

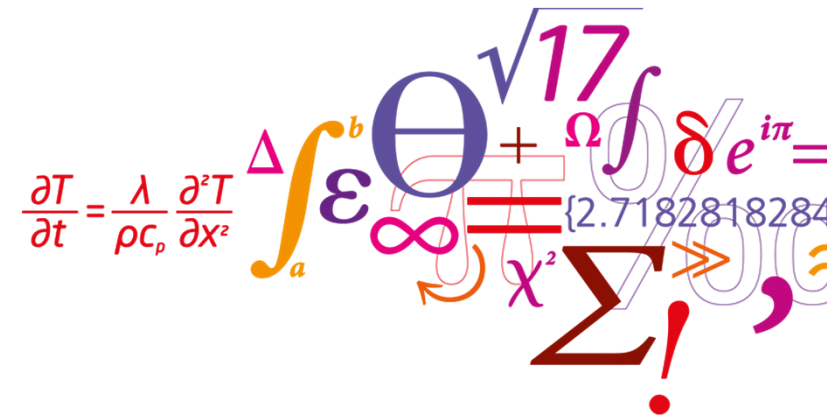
# Indvendig efterisolering af massiv murværk

## Forskningsprojekt

Nickolaj Feldt Jensen  
 Ph.D. Studerende, DTU Byg

**DTU Civil Engineering**  
 Department of Civil Engineering

---



# Forsøgsopstillingen på DTU



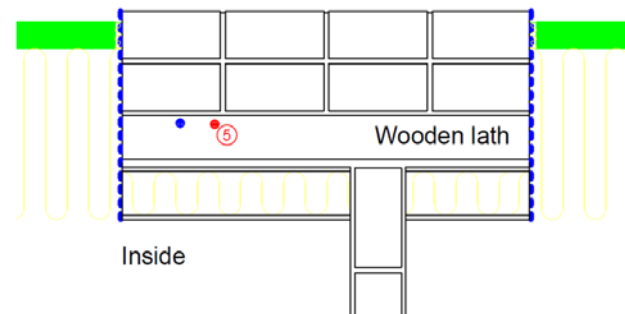
# Forsøgsopstillingen på DTU

①

- 24 væg konstruktioner med indbyggede træ elementer
- 7 isoleringssystemer\*
- Undersøgelse af vægge med/uden hydroforbering af udvendige overflade
- Undersøgelse af effekten af en tilsigtet kuldebro

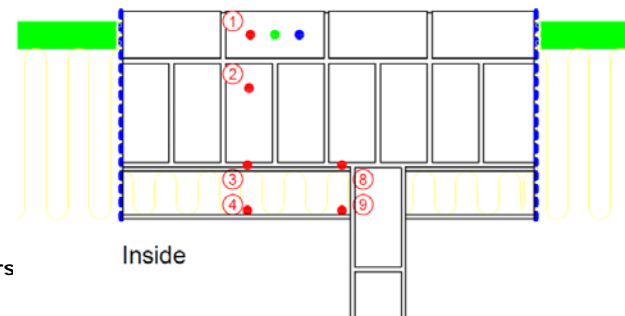
②

Outside  
Course 13: Layer of wooden lath

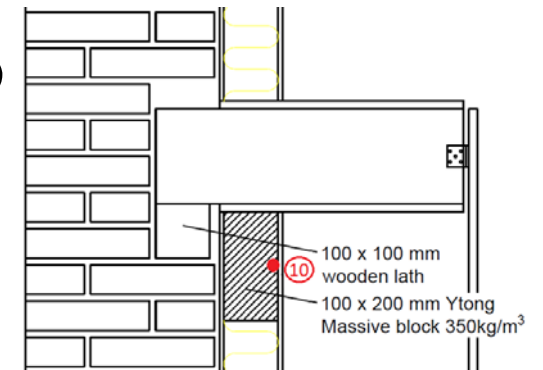


③

Outside  
Course 21: Measuring equipment



④



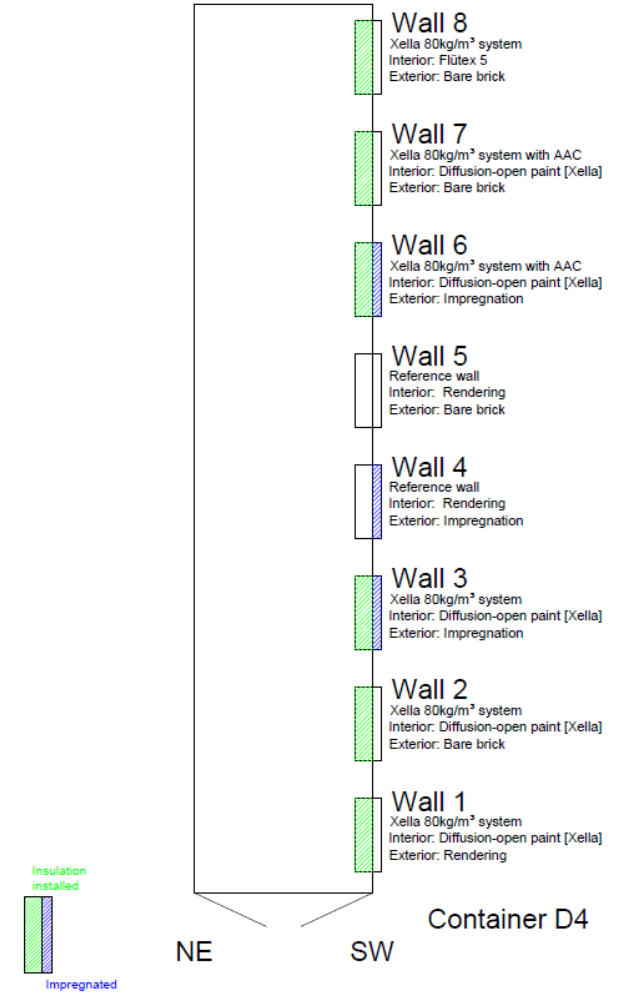
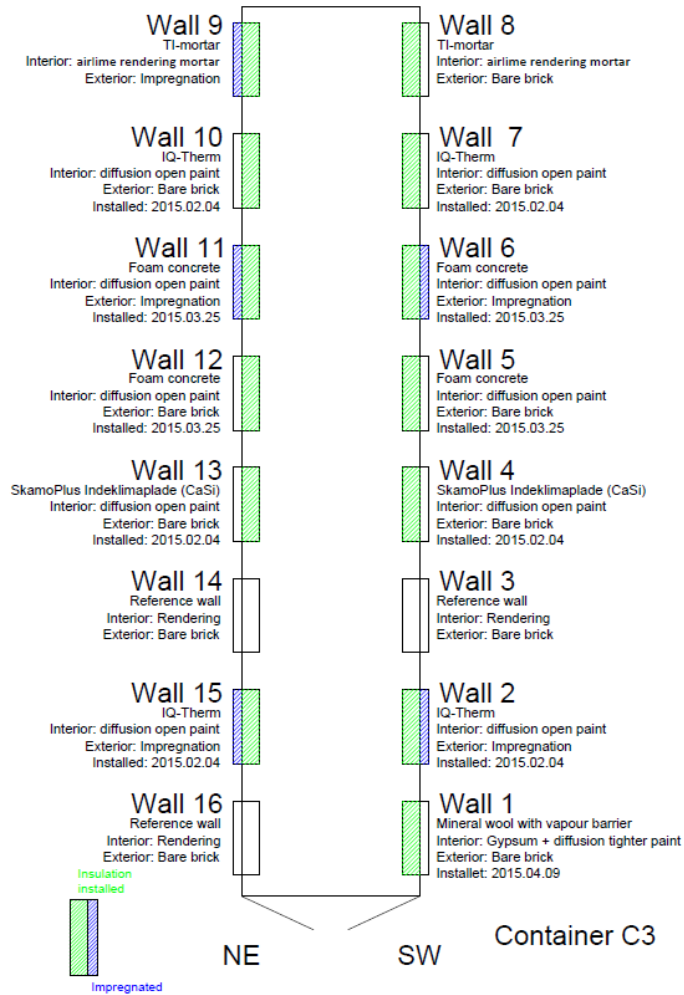
● HYT221 Digitale sensorer

