FH Salzburg
University of Applied Sciences

ZENTRUM
ALPINES
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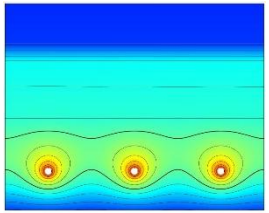
Thermally Activated Building Systems in Timber structures

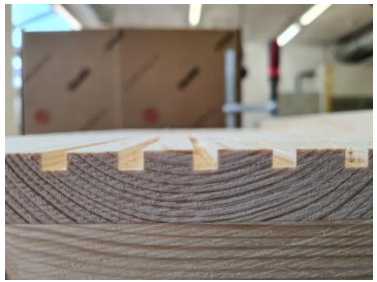
DI Michael Moltinger

competent
relevant
sustainable

TABS in Timber- Methodology

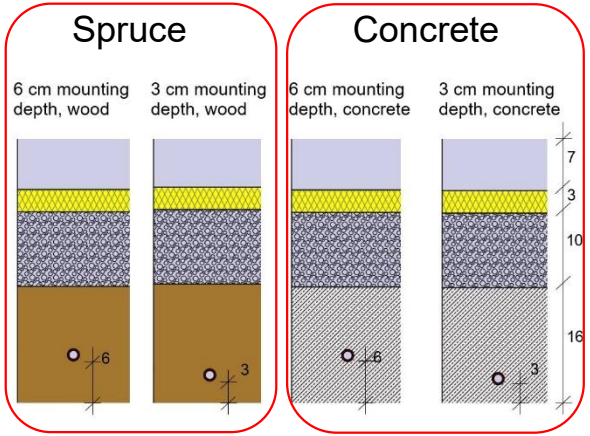
- Component models- 2D simulation
- Prototype construction (60x60 cm) with laboratory testing (Project aHolz/Woodactivation)
- Scaling up to 3 m² Monitoring phase (winter/summer)
- Implementation: Commercial construction in 2026, Salzburg (12 residential units, Lanserhofsiedlung)

