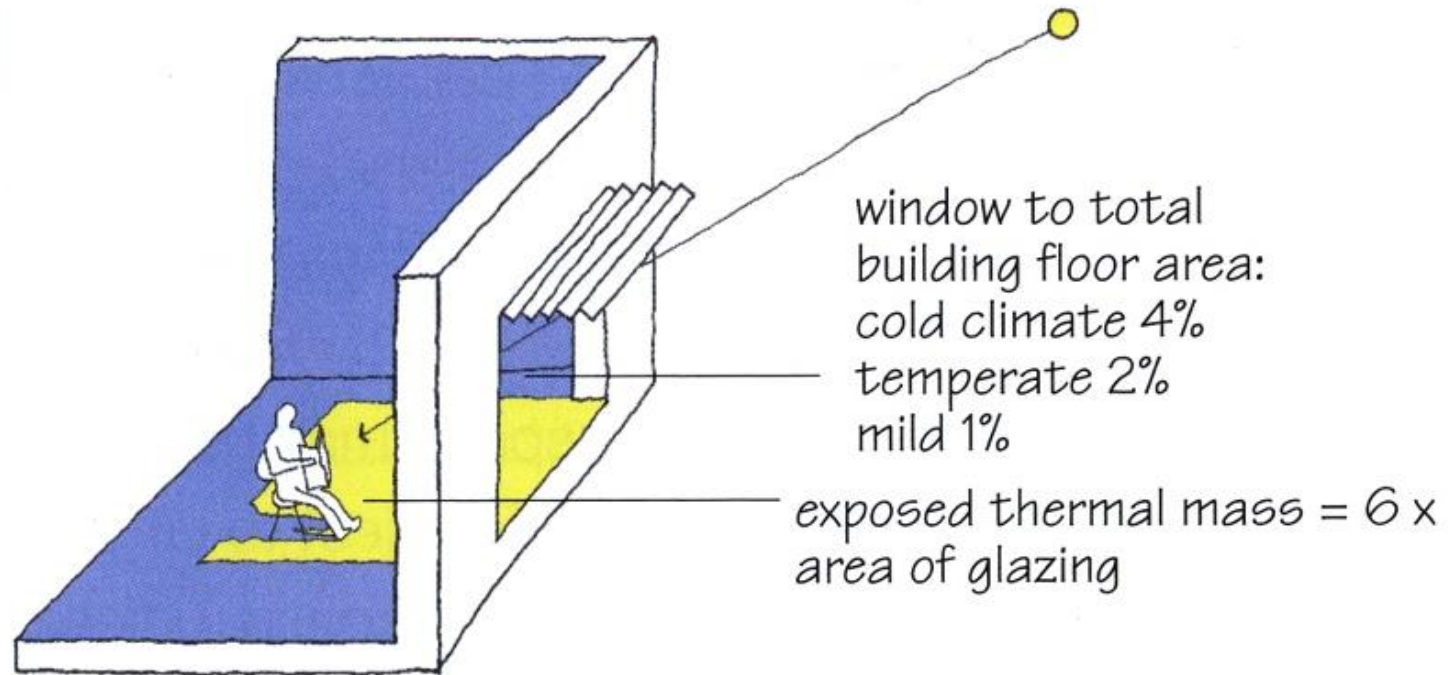
If the mass is on the outside of the building, the insulating layer on the inside will allow the building to heat up more quickly

Having the mass be on the inside will slow the rate at which the temperature changes in the building