● Træ dyvel modstandsmålere

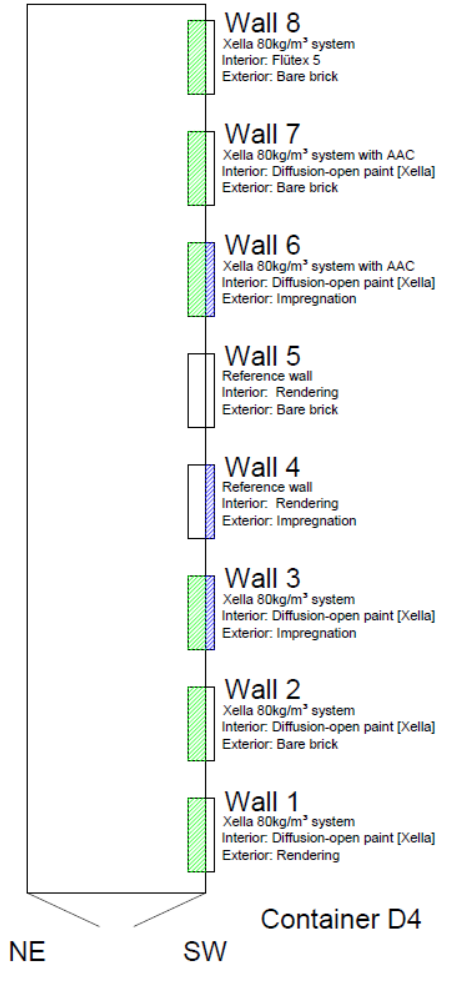
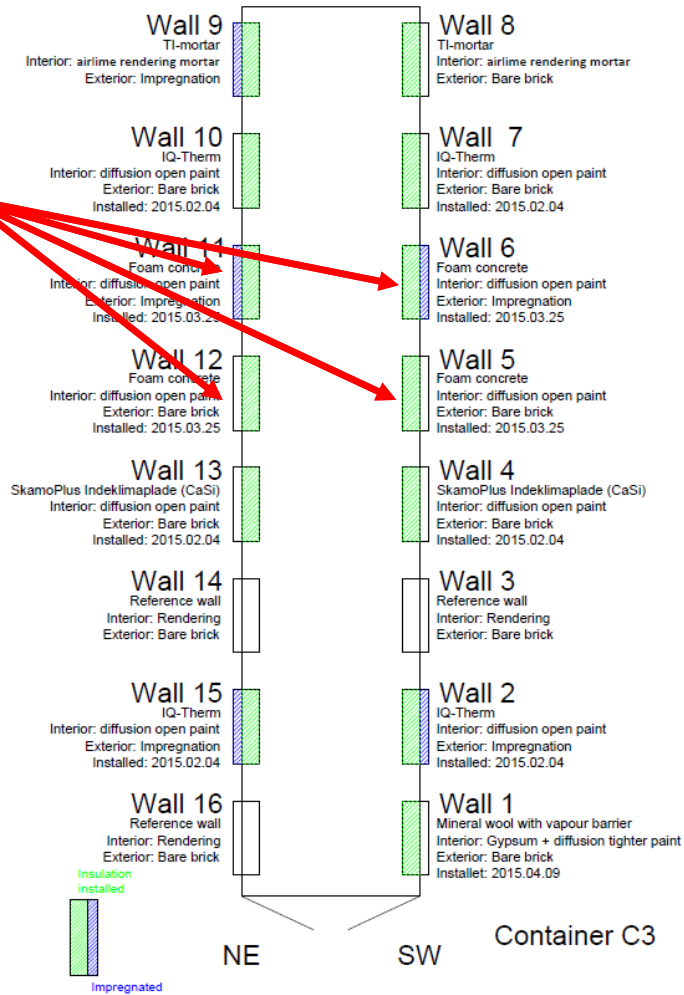
● Gips dyvel modstandsmålere

\*Mineral uld, Multipor, Kalcium silikat, IQ-Therm, DTU skum beton, TI isoleringspuds, og HygInsu