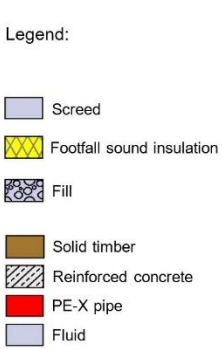


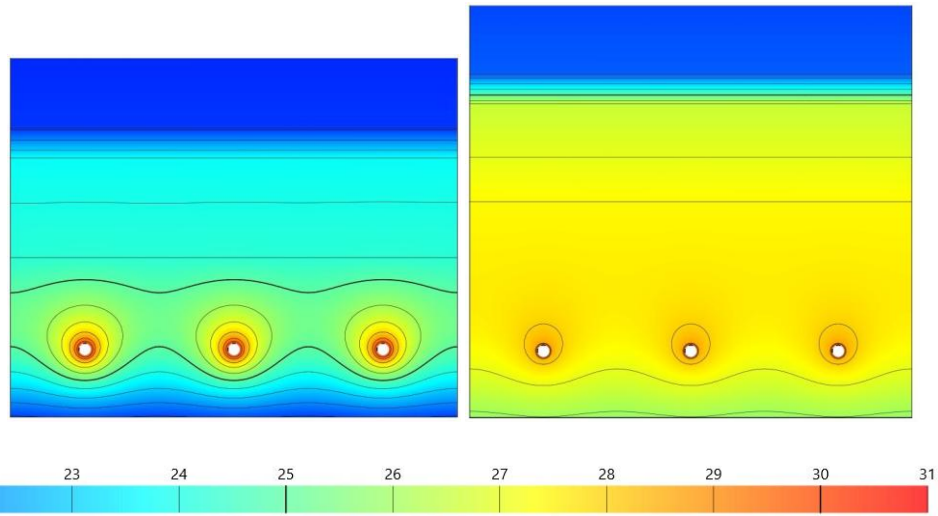


TABS in Timber

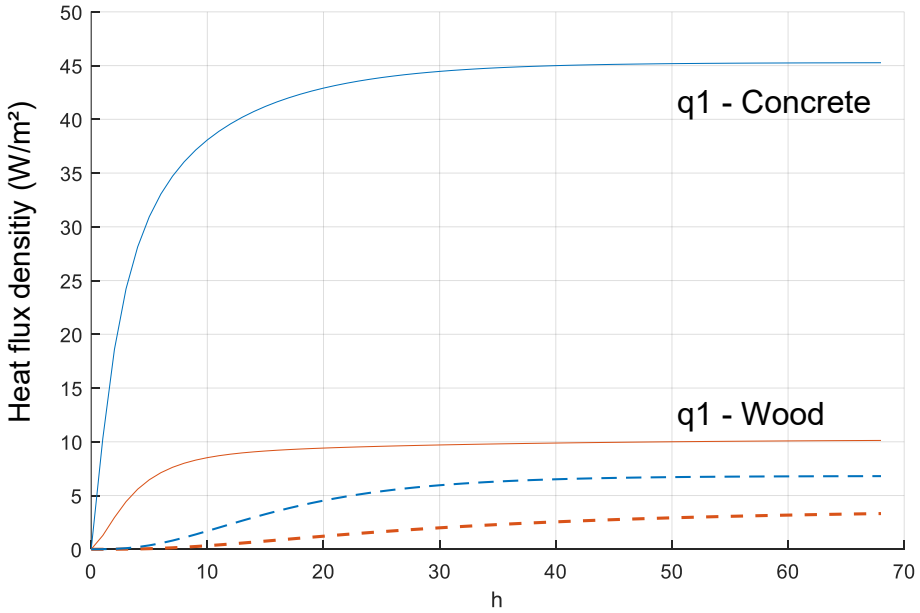
- Design temperature for heating
- Design temperature for cooling
- thermal storage
- load shifting
- integration of renewable energy