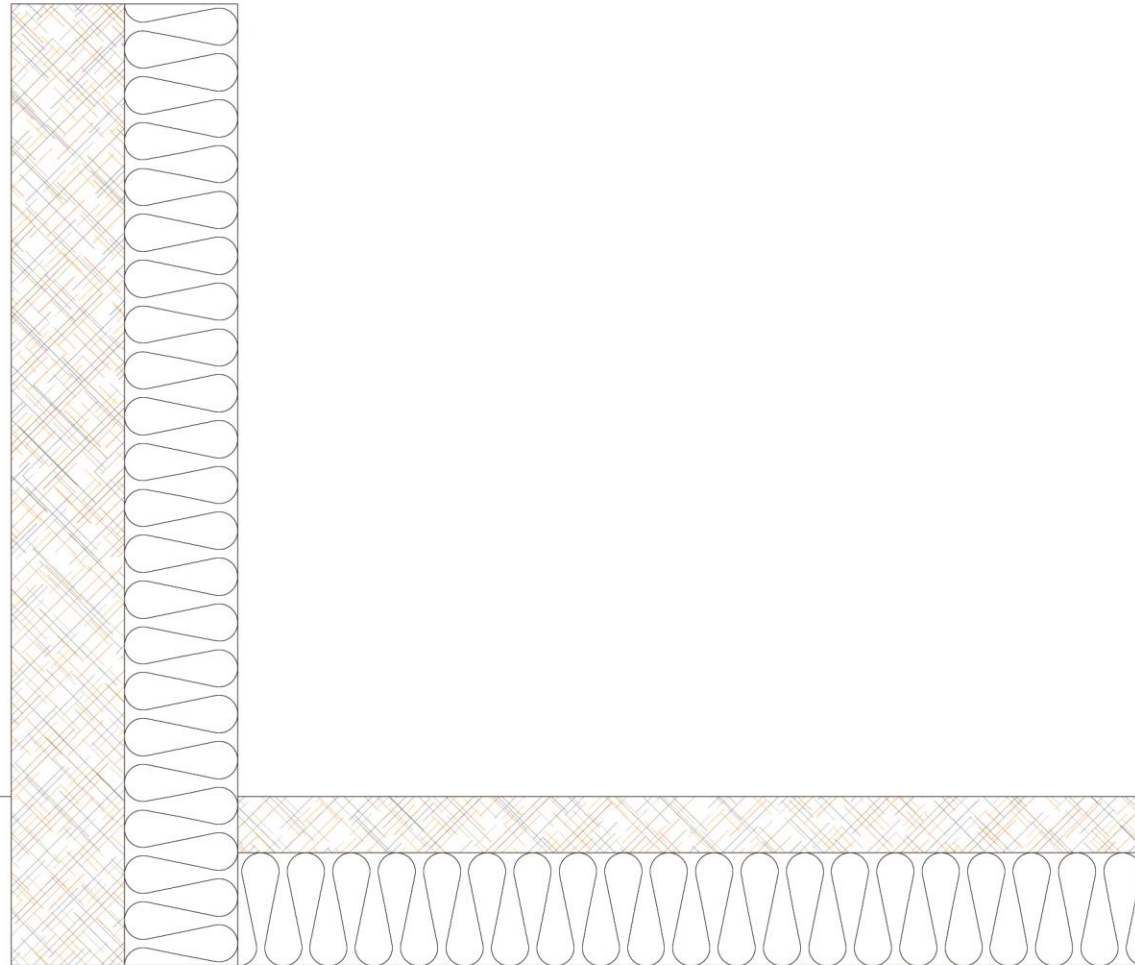
- Outdoor temperature
- - - Lightweight timber frame building
- ▣▣▣ Heavyweight building with insulation

The mass on the inside can absorb solar gains directly



Heywood, Huw. (2012)