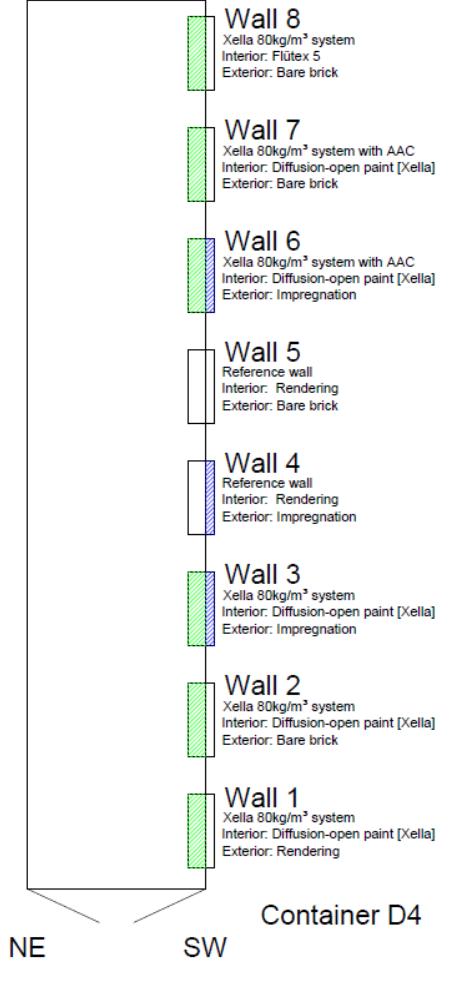
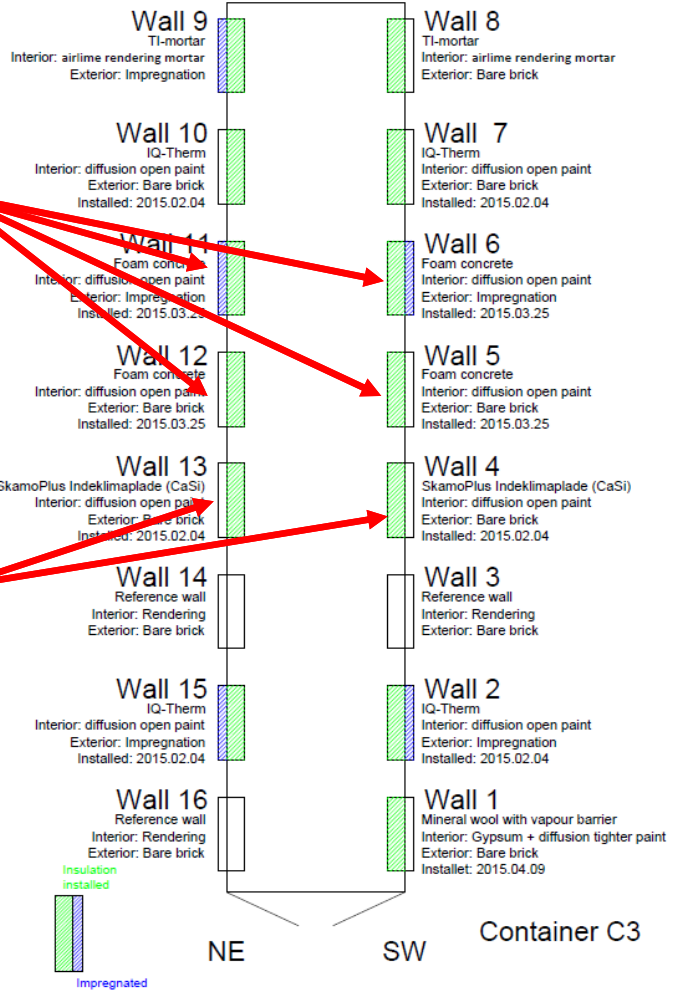
# Forsøgsopstillingen på DTU



# Forsøgsopstillingen på DTU

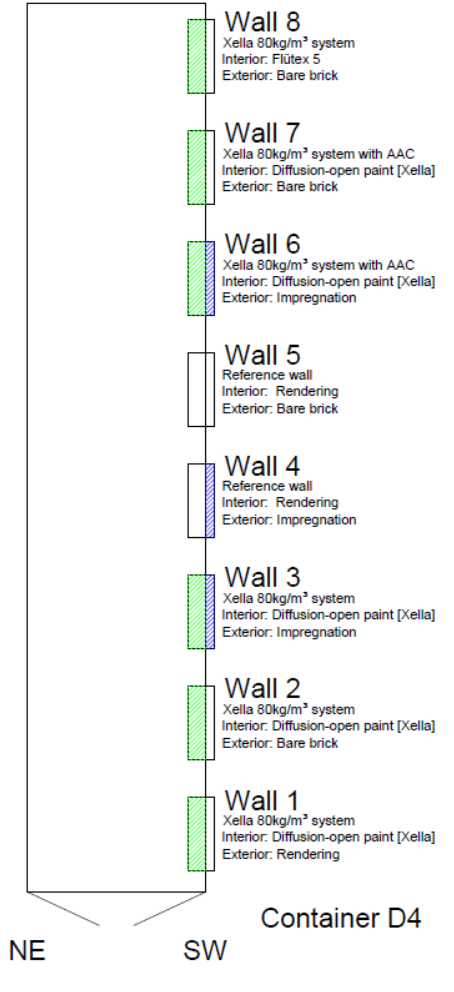
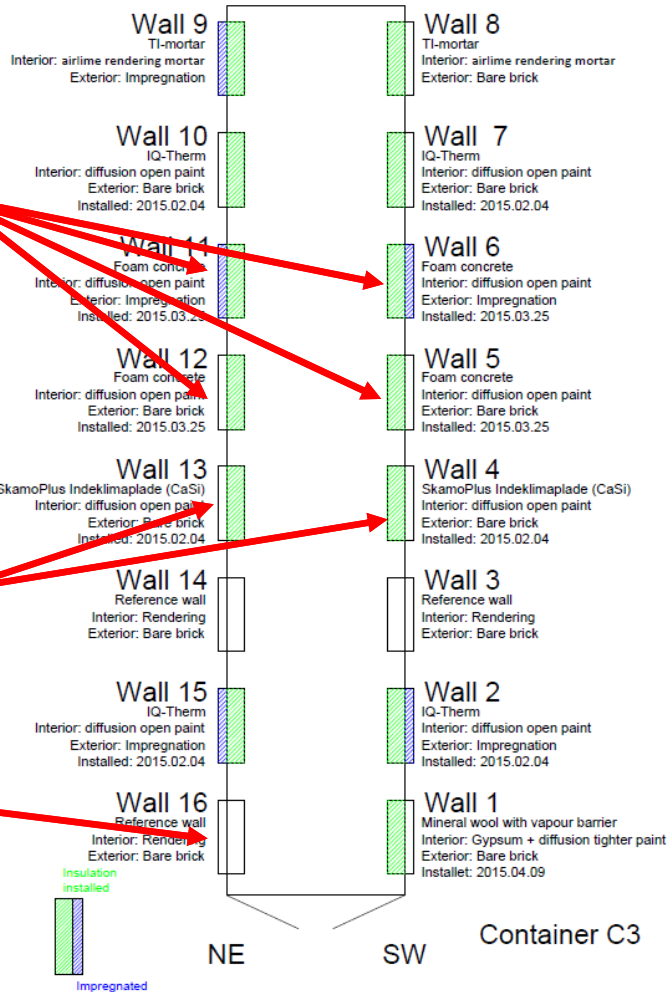