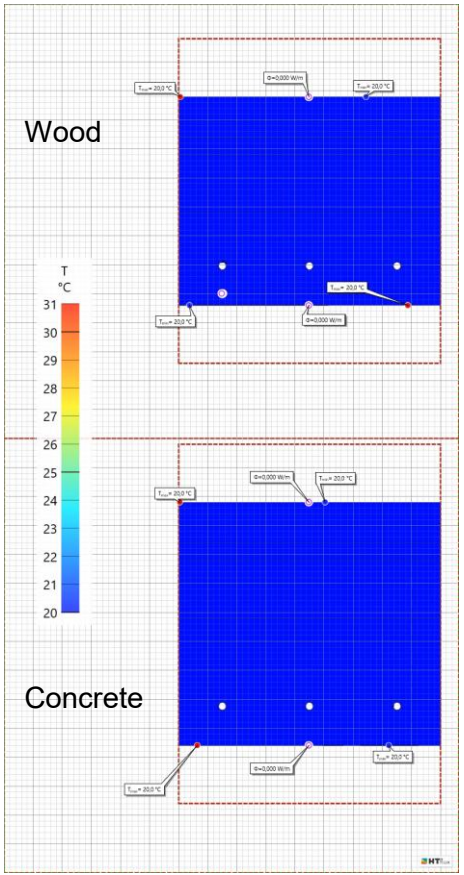




Heat-up process of TABS



- Fluid temperature = 30 °C
- Pipe distance= 15 cm
- Coverlayer= 6cm



Comparison of heat flux density

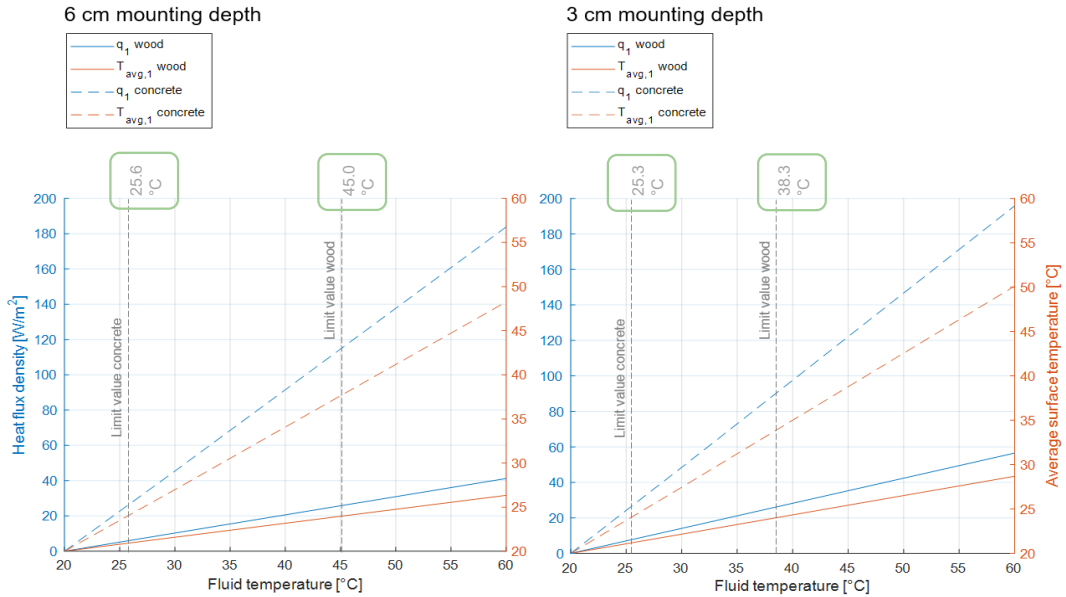
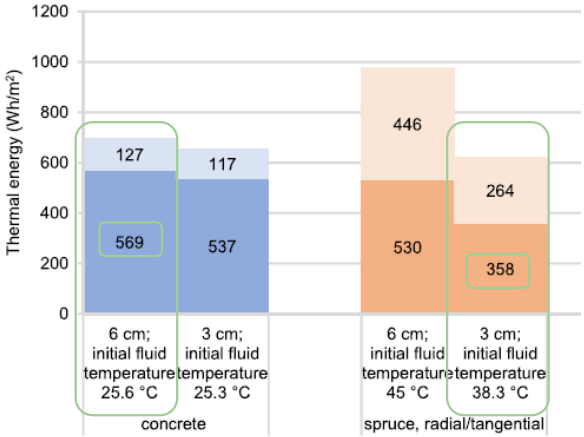


