



# Implications of synergistic durability relationships on design of construction elements.

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COST FP1303

28<sup>th</sup> February – 1st March 2017

Sofia, Bulgaria



## Biomaterials in construction

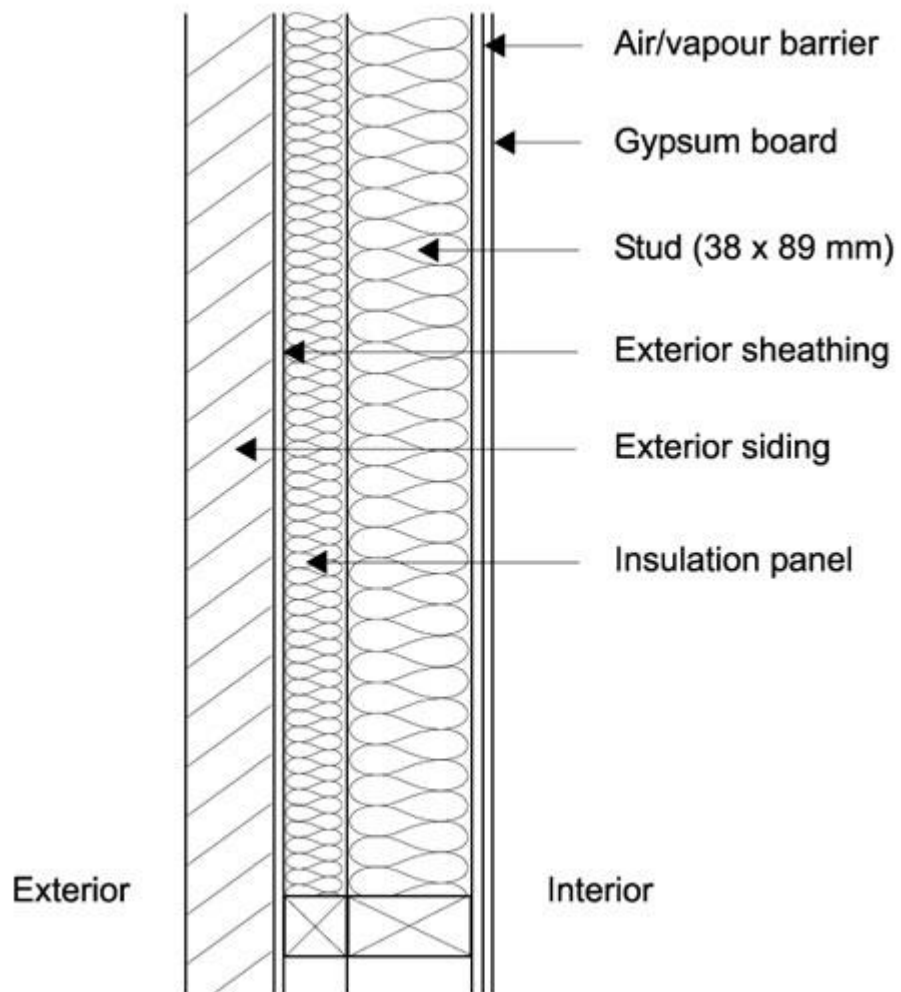
- Increasing use of non wood biobased materials
- Plant and animal fibre based materials
  - Insulation
  - Composites



## Standard wall building

- A simple wall concept is the multilayer approach
  - Sheathing – e.g. wood/brick/blockwork
  - Structural elements
  - Vapour barrier
  - Cavity insulation
  - Ideally breathable but water resistant







## SIPS

### Structural Insulated Panels

- Contain all the elements in a pre-formed module
- Uniform modules increases ease of construction
- Fast on-site construction



## Interaction of materials

- Materials interact with each other
- If biobased materials are used in combination what are the implications for durability
- Modelling based on properties?
- Testing – lab, field or service?