# Forsøgsopstillingen på DTU



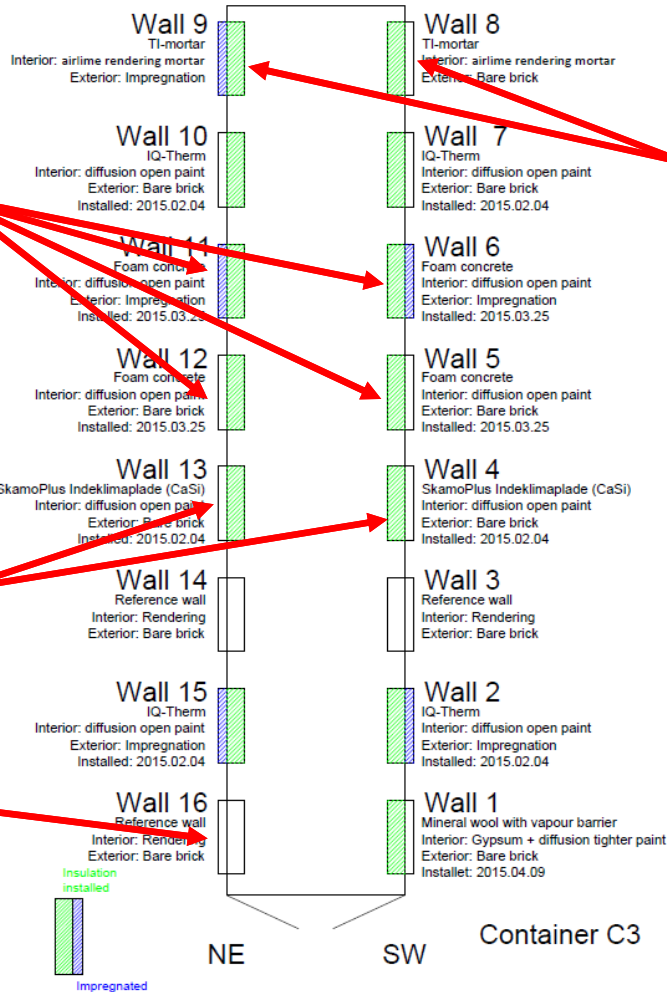
# Forsøgsopstillingen på DTU

DTU

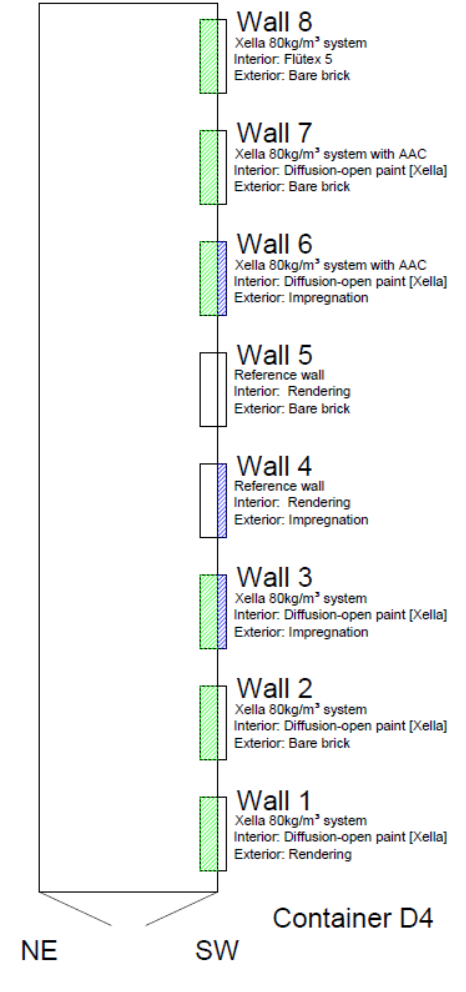


**HyglInsu**

# Forsøgsopstillingen på DTU



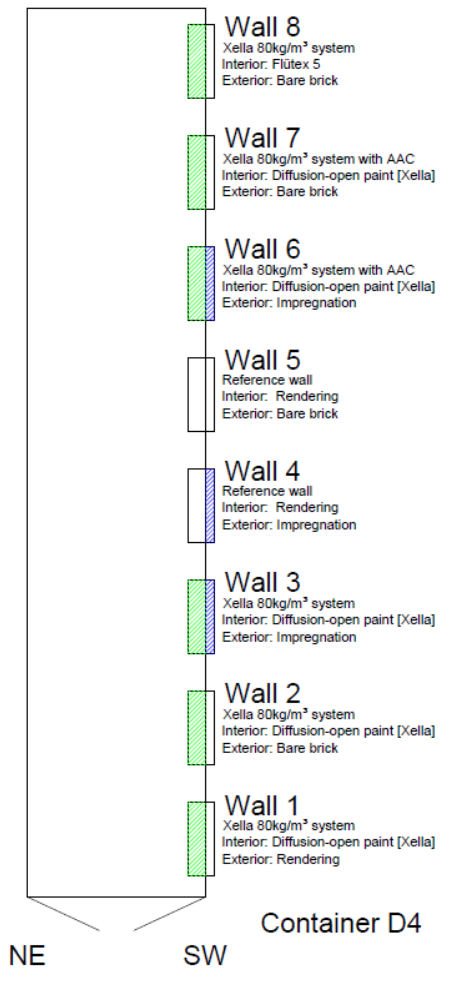
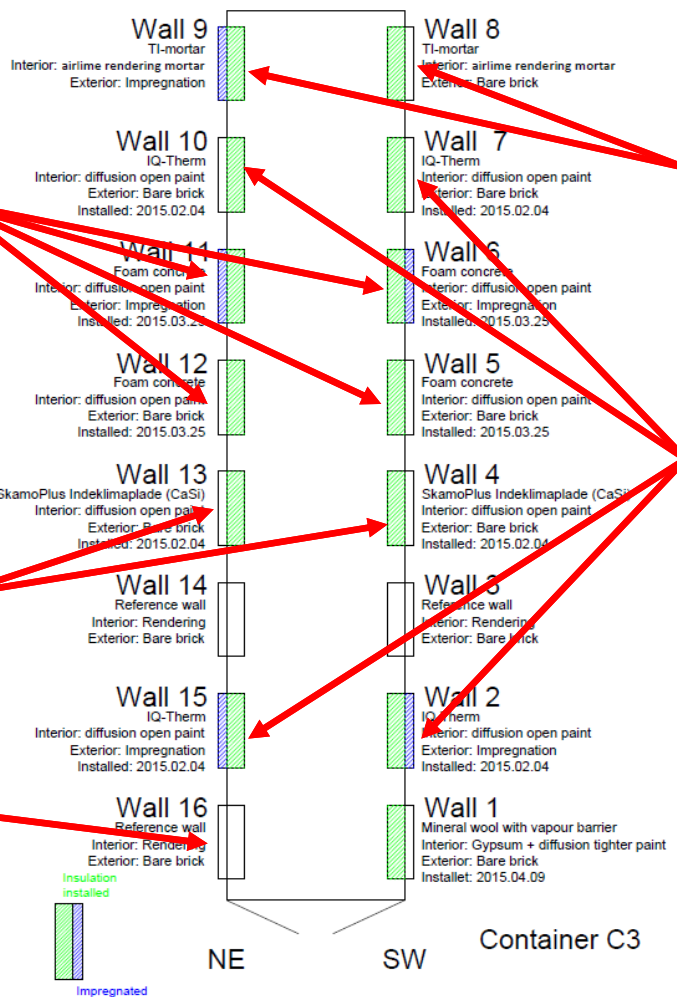
**Hygl Insu**





# Forsøgsopstillingen på DTU

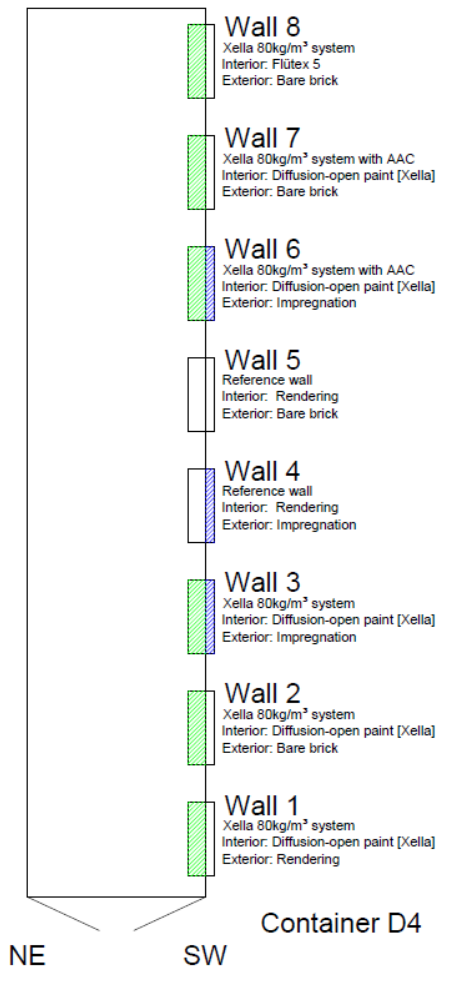
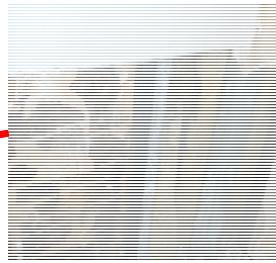
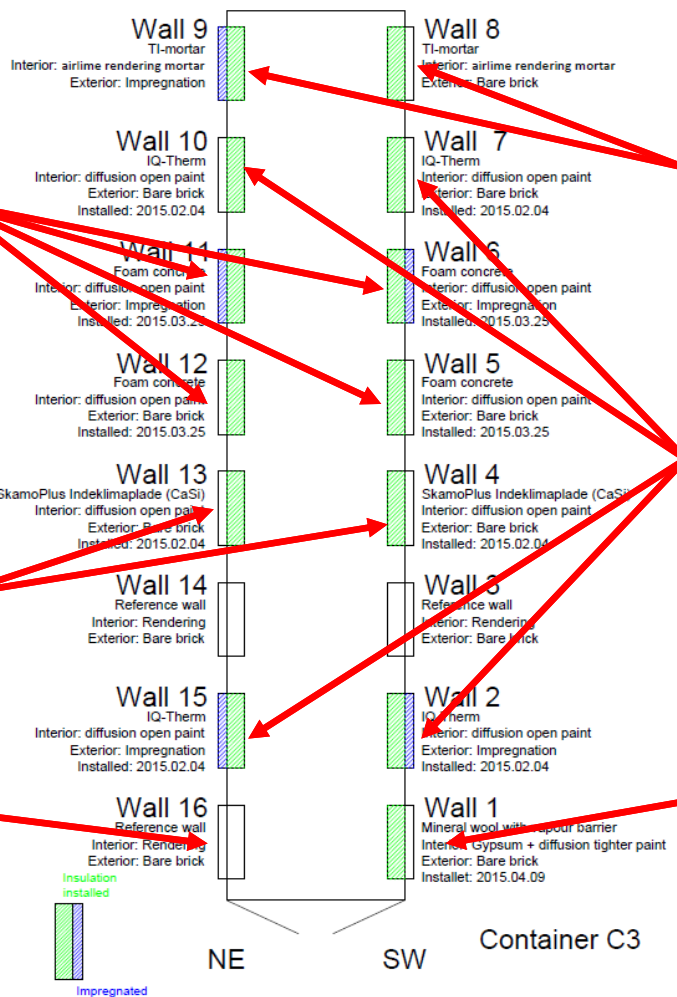
DTU