Fig: Comparison of heat flux density and average surface temperature as a function of the fluid temperature for a mounting depth of 6cm (left) and 3 cm (right) for TABS in concrete and wood

(Heidenthaler, D., Leeb, M., Schnabel, T. & Huber, H. 2021)

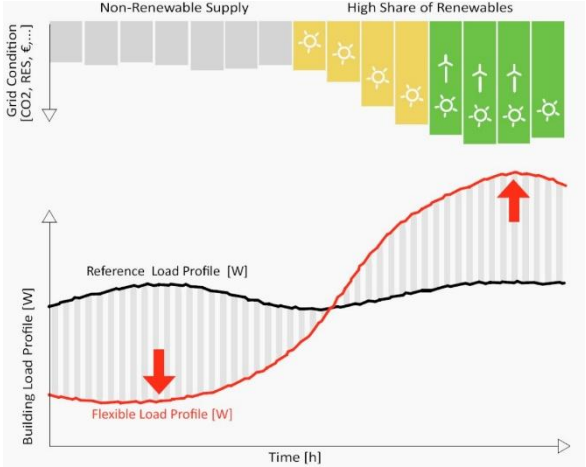
Comfort criteria:
4 K temperature difference between air temperature and surface temperature (ca 26 W/m²)

Comparison of thermal energy storage



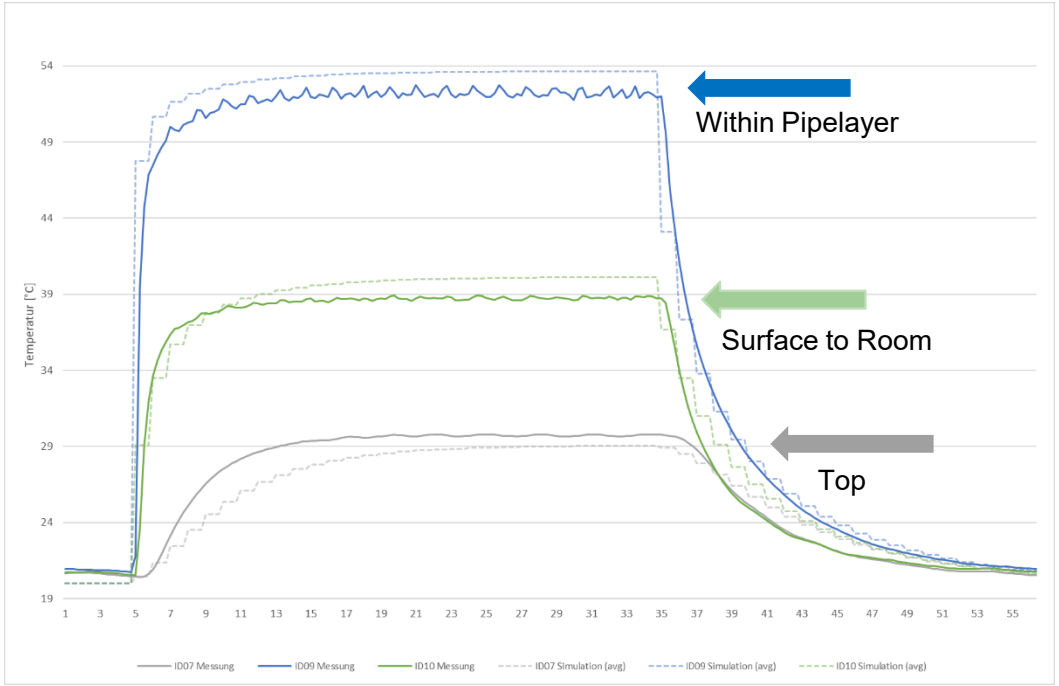
Same heat flux with 26 W/m²

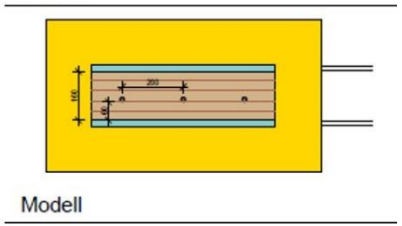
Fig: Comparison of the thermal energy storage potential of the concrete and wooden variants for two different mounting depths, basic variants. (Heidenthaler, D., Leeb, M., Schnabel, T. & Huber, H. 2021)



Source: Energy-Flexible Zero-Energy Buildings – The impact of building design on energy flexibility (Tobias Weiss, 2019)