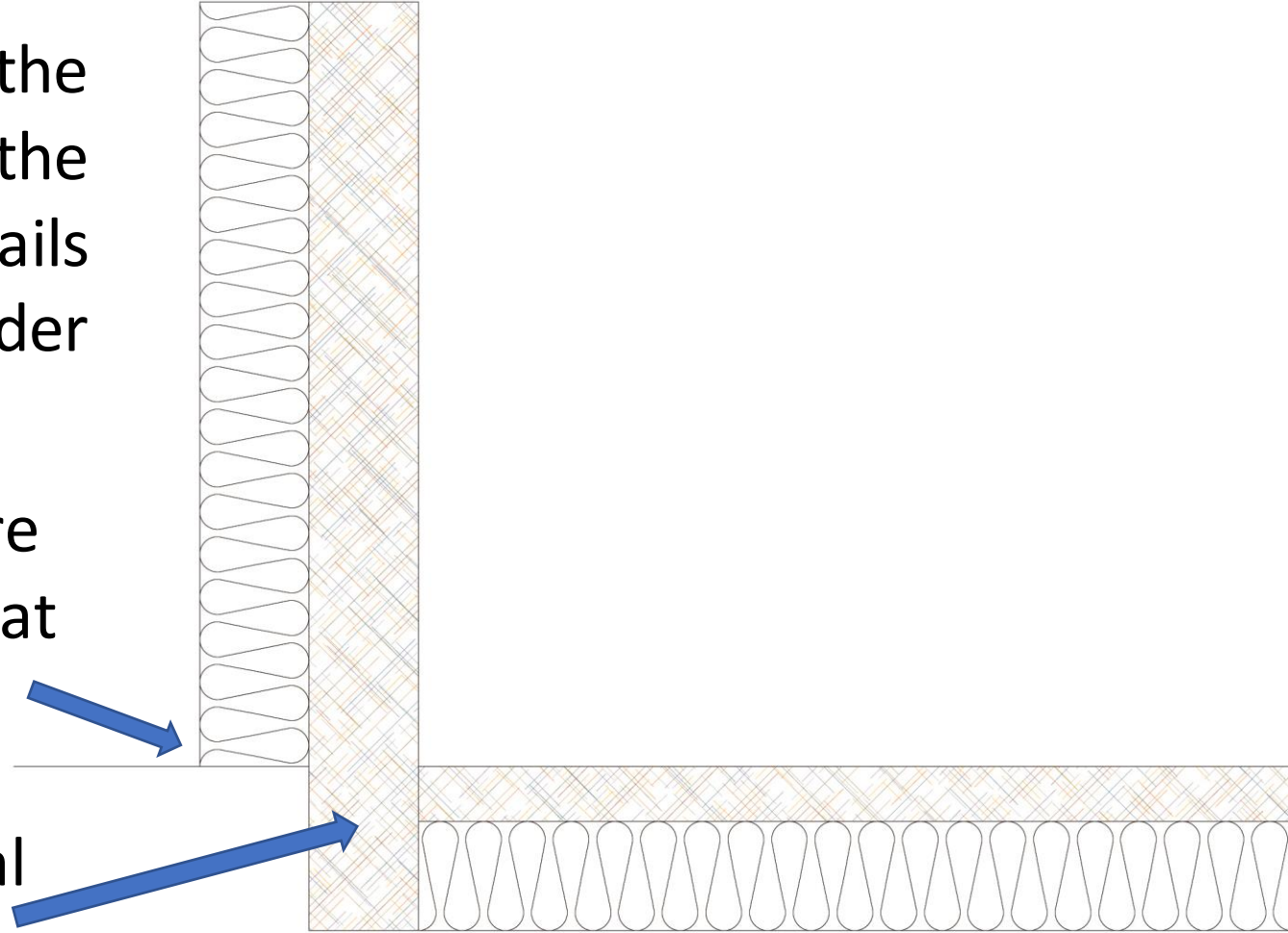
The mass on the  
outside could make  
the foundation  
details easier



The mass on the inside could make the foundation details harder

Insulation layer more exposed, especially at ground level

Potential for thermal bridging





What effect will the thickness of each layer have thermally?

<b>Composite Cob</b>	<b>Density kg/m<sup>3</sup></b>	<b>Thickness m</b>	<b>Cond. W/m.K</b>	<b>Resistance m<sup>2</sup> K/W</b>
Internal surface		n/a	n/a	0.12
Dense Cob UK6 5% Hemp straw	1300	0.300	0.45	0.67
Lightweight Cob UK3 50% Hemp shiv	340	0.300	0.11	2.73
External Surface		n/a	n/a	0.06
<hr/> <b>Total Resistance</b>				<b>3.57</b>
<hr/> <b>U-Value W/m<sup>2</sup>K</b>				<b>0.28</b>

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Lightweight Cob UK3 50% Hemp shiv	340	0.250	0.11	2.27
External Surface		n/a	n/a	0.06
<hr/> <b>Total Resistance</b>				<b>3.23</b>
<hr/> <b>U-Value W/m<sup>2</sup>K</b>				<b>0.31</b>

# What effect will the order of each layer have on moisture?

Moisture inside

	THICKNESS L(m)	$r_v$	$R_v$	vp Drop	vp at Boundary	Dew PT Boundary	T at Boundary
INTERNAL SURFACE BOUNDARY			neg		1400	12	20
Earth RENDER BOUNDARY	0.03	40	1.20	70.02	1229.98	11	18.86
Dense Cob BOUNDARY	0.03	40	10.00	583.52	746.46	3	18.45
Light Cob BOUNDARY	0.1	20	2.00	216.70	629.76	0.1	10.46
LIME RENDER BOUNDARY	0.03	17	5.51	137.76	600.00	0	0.93
EXTERNAL SURFACE TOTAL Vapour Resistance			neg 13.71				0.57
INSIDE VAPOUR PRESSURE	1400						
OUTSIDE VAPOUR PRESSURE	600						
TOTAL VP DROP	800						

# What effect will the order of each layer have on moisture?