**Hygl Insu**

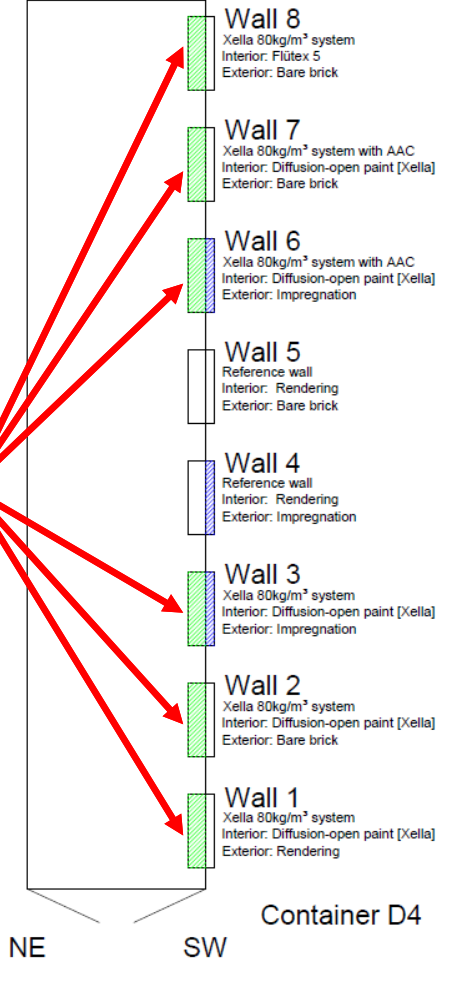
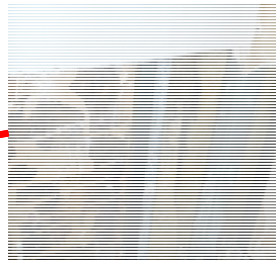
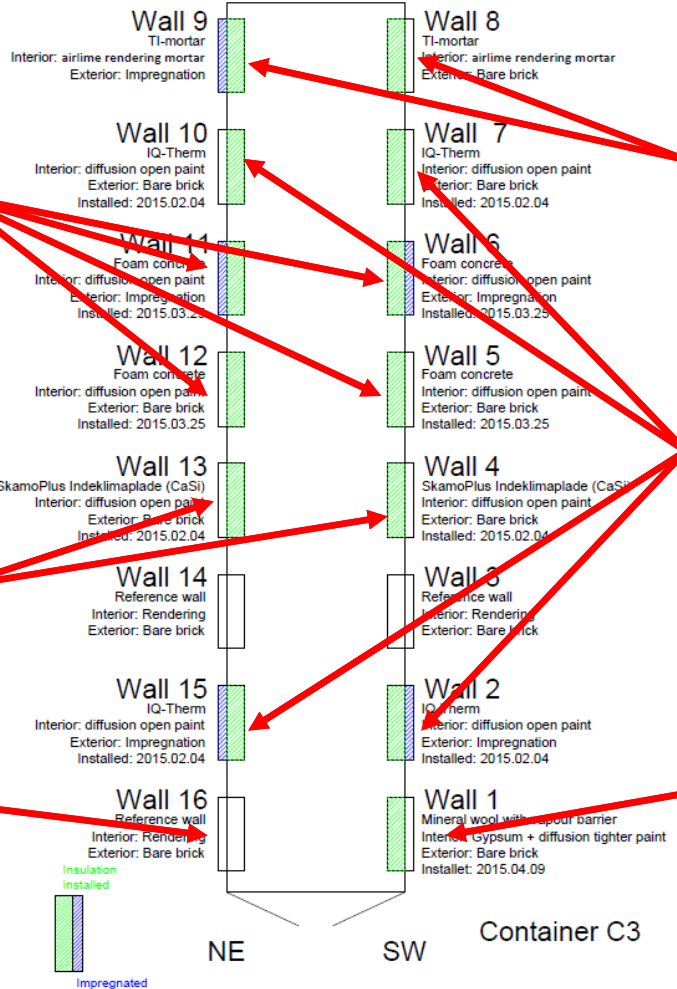
# Forsøgsopstillingen på DTU

DTU



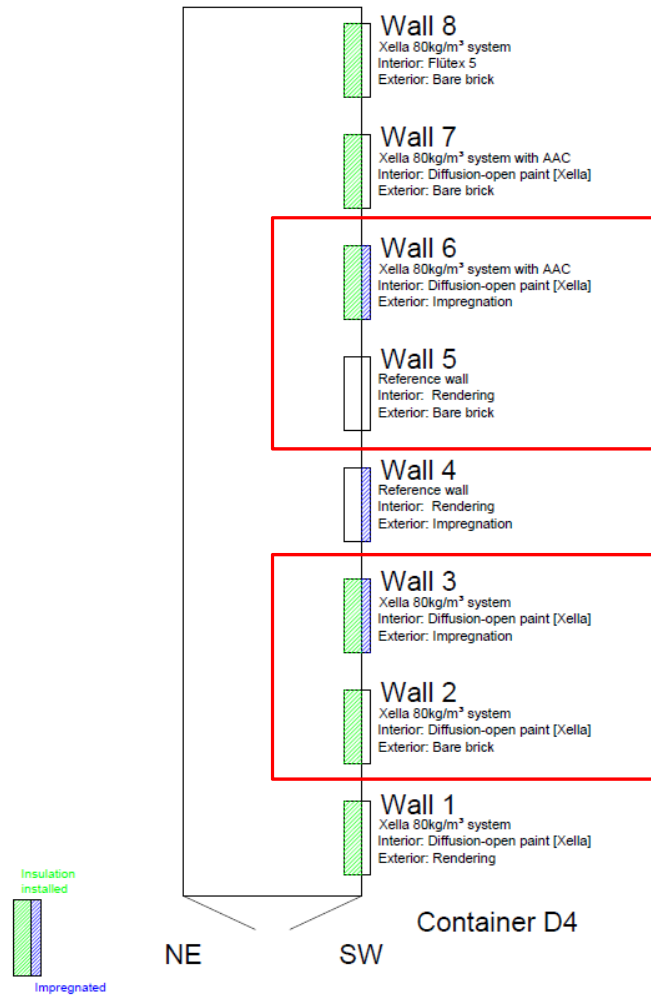
**HyglInsu**

# Forsøgsopstillingen på DTU

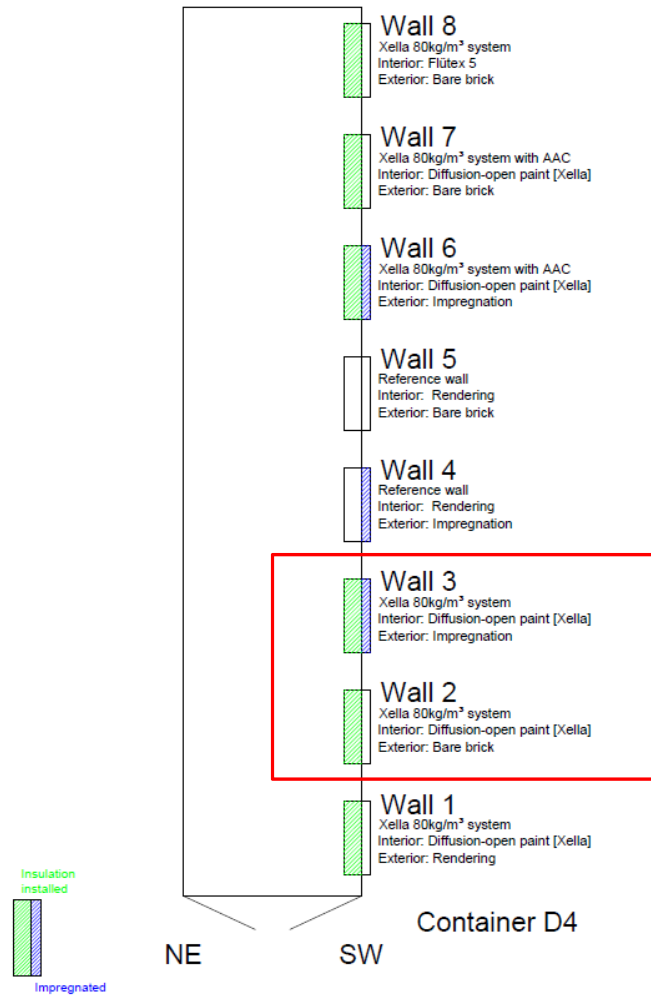


**HyglInsu**

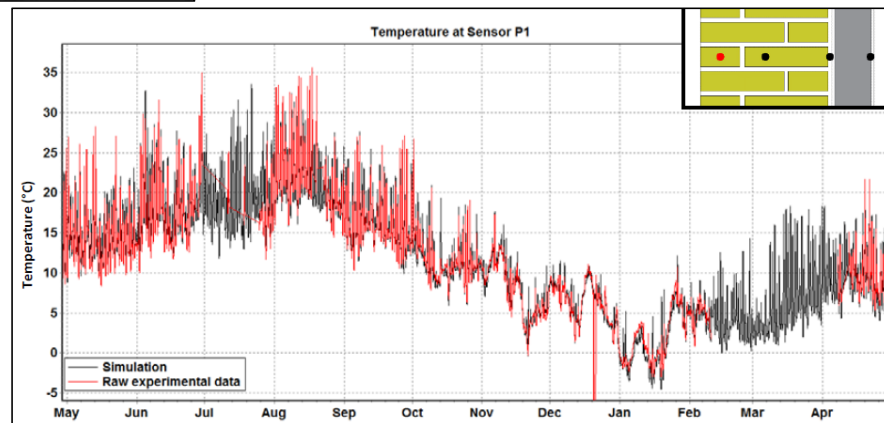
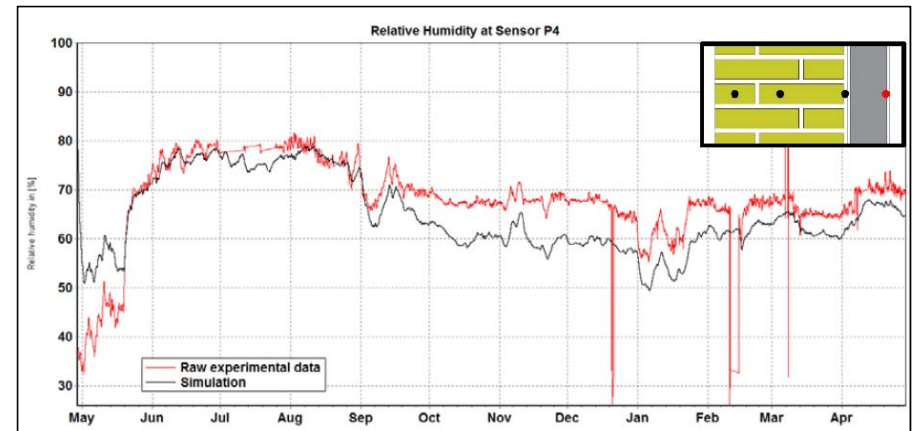
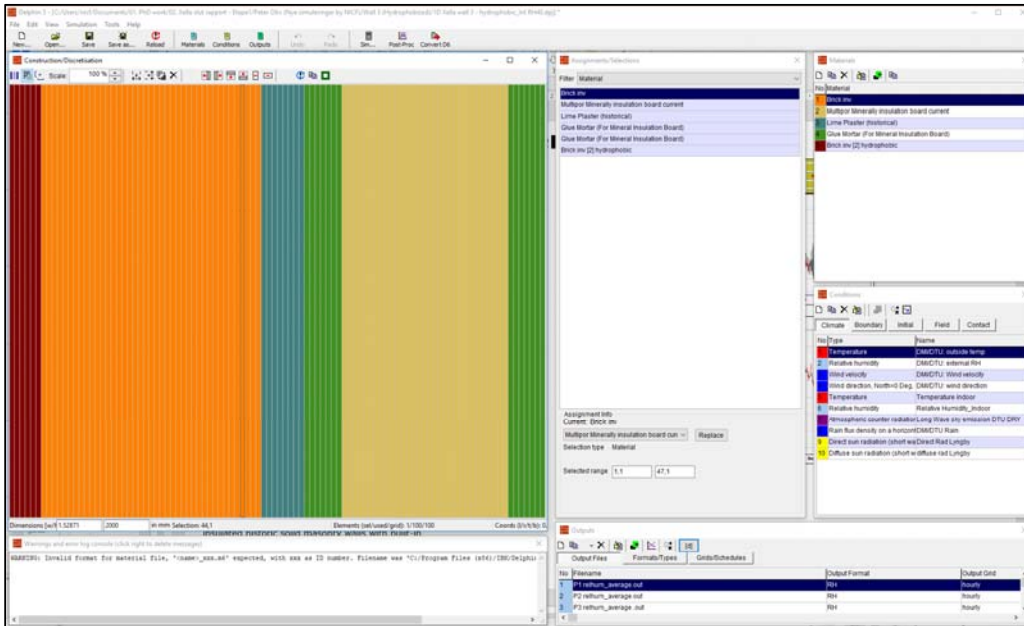
# Forsøgs resultater



# Simulerings studier



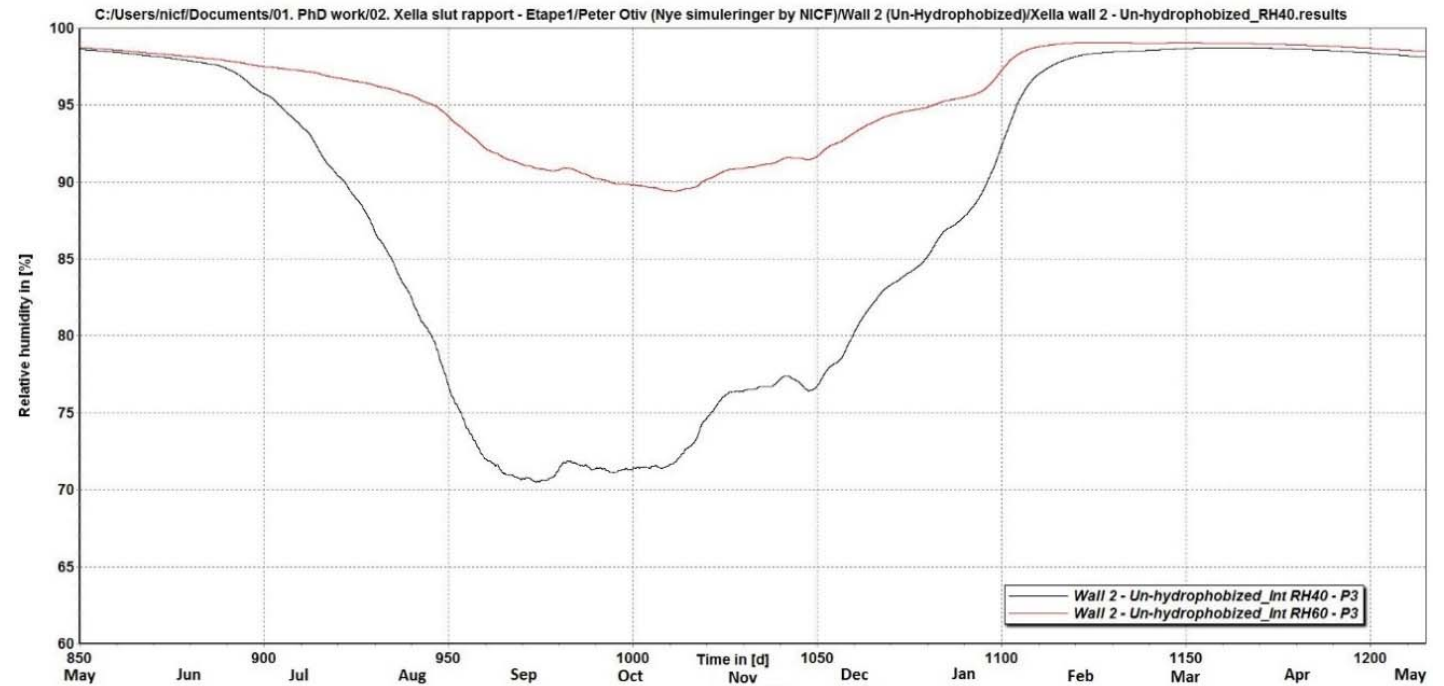
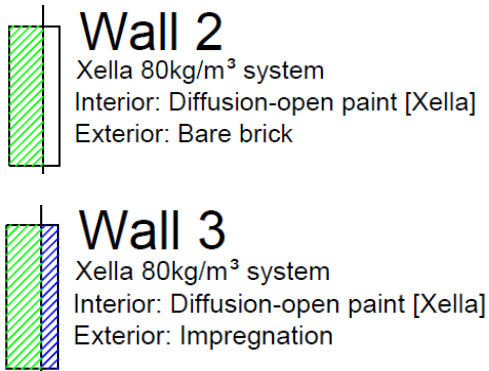
# Simulerings studier



Resultater (Model validering) fra:

Otqv, P. (2016). Hygrothermal modelling of internal insulation to solid masonry walls. