



Multi Functional Performance of  
Wood Fibre Insulation



The background of the image is a dense pile of cut wood logs. In the center of the image, a single log is positioned so that its circular cross-section is clearly visible, forming a heart shape. The wood has a warm, golden-brown tone with visible grain patterns. The text is overlaid on the left side of the image, in a white, bold, sans-serif font.

**Why should we be building with wood?**

**“When someone invents a material that is:  
Renewable,  
Reusable,  
Organic,  
Biodegradable,  
Whose production cleans the air and water,  
sequesters carbon, creates oxygen, provides habitat  
for us and other species  
Gives us a material that is strong, light, diverse,  
Versatile, beautiful, ubiquitous and inexpensive...”**



A close-up photograph of a heart-shaped wood cross-section, likely a tree trunk, resting on a bed of wood chips. The heart shape is formed by the natural grain of the wood, with the pointed ends at the top and bottom. The wood has a warm, golden-brown hue and visible growth rings. The surrounding wood chips are smaller, irregular pieces of wood, also in various shades of brown, creating a textured background.

**“Then I’ll invest in it, until  
then, I’ll use wood  
wherever I can!**

**If not wood, then what?”**

**Peter Moonen Canadian Wood  
Council**





- **Wood Fibre Manufacture and Product Types**
- **Performance Characteristics**
- **Applications (Timber Frame, CLT, Solid Masonry Internal Wall Insulation)**
- **Costs**
- **Summary**

# WHAT IS WOODFIBRE INSULATION?

- Made with post-industrial recycled wood chips (spruce and pine)
- Rigid Boards (110-240kg/m<sup>3</sup> density), flexible batts (50kg/m<sup>3</sup> density) and loose fill (25-40kg/m<sup>3</sup> density)
- Woodfibre boards by “wet” & “dry” method
- Excellent insulation material for internal or external applications
- All products are Certified according to EN13171 and have EPD's
- **Can be applied almost anywhere provided it is above ground level**

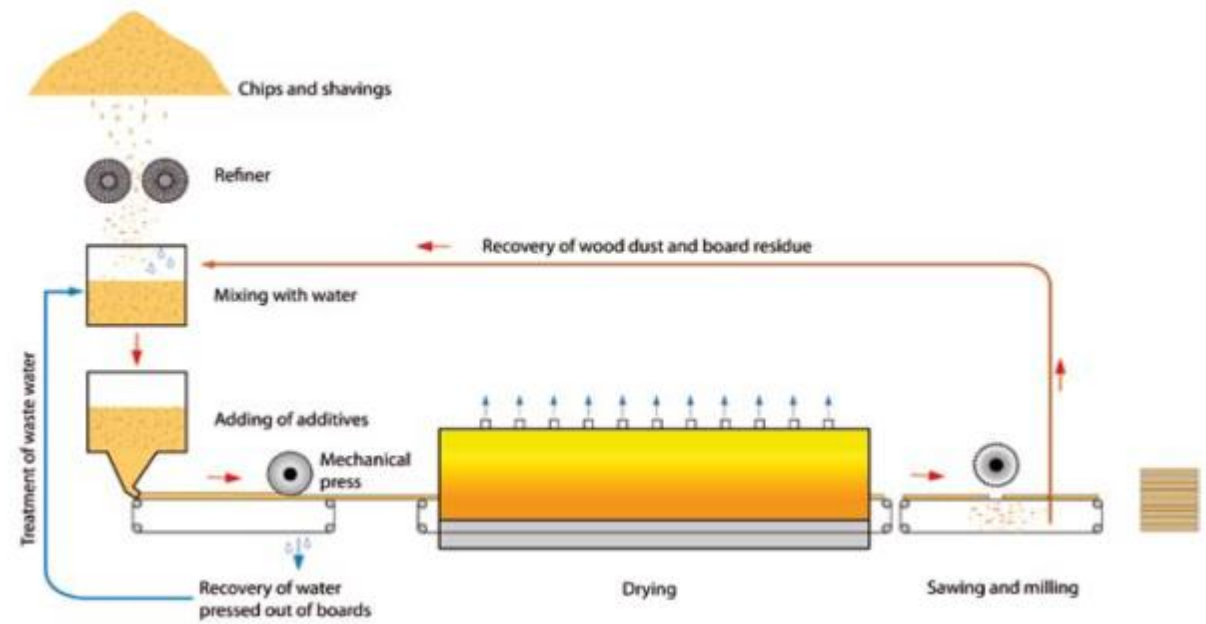
# The Wet Production Process

Thickness: 4 mm – 25 mm

Glued layers: > 20 mm boards

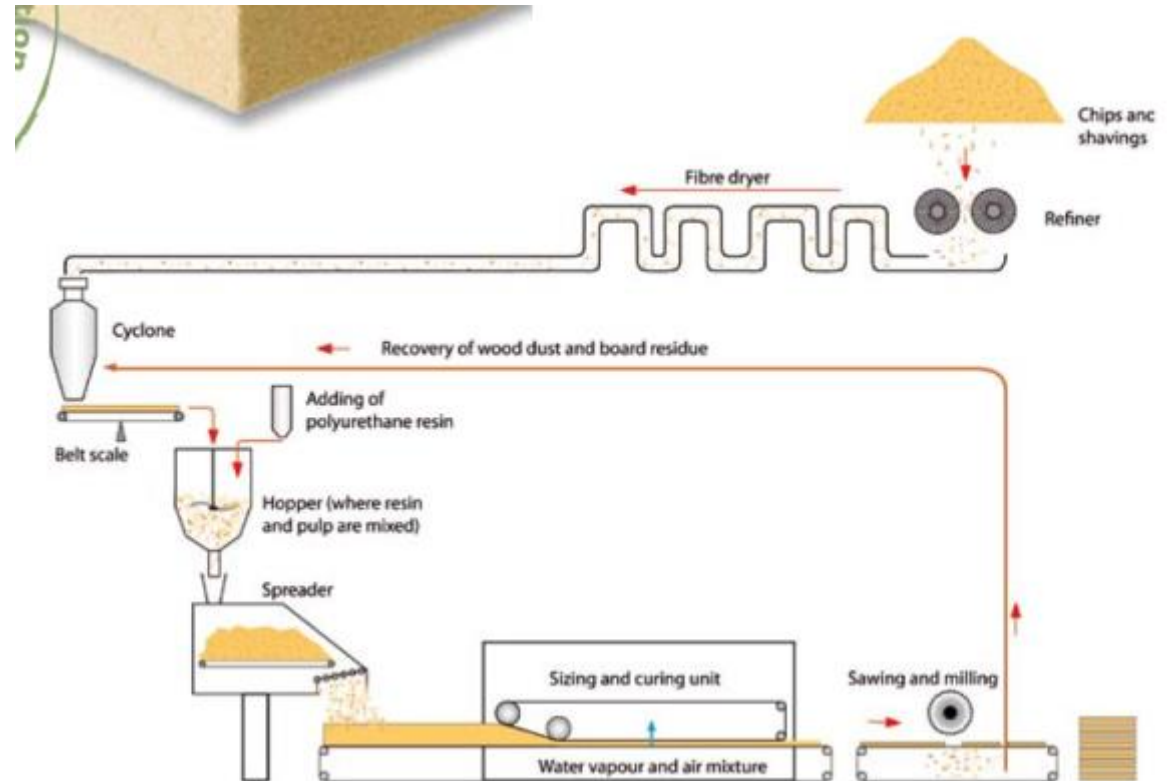
Density: 160 – 270 kg/m<sup>3</sup>

Diffusion open (μ): 5



# The Dry Production Process

- ✓ homogeneous
- ✓ Insulation thicknesses 20 - 240 mm
- ✓ Woodfibre-blow in insulation
- ✓ less tolerances
- ✓ Higher stability with lower densities (110 – 200 kg/m<sup>3</sup>)
- ✓ More diffusion open with  $\mu = 3$
- ✓ 40 % less Energy and CO<sub>2</sub>-consumption
- ✓ Less additives – higher percentage wood component 94 – 96 %



# EXAMPLE WOOD FIBRE INSULATION PRODUCTS



❑ GUTEX Multiplex-top



❑ GUTEX Thermoflex



❑ GUTEX Thermofibre



# WHY WOODFIBRE INSULATION



## The Benefits:

- Optimum combination of Thermal insulation in Winter & Summer
- Effective acoustic properties
- Speed of application
- Very Robust
- Extremely diffusion open, reducing condensation risk
- Consistent quality and reliable application
- Inherently windtight material
- Recyclable & Optimum Sustainability

# Wood Fibre Benefits: Insulation in Winter

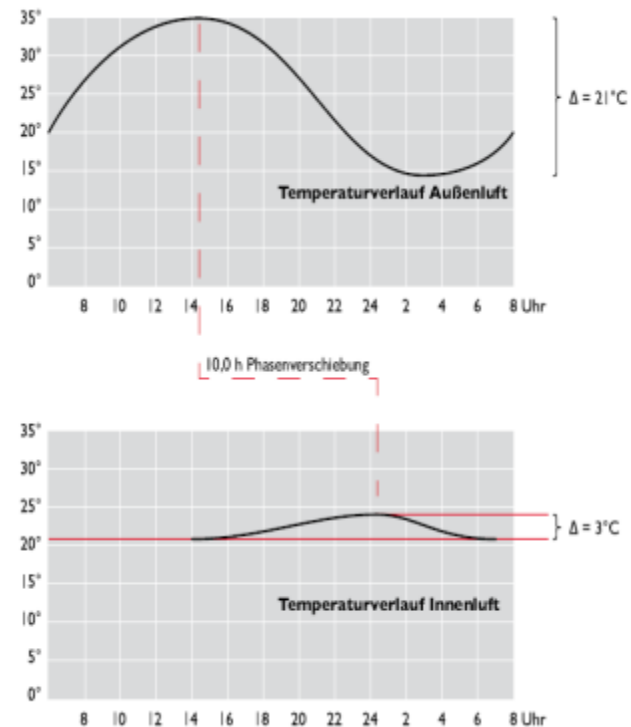
- Lambda Value range 0.036 – 0.045W/mK
- Less Thermal Bridges
- Wind Tight Construction
- Air Tight Construction
  - High Air Flow Resistivity ( $\text{kPa}\cdot\text{s}/\text{m}^2 = 100$  for Gutex Multiplex Top)
- U Values  $<0.10\text{W}/\text{m}^2\text{K}$  for Walls, Roof and floors





# Wood Fibre Benefits: Insulation in Summer

- High Specific Heat Capacity (2100 J/kgK)
- High Density (up to 180kg/m<sup>3</sup>)
- Combination gives a high level of protection against summer overheating
- Heat from the sun takes longer to enter into the building (Decrement Delay)
- Temperature increase reduced (Amplitude Damping)

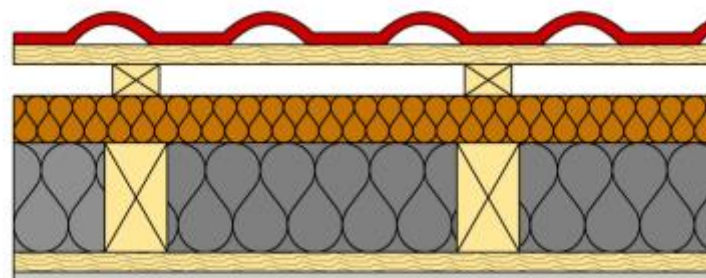
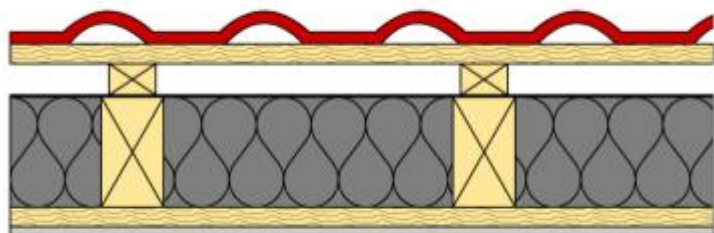


Phase shift = 10,0 h

Amplitude damping (1/TAR) =  $21^\circ\text{C} / 3^\circ\text{C} = 7$



# Additional insulation layer for roofing: U value and Decrement Delay boost



	sarking membrane
U-value (W/m <sup>2</sup> K)	0,35
Phaseshift (h)	6,9 h (24%)

GUTEX Multiplex-top			GUTEX Ultratherm						
thickness (mm)									
22	28	35	50	60	80	100	120	140	160
0,29	0,28	0,27	0,24	0,23	0,21	0,19	0,18	0,16	0,15
8,0 (20%)	8,4 (19%)	8,9 (17%)	10,0 (14%)	10,7 (12%)	12,2 (8%)	13,6 (6%)	14,9 (4%)	16,2 (3%)	17,6 (2%)





# Wood Fibre and Acoustic Insulation

low dynamic stiffness

porous fibre structure

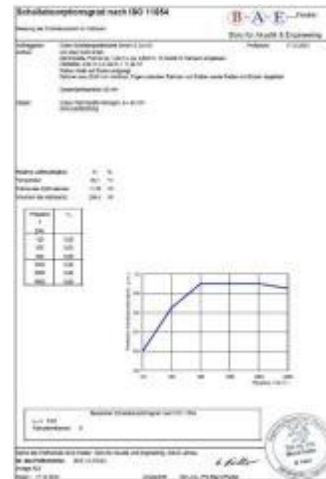
density

reduces impact noise

improves room acoustics



GUTEX Thermofloor

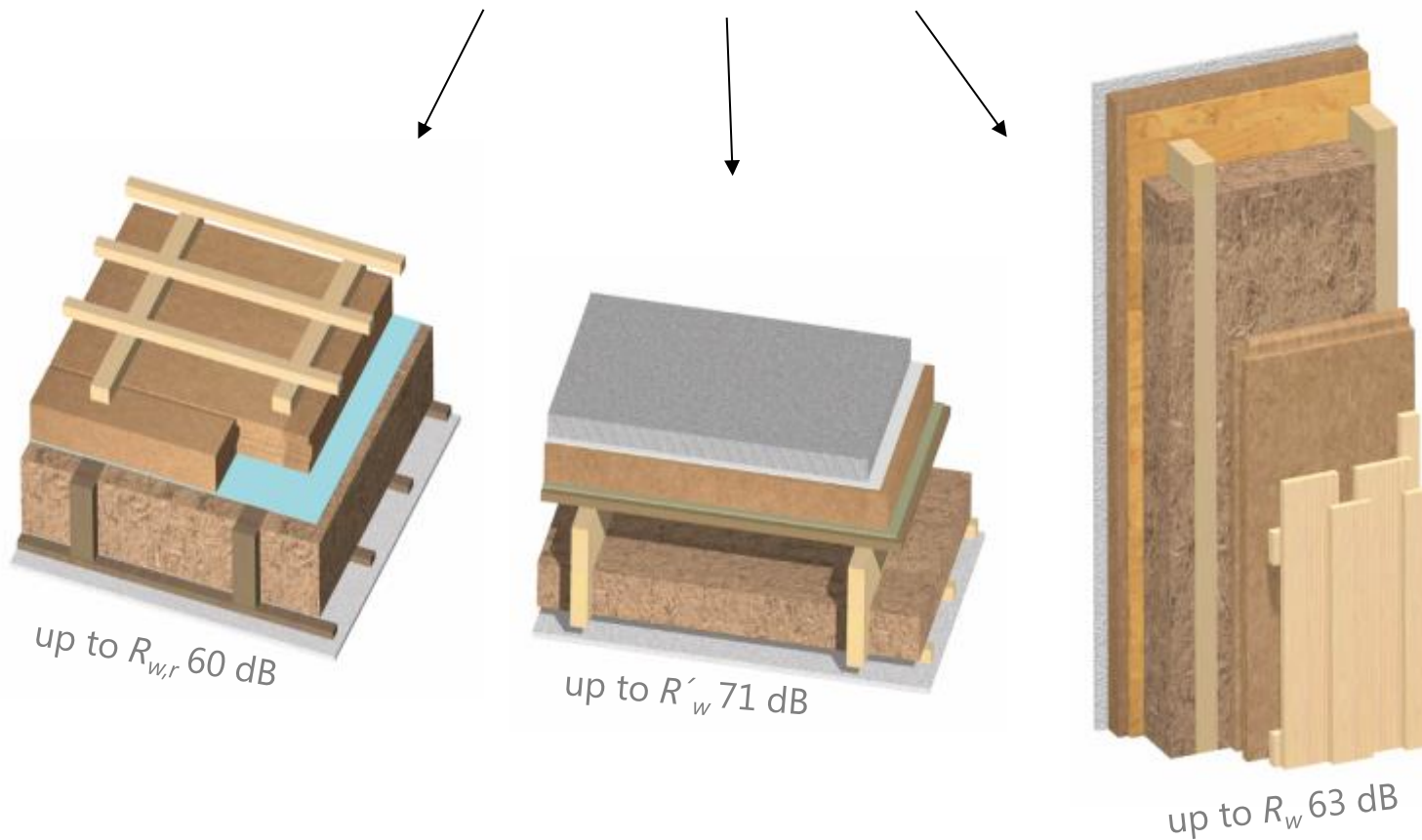


Lignotrend



# Wood Fibre and Acoustic Reduction

The combination of design and material





# Wood Fibre and Fire Protection

- Wood Fibre chars with no explosive burning process
- Can achieve up to REI 90 (90 minute rating EN13501-2/BS476 Part 20) using Gutex in Timber Frame Construction

		Von Außen			
		REI 30	REI 45	REI 60	REI 90
		≥ 40mm GUTEX Multitherm ohne Putz	≥ 60mm GUTEX Multitherm + 5 mm mineralische Armierungsschicht	≥ 60mm GUTEX Thermowall N+F Thermowall-gf	≥ 80mm GUTEX Thermowall N+F ohne Putz
Von Innen REI 90	≥ 15 mm Fermacell GF-Platte + ≥ 15 mm Fermacell GF-Platte	Ständer Vollholz ≥ 140x60 mm <sup>3</sup> , Achsab. ≤ 833mm, Gefachdämmung aus Steinwolle (Schmelzpunkt > 1000°C, Rohdichte ≥ 40kg/m <sup>3</sup> ), d ≥ 140mm	Ständer Vollholz ≥ 140x60 mm <sup>3</sup> , Achsab. ≤ 833mm, Gefachdämmung aus Steinwolle (Schmelzpunkt > 1000°C, Rohdichte ≥ 40kg/m <sup>3</sup> ), d ≥ 140mm	Ständer Vollholz ≥ 160x60 mm <sup>3</sup> , Achsab. ≤ 825 mm, Gefachdämmung aus Steinwolle (Schmelzpunkt ≥ 1000°C, Rohd. ≥ 40kg/m <sup>3</sup> ), d ≥ 160 mm	Ständer Vollholz ≥ 160x60 mm <sup>3</sup> , Achsab. ≤ 625 mm, Gefachdämmung aus Steinwolle (Schmelzpunkt ≥ 1000°C, Rohdichte ≥ 40kg/m <sup>3</sup> ), d ≥ 160 mm
	≥ 15 mm Fermacell GF-Platte + Installationsebene ohne Dämmung + ≥ 15 mm Fermacell GF-Platte				
	≥ 15 mm Fermacell GF-Platte + Installationsebene mit Dämmung*) + ≥ 15 mm Fermacell GF-Platte				
	≥ 18 mm GKF/GF + ≥ 18 mm GKF/GF + ≥ 15 mm OSB 3/4	Ständer Vollholz ≥ 140x60 mm <sup>3</sup> , Achsab. ≤ 833 mm, Gefachdämmung aus GUTEX Thermoflex, d ≥ 140mm	Ständer Vollholz ≥ 140x60 mm <sup>3</sup> , Achsab. ≤ 833mm, Gefachdämmung aus Steinwolle (Schmelzpunkt > 1000°C, Rohdichte ≥ 40kg/m <sup>3</sup> ), d ≥ 140mm	Ständer Vollholz ≥ 160x60 mm <sup>3</sup> , Achsab. ≤ 825 mm, Gefachdämmung aus Steinwolle (Schmelzpunkt ≥ 1000°C, Rohdichte ≥ 40kg/m <sup>3</sup> ), d ≥ 160 mm	Ständer Vollholz ≥ 160x60 mm <sup>3</sup> , Achsab. ≤ 625 mm, Gefachdämmung aus Steinwolle (Schmelzpunkt ≥ 1000°C, Rohdichte ≥ 40kg/m <sup>3</sup> ), d ≥ 160 mm
	≥ 18 mm GKF/GF + ≥ 18 mm GKF/GF + Installationsebene ohne Dämmung + ≥ 15 mm OSB 3/4	Ständer Vollholz ≥ 160x60 mm <sup>3</sup> , Achsab. ≤ 833mm, Gefachdämmung aus GUTEX Thermofibre, d ≥ 160 mm	Ständer Vollholz ≥ 160x60 mm <sup>3</sup> , Achsab. ≤ 825 mm, Gefachdämmung aus Steinwolle (Schmelzpunkt ≥ 1000°C, Rohdichte ≥ 40kg/m <sup>3</sup> ), d ≥ 160 mm	Ständer Vollholz ≥ 160x60 mm <sup>3</sup> , Achsab. ≤ 625mm, Gefachdämmung aus GUTEX Thermoflex, d ≥ 160 mm	
	≥ 18 mm GKF/GF + ≥ 18 mm GKF/GF + Installationsebene mit Dämmung*) + ≥ 15 mm OSB 3/4	Ständer Vollholz ≥ 160x60 mm <sup>3</sup> , Achsab. ≤ 833 mm, Gefachdämmung aus Cellulose (Rohdichte ≥ 45kg/m <sup>3</sup> ), d ≥ 160 mm	Ständer Vollholz ≥ 160x60 mm <sup>3</sup> , Achsab. ≤ 625mm, Gefachdämmung aus GUTEX Thermoflex, d: 160mm		

Die brandschutztechnisch zulässigen Wandhöhen und maximalen Belastungen für die zu bewertenden Wandkonstruktionen und die Verbindungsmittel sind mit dem allgemeinen Prüfzeugnis P-SAC-02/81-740(19) und der DIN 18181:2008-10[1] zu entnehmen.

\*) GUTEX Thermoinstal, GUTEX Thermoflex, mineralische Dämmstoffe mit einem Schmelzpunkt ≥ 1000°C

\*\*) oder ≥ 12mm OSB 3/4 oder ≥ 13mm Holzwerkstoffplatte \*\*\*) Wandaußenseite ist immer verputzt auszuführen



## Wood Fibre and Fire Protection

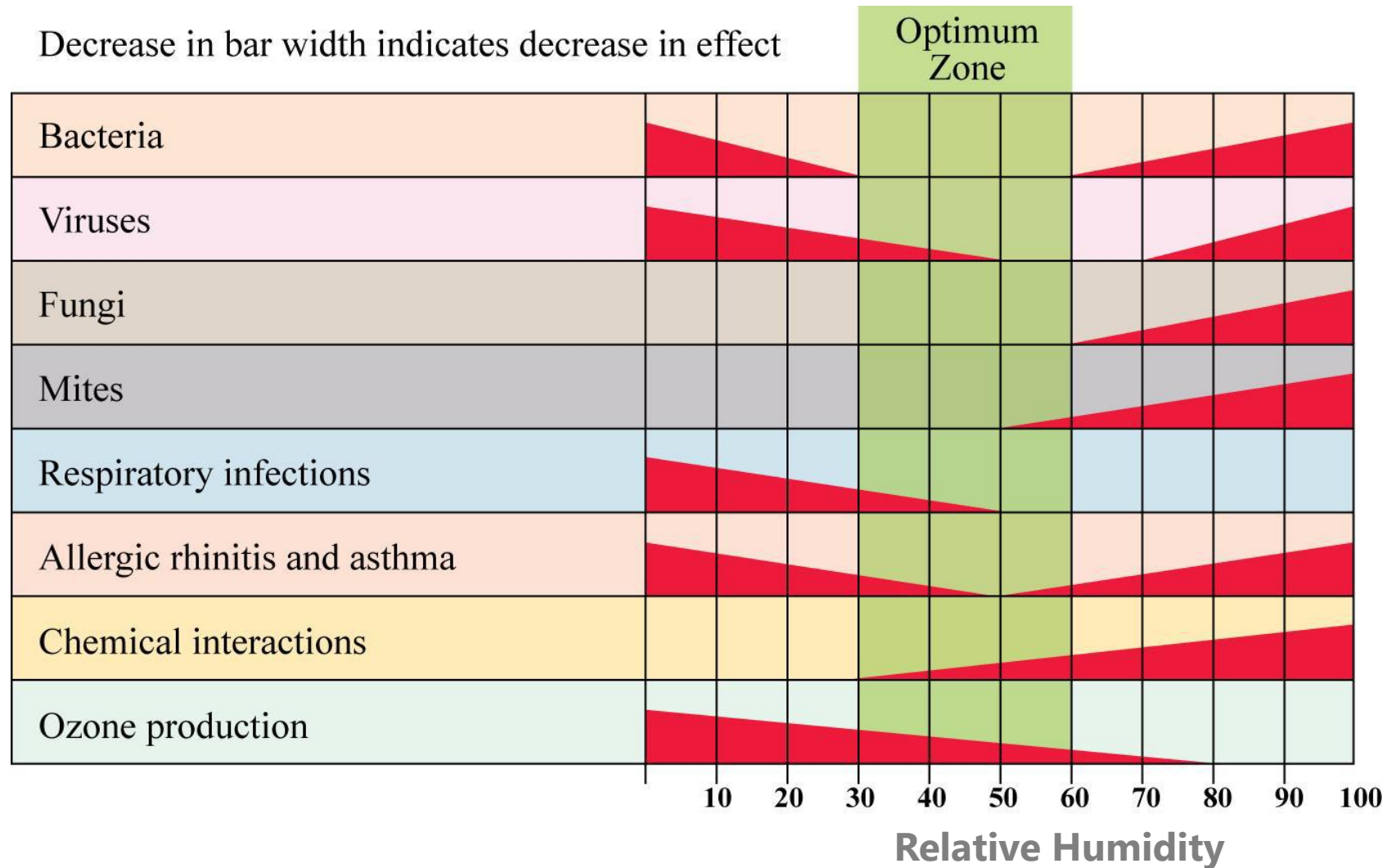
**Fire Toxicity is the biggest cause of death and injury in fires**

**It has been evidenced\* that products based on polystyrene, Polyisocyanurate, amongst others, have far greater yields of toxicity, up to six times, when compared to the combustion of natural materials such as wood**

**\* University of Central Lancashire**

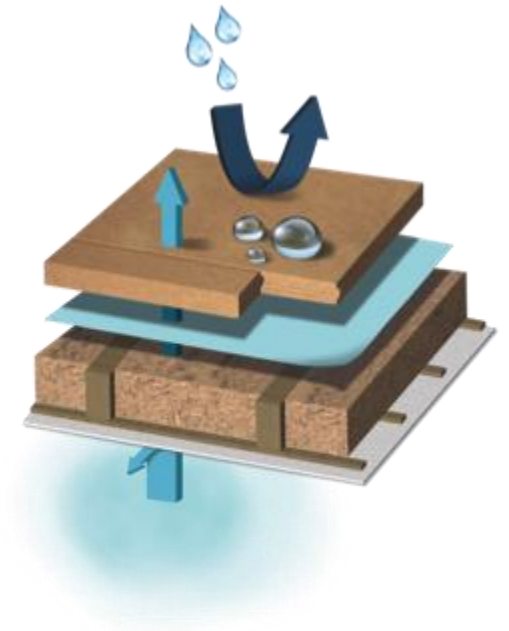


## Wood Fibre and Health: Contribution Towards Indoor Humidity Control



# Wood Fibre and Health: Mould Resistance

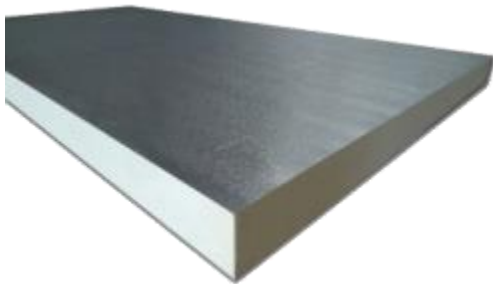
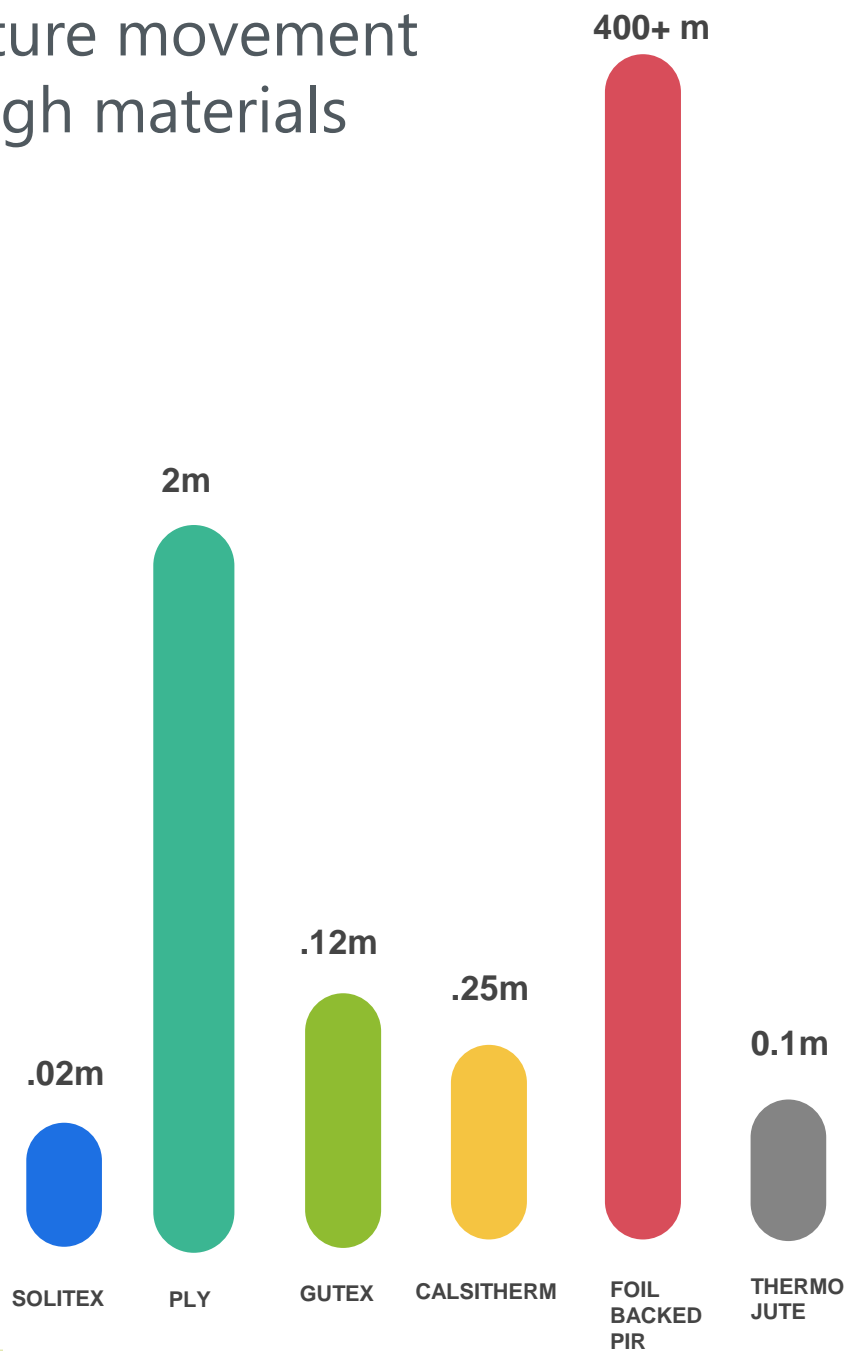
- Moisture Vapour Diffusion Open -  **$\mu$ -value = 3**
- Absorbs and releases 15% of its own weight of water
- Moisture vapour diffusion open and wind tight
- Design flexibility – don't have to use high vapour resistant VCL membranes





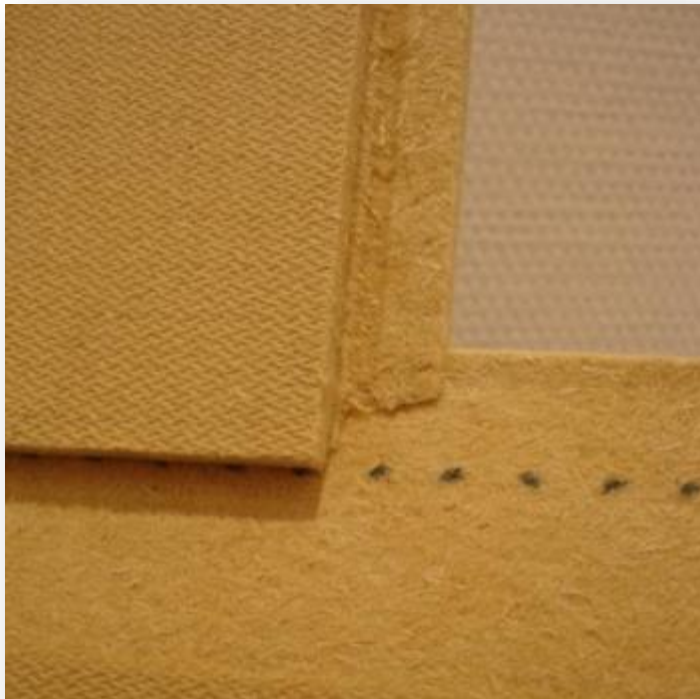
# MOISTURE VAPOUR DIFFUSION RESISTANCE

Moisture movement  
through materials



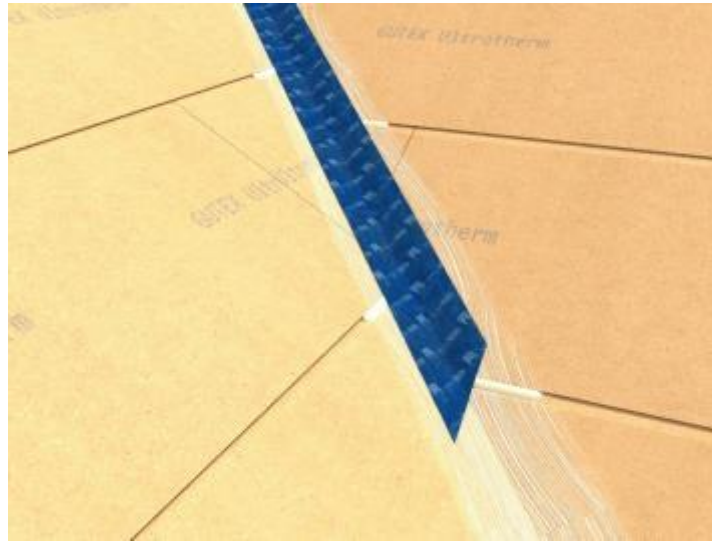
## WOOD FIBRE DURABILITY

- ✓ Hail- and rainproof
- ✓ Windtight
- ✓ Suitable as temporary roof covering
- ✓ Diffusion open



## Roof Valleys and Ridges

## WOOD FIBRE DURABILITY



**Valley**



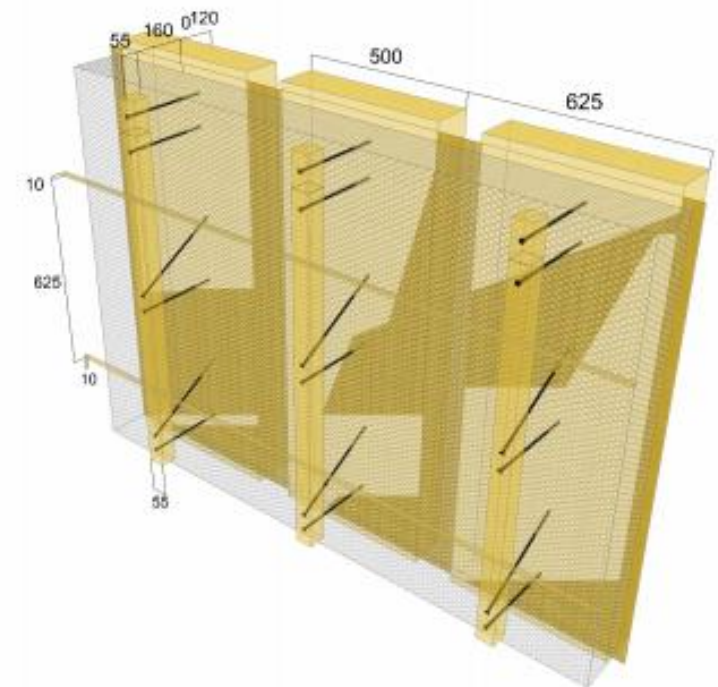
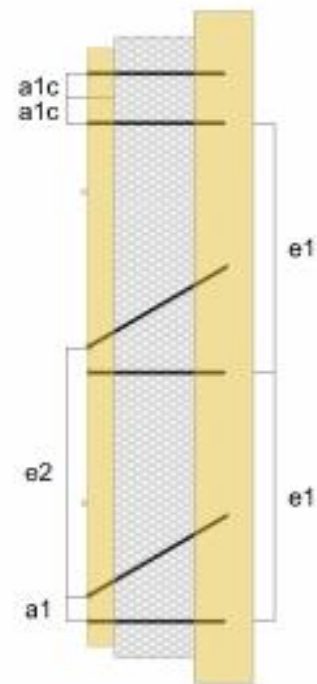
**Ridge**



# WOOD FIBRE BUILDABILITY

## Fast Installation Timber Frame

Thermally broken temporary fixings  
Then Shear and Suction screws





# WOOD FIBRE BUILDABILITY

## Fast Installation Internal Solid Masonry Wall Insulation

Lime Mortar Adhesive  
Tile onto the Wall



# WOOD FIBRE SUSTAINABILITY CARBON AND BUILDINGS

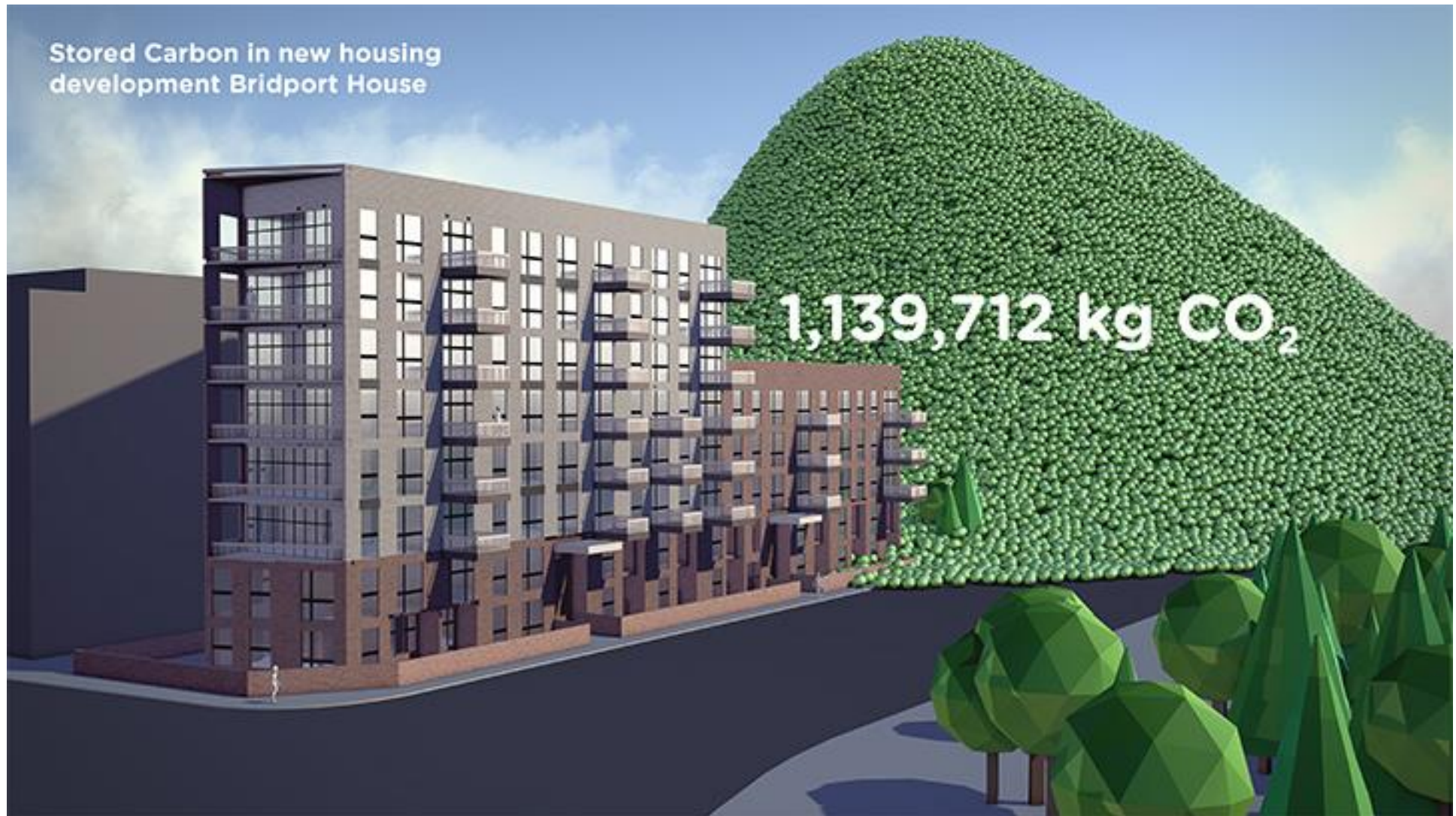
Life Cycle of buildings accounts for 40% of total global energy (ref: Dixit et al. 2010)

In Europe construction accounts for 4.8 tonnes of mineral extraction per person per year (ref: Bribian, I.Z.Capilla, A.V. & Uson,A.A, 2008)

Non-renewable materials sourced from finite resource and extracted once

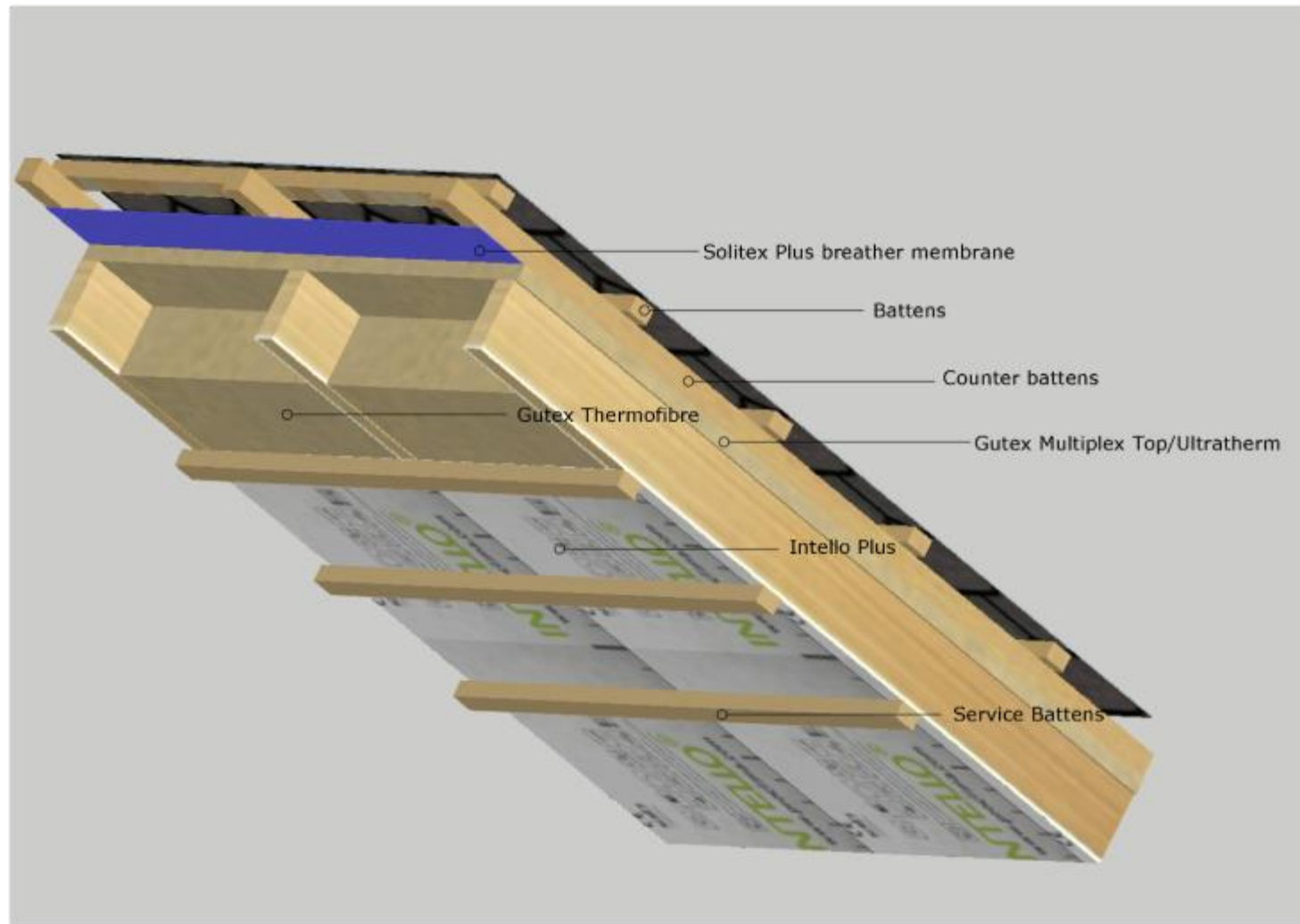
**1 kg of dried timber can sequester 1.8kgCO<sub>2</sub>eq/kg stored as Carbon** (Ref: Berge, B., 2009)

## CARBON STORAGE IN BUILDINGS



REF: <http://www.woodforgood.com/sustainability/build-with-carbon>

# WOOD FIBRE IN ROOF STRUCTURES

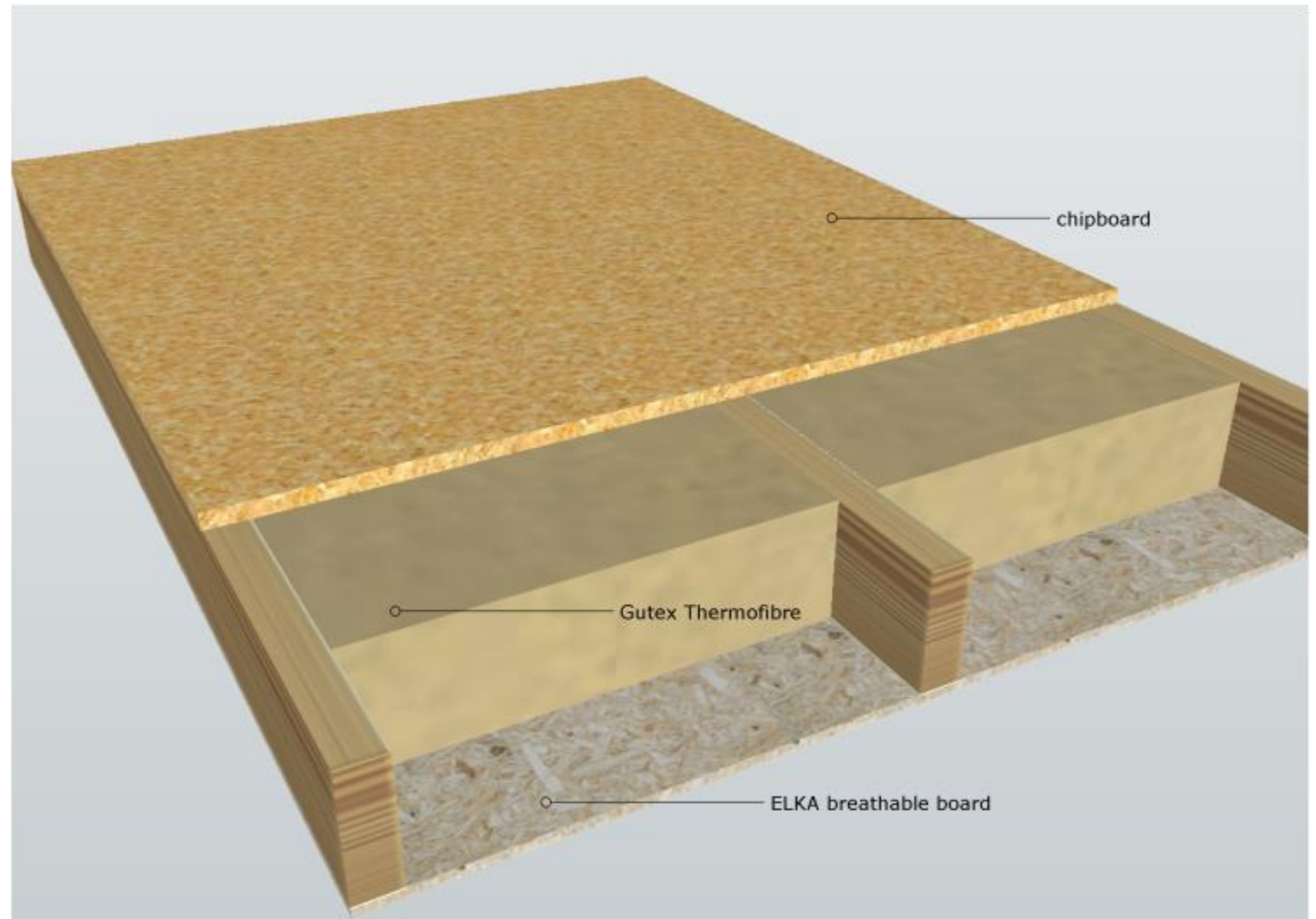




## WOOD FIBRE IN WALL STRUCTURES



# WOOD FIBRE IN FLOORS



# WOOD FIBRE IN CLT (Cross Laminated Timber)



# WOOD FIBRE AS INTERNAL INSULATION IN SOLID MASONRY WALLS

~ 8 million difficult to treat solid masonry wall residential properties in the UK

Main issue with Insulation Upgrades is moisture, condensation and mould



Rot of half-timbered structure probably caused by low-permeance coating not providing sufficient drying potential for given exposure conditions





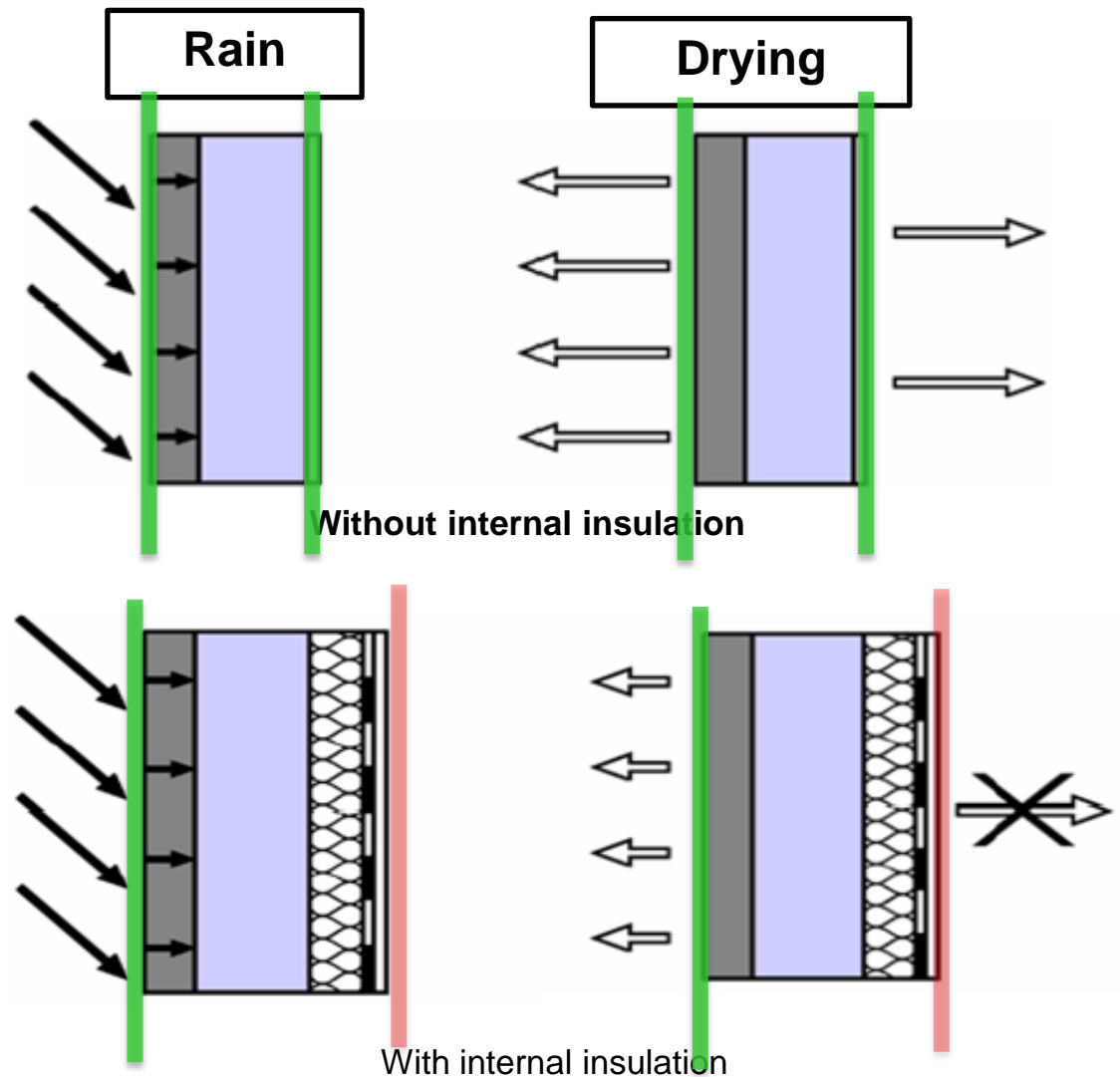
# WOOD FIBRE AS INTERNAL INSULATION IN SOLID MASONRY WALLS

## Moisture and its impact on Buildings

Freeze/Thaw Spalling

Higher moisture in the wall on the weather side

Importance of breathable materials



Ref: Hartwig M. Künzle Fraunhofer IBP 2006



**ECOLOGICAL BUILDING SYSTEMS**

# WOOD FIBRE AS INTERNAL INSULATION IN SOLID MASONRY WALLS

## COMMON ERROR: DOT and DAB PIR BOARDS ONTP THE WALL

Minimising Mould Risks  
Avoid Stagnant Air Gaps!



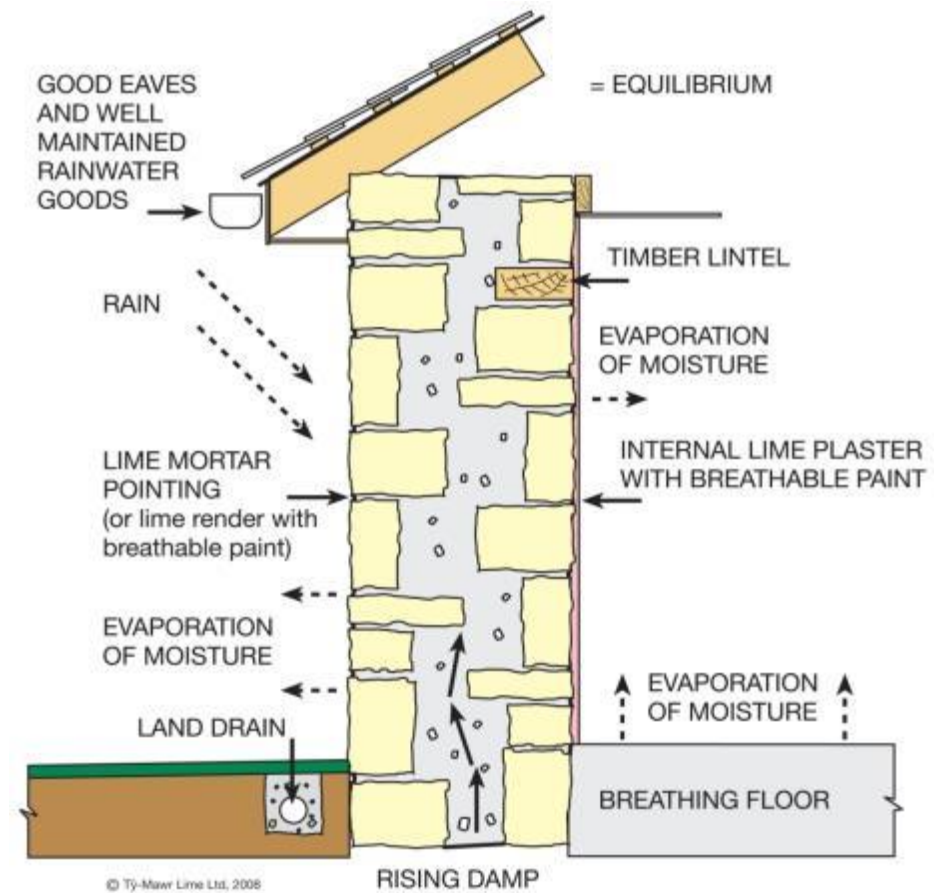
Hidden mould growth in cold climates  
(behind interior insulation)



# WOOD FIBRE AS INTERNAL INSULATION IN SOLID MASONRY WALLS

## Moisture Control in Solid Masonry Walls

Traditional  
approach  
("breathable")



Ref: Ty Mawr Lime

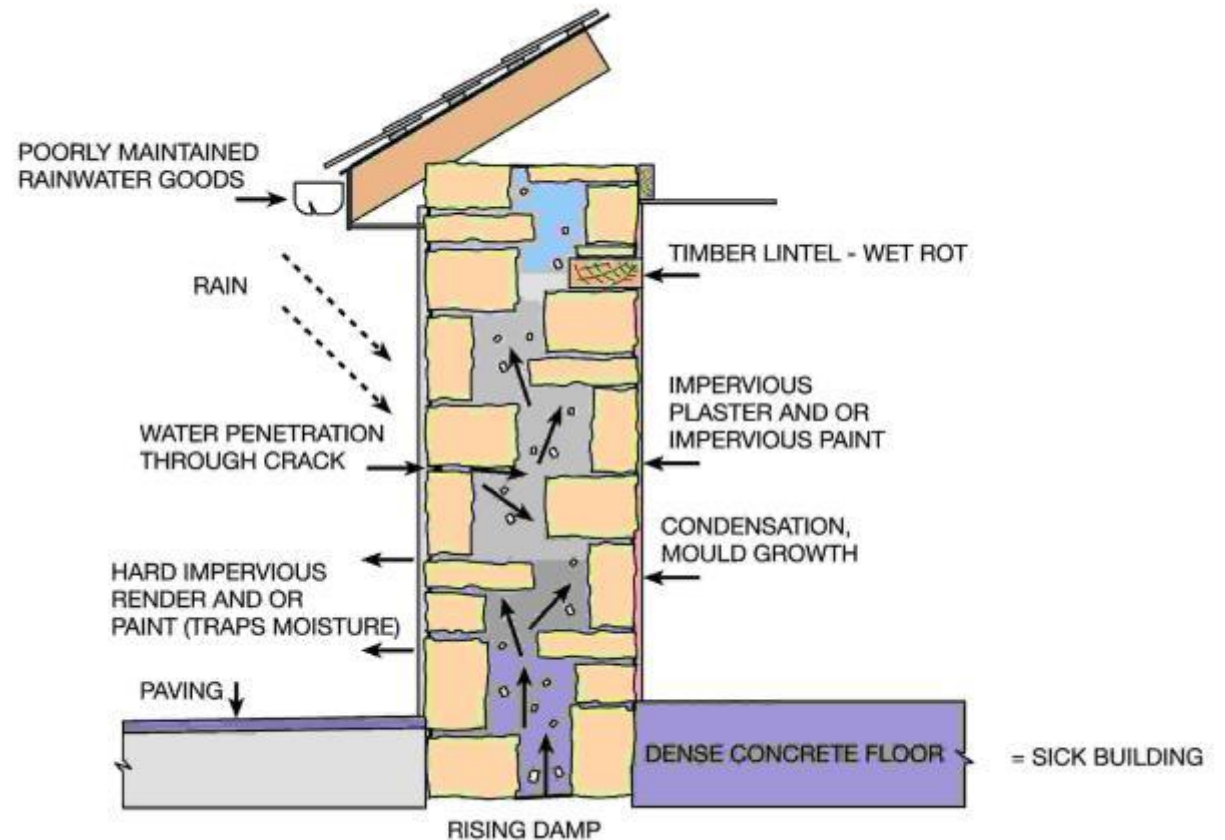


**ECOLOGICAL BUILDING SYSTEMS**

# WOOD FIBRE AS INTERNAL INSULATION IN SOLID MASONRY WALLS

## Moisture Control in Solid Masonry Walls

Contemporary approach  
(non “breathable”)



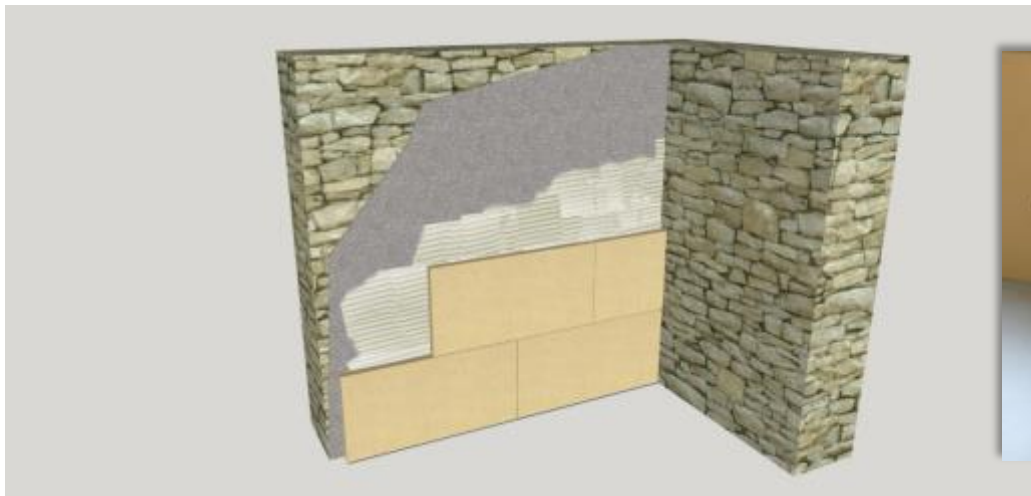
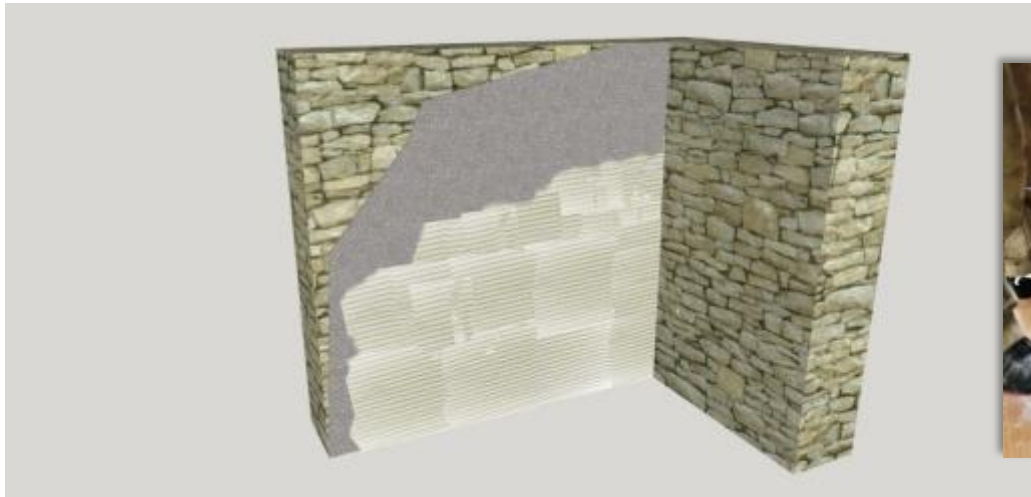
Ref: Ty Mawr Lime



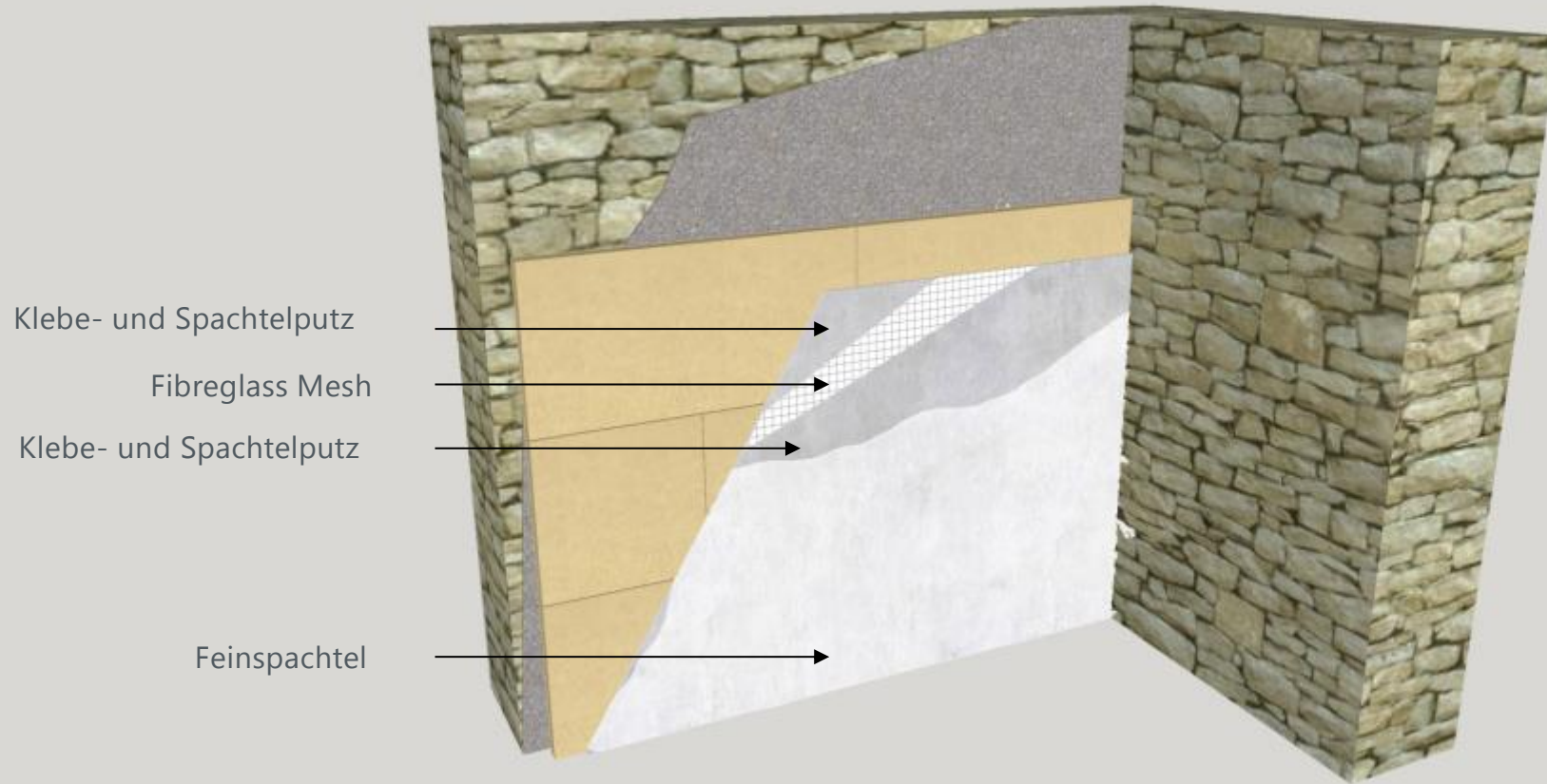
**ECOLOGICAL BUILDING SYSTEMS**



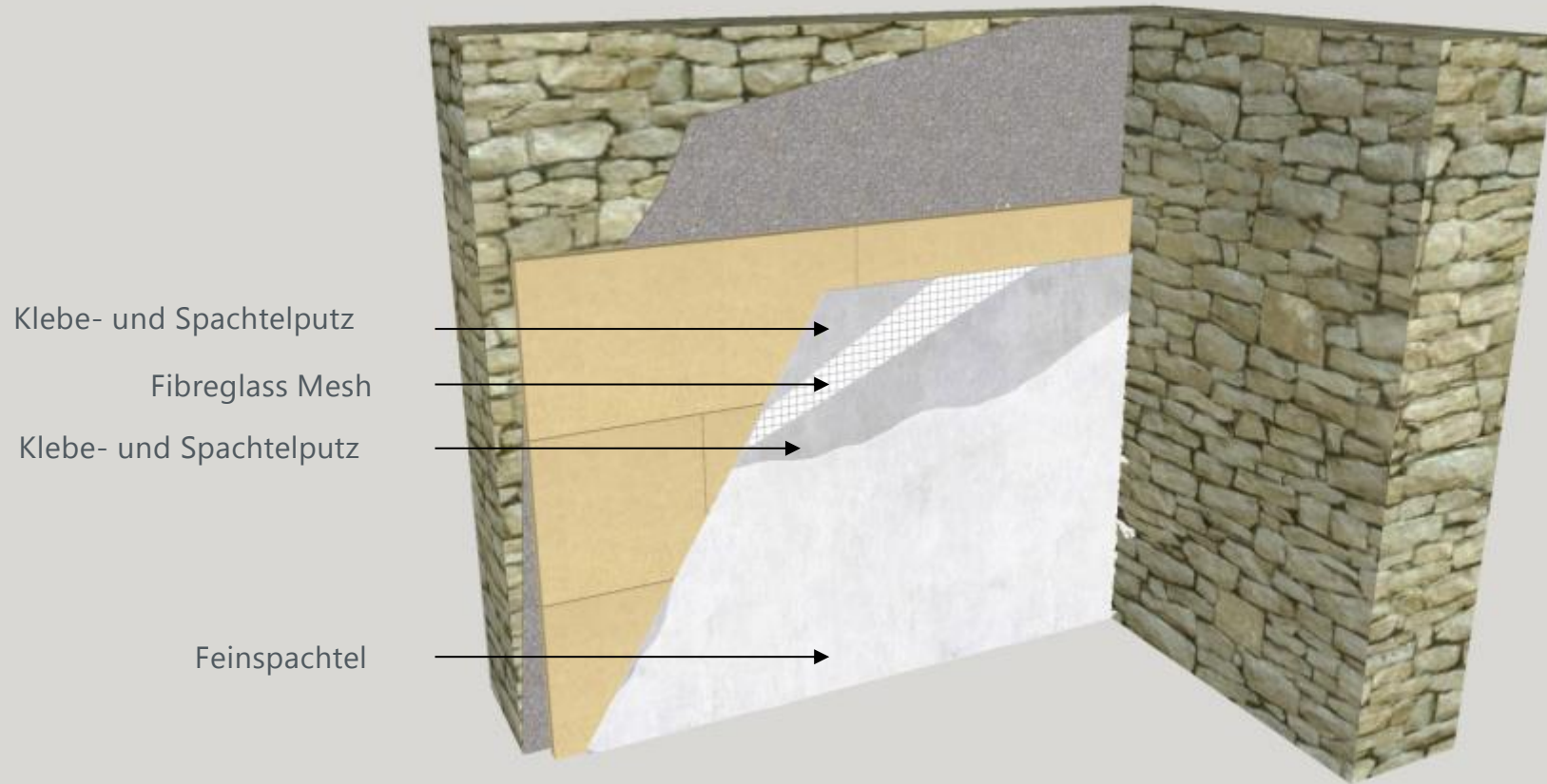
**Woodfibre insulation is FULLY BONDED to the wall.**



# Finishing layers (Klebe-Spachtelputz / Feispachtel)



# Moisture Vapour Diffusion Open Finishing Layers



Cost: 40mm ~£30/m<sup>2</sup>; 100mm ~£50/m<sup>2</sup>



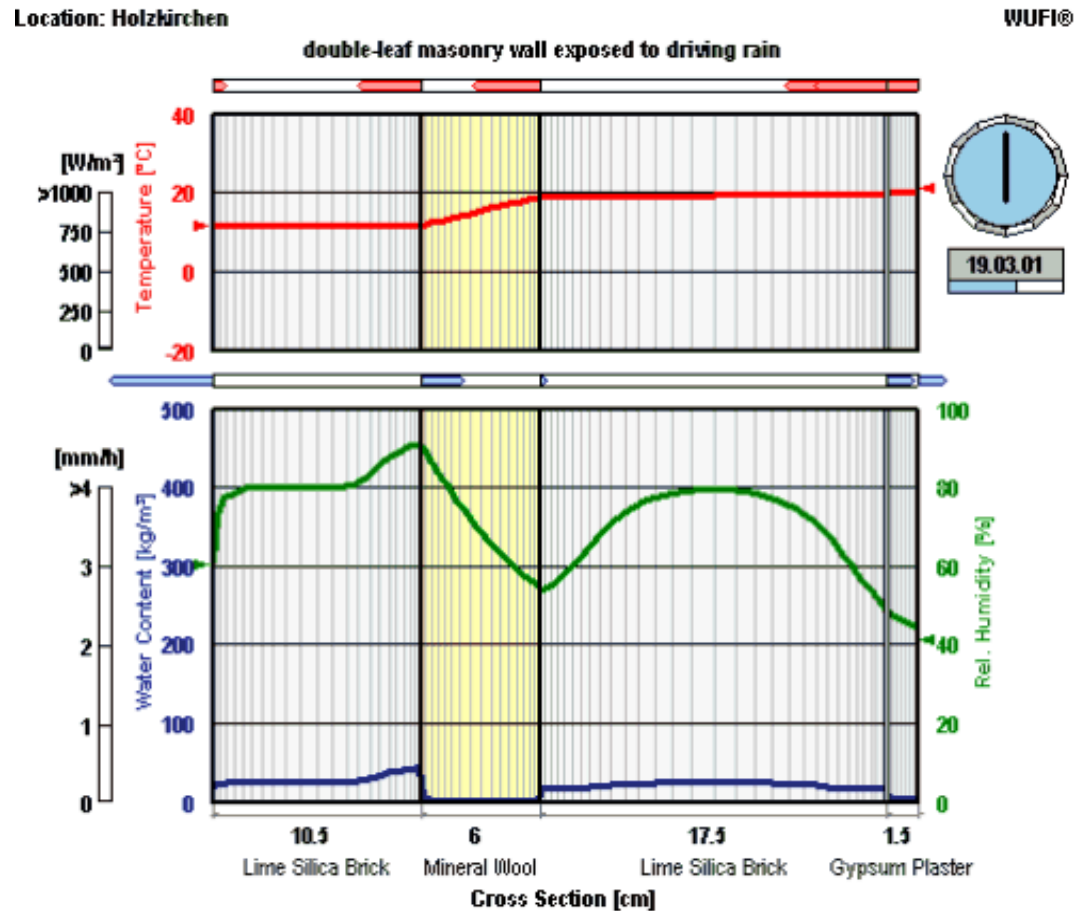
**ECOLOGICAL** BUILDING SYSTEMS

# AVOIDING THE RISKS

## Hygrothermal Modelling

Computer- assisted simulation program for heat and humidity transports (dynamic) WUFI

- Real climatic data
- Inside and outside temperature
- Inside and outside humidity
- Light absorption
- Moisture storage capability
- Capillary action  
(Data of one reference year at intervals of 1 hour)



Current EN 15026: 2007 provides higher accuracy compared with EN 13788:2011 in BS 5250.



# SUMMARY

- Compatible materials optimise vapour permeability of construction
- Outstanding thermal resistance up to Passivhaus/nZEB
- Fast installation makes building weathertight
- Carbon sequestering, compostable and more ecological
- Outstanding acoustic values
- Excellent heat protection (Low thermal diffusivity)
- Increased protection against mould
- Cost effective!





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