Comparison of heat flux density



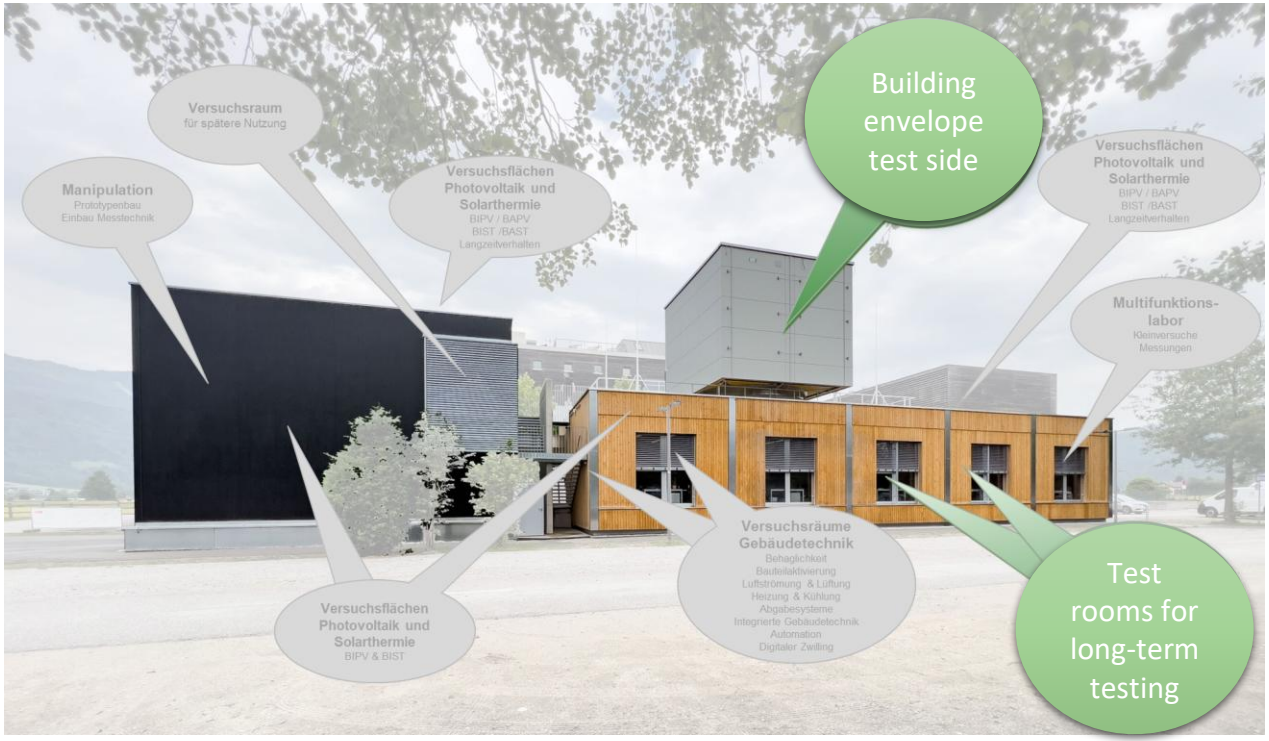


Prototype 60x60cmx16cm

Maximum Heat 60°C Pre Flow

Comparison Simulation- Prototype Test

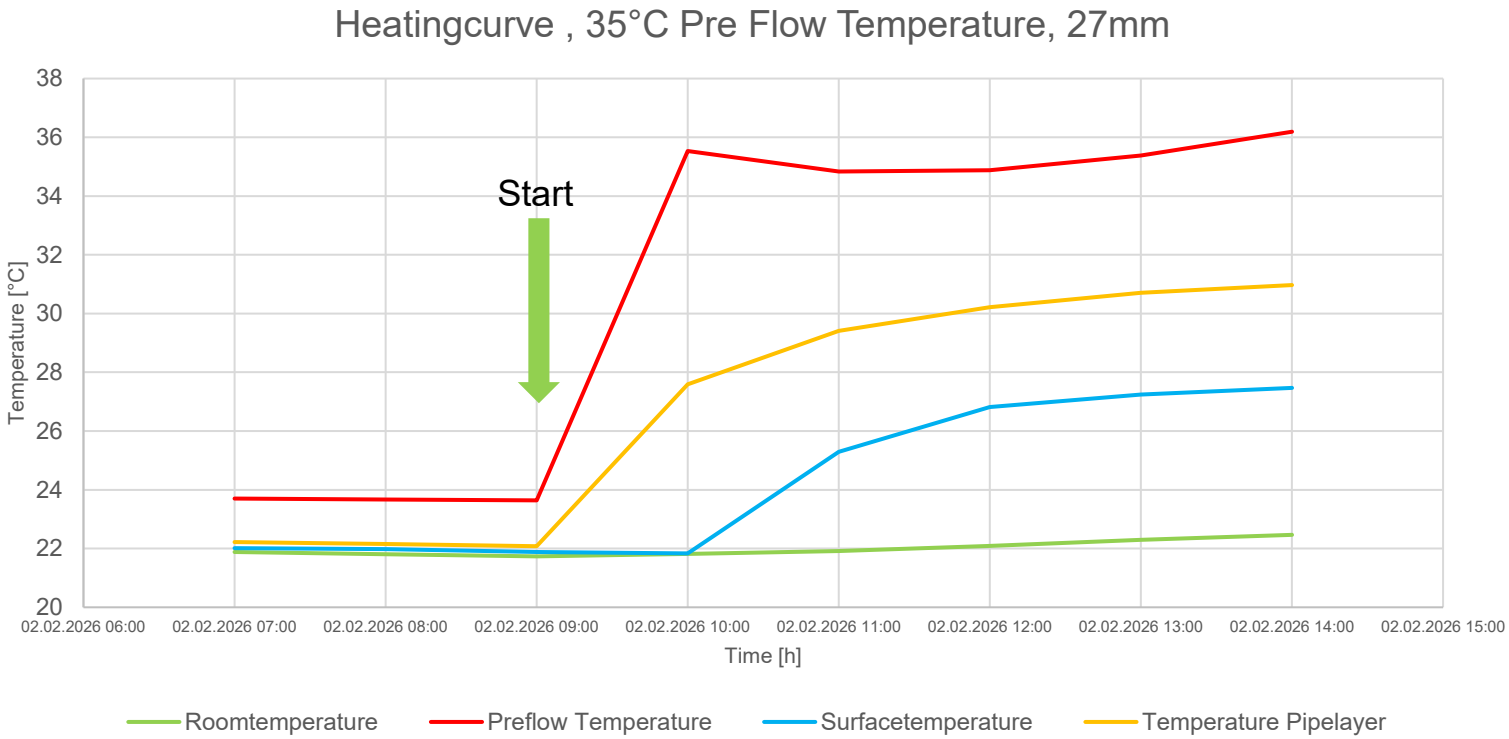
Building test bench



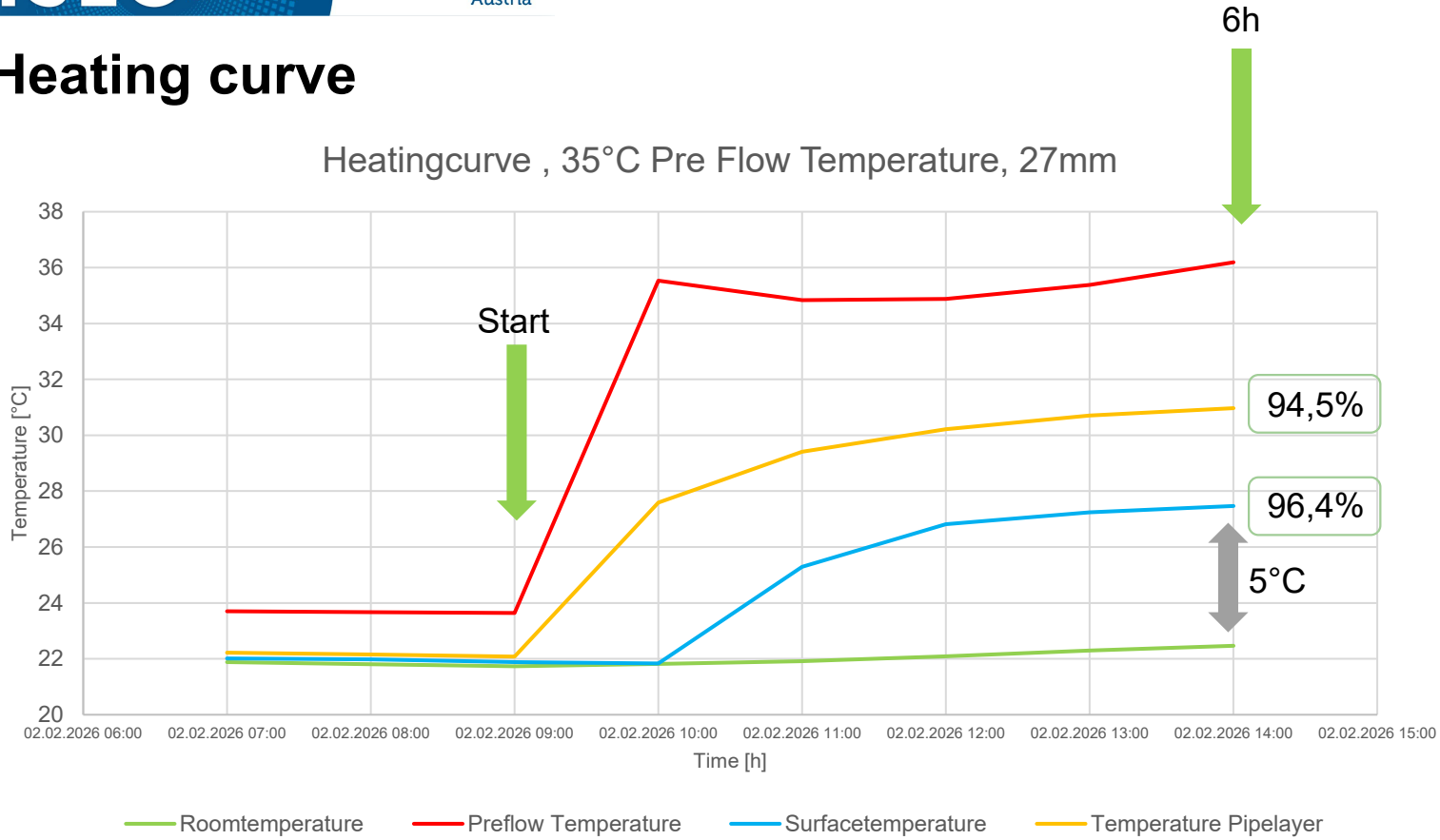
Construction- TABS Element

Construction

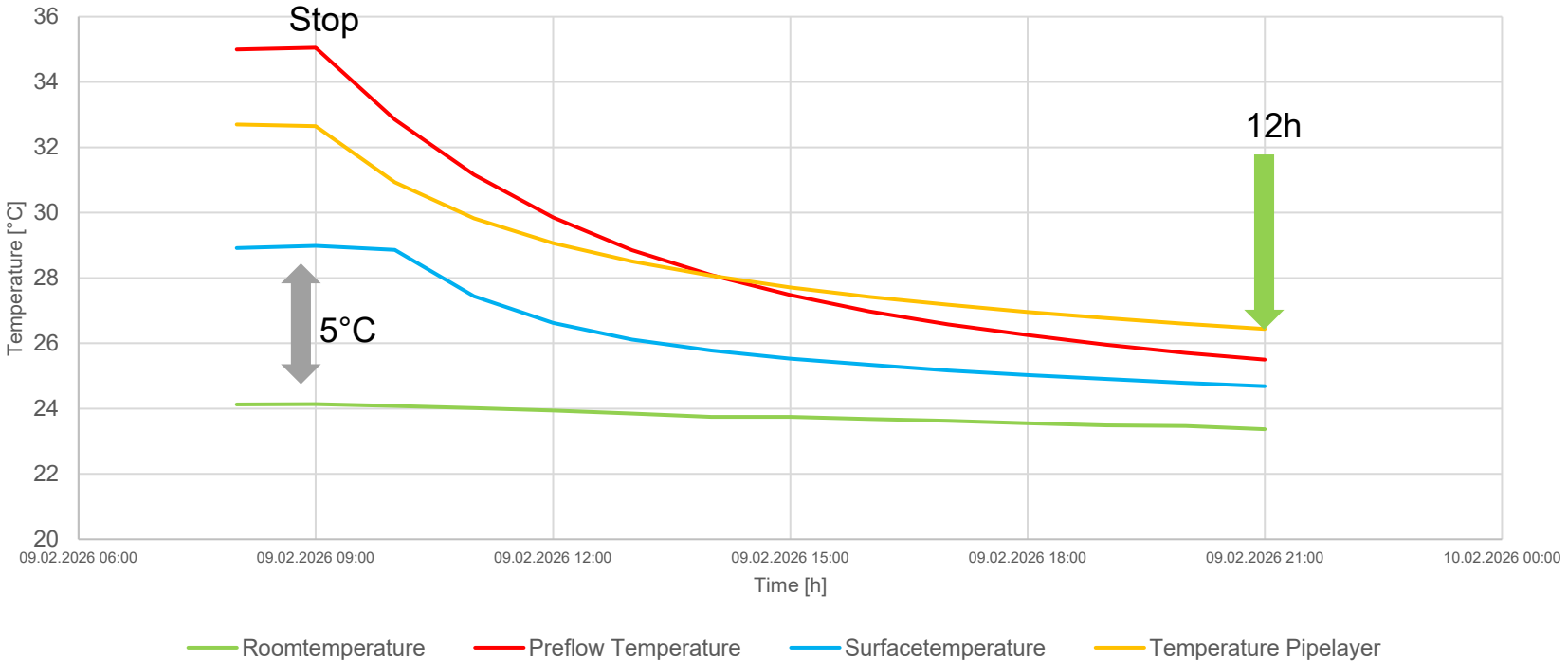
Heating curve



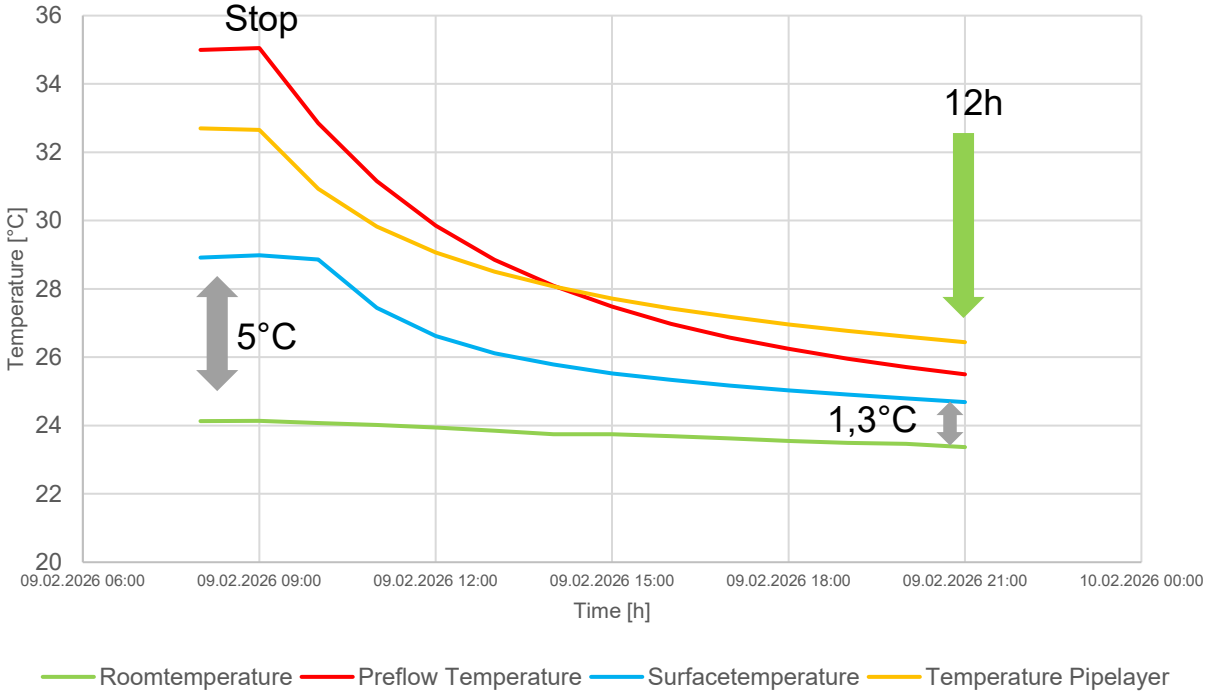
Heating curve



Cooling Off-Phase, Storage Potential



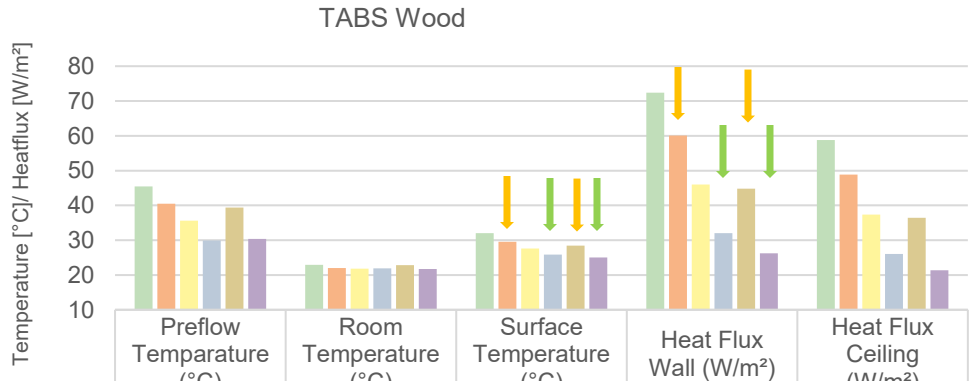
Cooling Off-Phase, Storage Potential



36h: Surfacetemperature = Roomtemperature : 23,11°C

72h: Temperature of Pipelayer = Roomtemperature

Test Results Heating



		Preflow Temparature (°C)	Room Temperature (°C)	Surface Temperature (°C)	Heat Flux Wall (W/m²)	Heat Flux Ceiling (W/m²)
	Variante 1 45°C_27mm	45,45	22,95	32	72,4	58,8
40°C	Variante 2 40°C_27mm	40,45	22,02	29,53	60,1	48,84
	Variante 3 35°C_27mm	35,57	21,86	27,61	46	37,37
30°C	Variante 4 30°C_27mm	29,94	21,9	25,9	32	26
40°C	Varainte 5 40°C_42mm	39,4	22,87	28,47	44,8	36,4
30°C	Variante 6 30°C_42mm	30,4	21,75	25,03	26,24	21,32

Variante 1 45°C_27mm Variante 2 40°C_27mm Variante 3 35°C_27mm
Variante 4 30°C_27mm Varainte 5 40°C_42mm Variante 6 30°C_42mm

Conclusion

- The thickness of the top layer has a significant impact on heat storage and heat flow
- The process of heating the wood until the first heat begins to flow from the wall into the room is faster than expected
- Within a 27mm topcover, there is already after 6h **95%** of the maximum heat flux available.
- With a thinner top layer (27 mm), a flow temperature of 30°C is sufficient to achieve a heat flux of 26 W/m² (4 K temperature difference between the surface and room temperature)
- Outlook: Implementation in a commercial construction in the end of 2026, Salzburg (12 residential units, Lanserhofsiedlung)

Contact details:

DI **Michael Moltinger**, BSc
michael.moltinger@fh-salzburg.ac.at

Zentrum Alpines Bauen

www.alpinesbauen.at

Twin²Sim:

https://www.fh-salzburg.ac.at/forschung/forschungsgruppen/smart-building-und-smart-city/twin2sim

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References

Heidenthaler, D. (2020). Bauteilaktivierung im Holzbau - Untersuchung der Funktionstauglichkeit anhand einer Parameterstudie [Master's thesis]. Salzburg University of Applied Sciences, Salzburg.

Heidenthaler, D., Leeb, M., Schnabel, T. & Huber, H. (2021). Comparative analysis of thermally activated building systems in wooden and concrete structures regarding functionality and energy storage on a simulation-based approach. Energy, 233, 121138. https://doi.org/10.1016/j.energy.2021.121138