## Materials

- Sheep's wool
- Mineral wool
- Hemp insulation



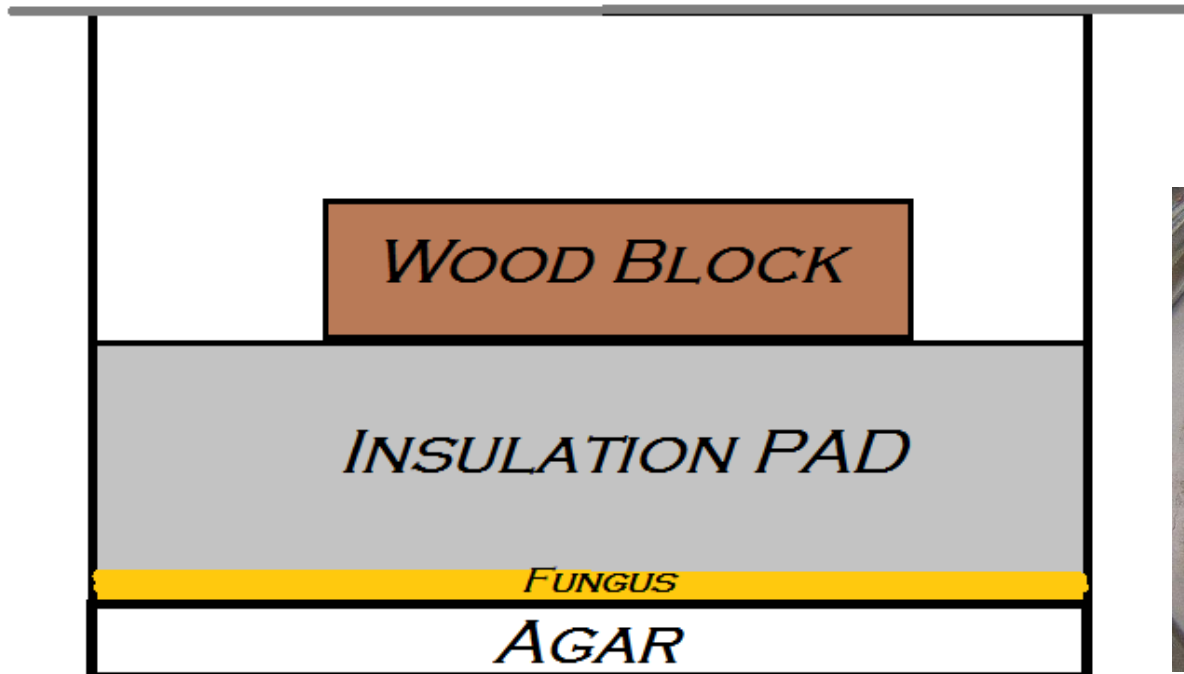
## Testing durability of materials in combination

- Based on EN 113
- Uses pad of insulation between fungus and wood block
- *Used Coniophora puteana* (brown rot)





## Test assembly



## Results!



- Low levels of growth with wool pads



## Mineral wool



- Growth on and decay of block evident



## Hemp!



Considerable growth  
and decay of both pad  
and block!

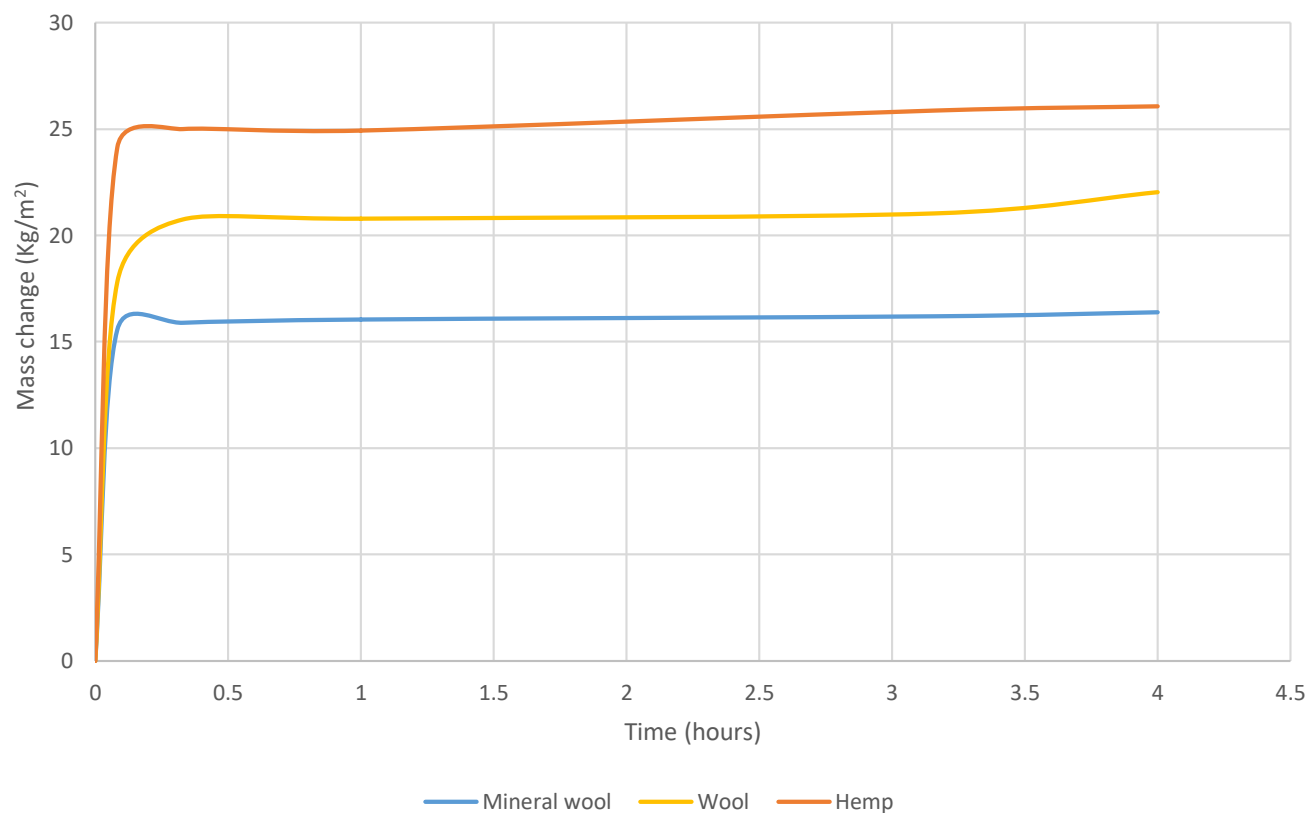


## Hygroscopic properties

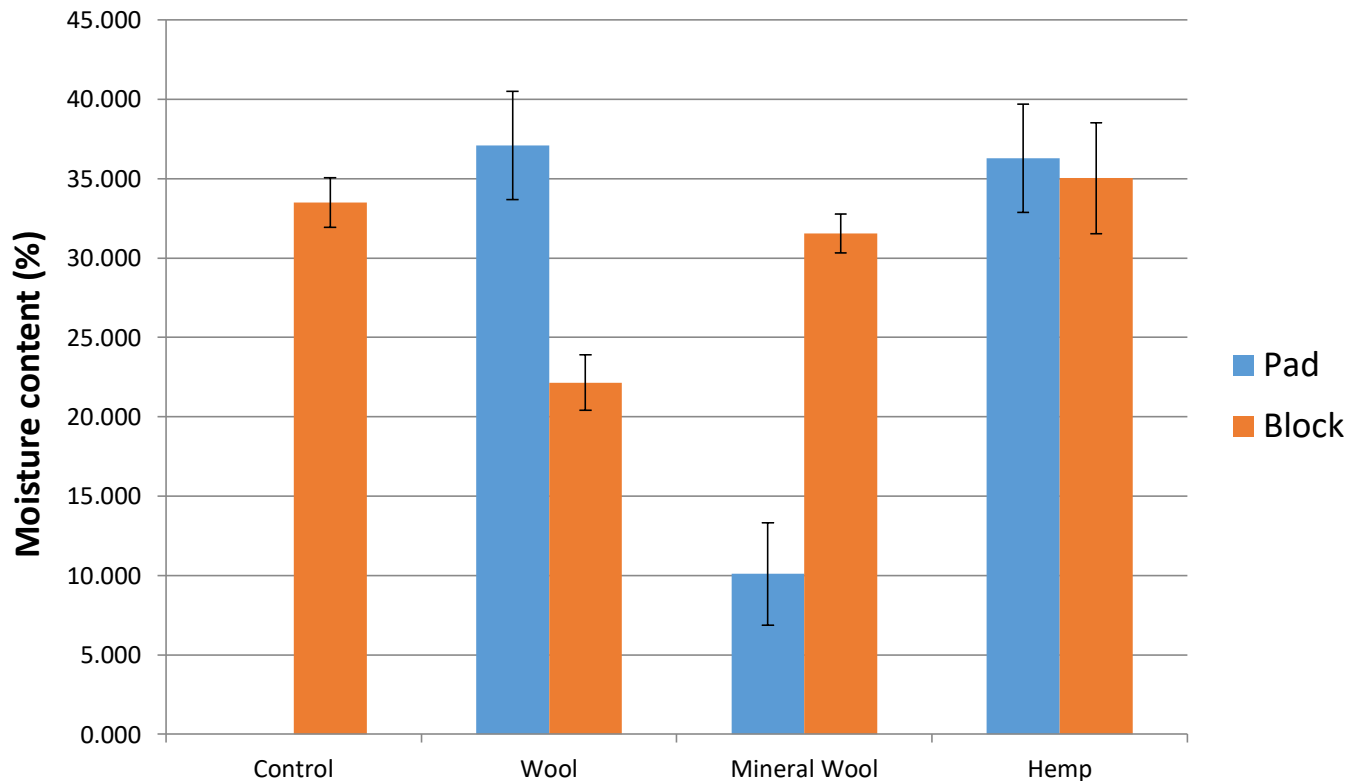
- Water absorption - partial immersion: EN 15148
  - Bottom of sample (>5mm) immersed into water
  - Uptake of water determined by mass change over time



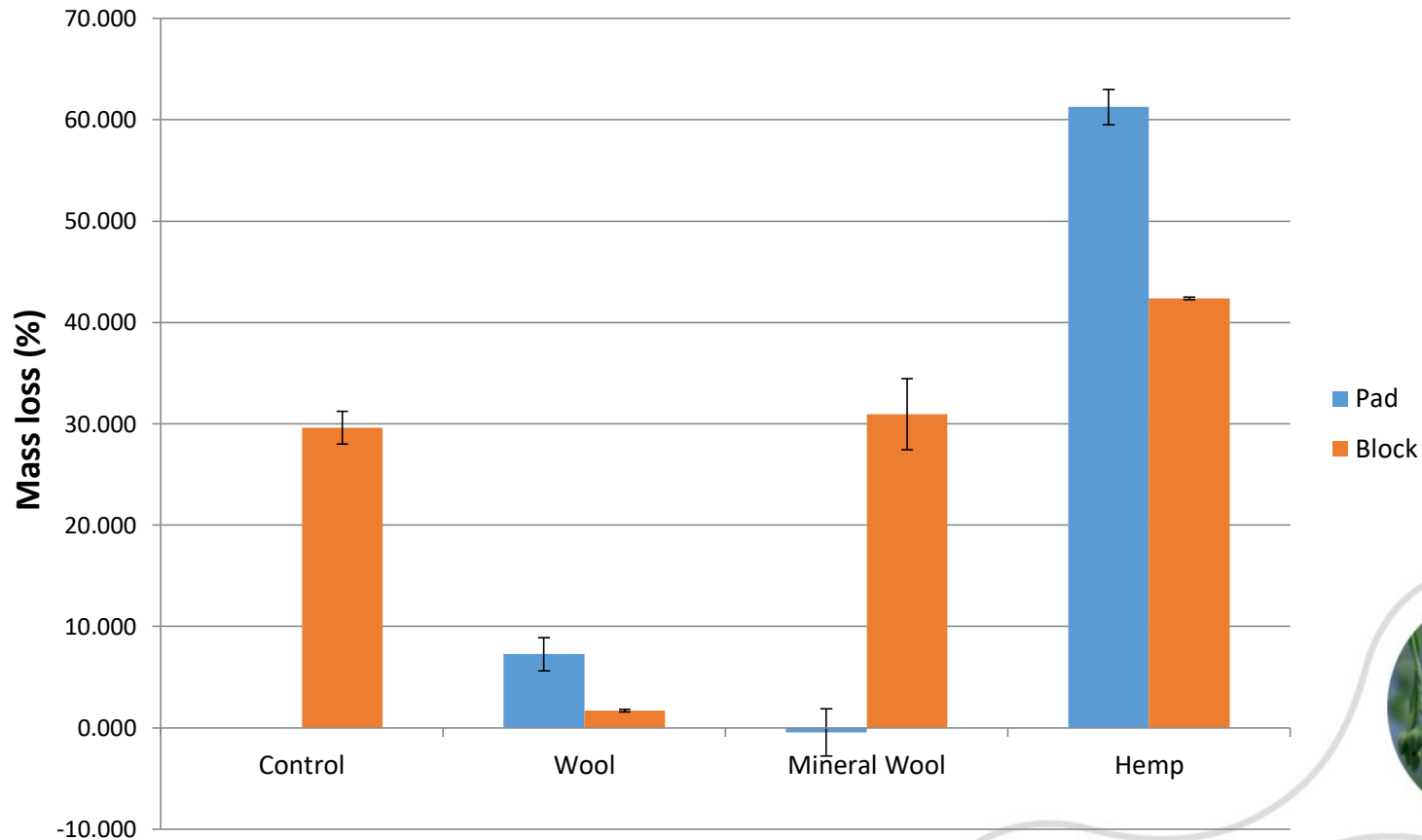
# Water absorption by partial immersion



## Post exposure moisture content



## Mass loss





## Summary

- Wool/wood combination has lower wood mass loss than controls
- Hemp/wood combination has higher wood mass loss than controls
- Mineral wool did not affect mass loss



## Conclusion

- Some combinations of materials can affect the durability of the timber elements
- Depending on the material used in combination this effect can be either **+ve** or **-ve** for durability



## Implication

- During the design of components an understanding of the materials and the hazards/risks is essential.
- However, materials must be considered not just as singular components but as part of a unit
- Interactions between materials need to be understood and tested.





## Acknowledgements



This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 609234





Thank you for listening

Any questions?

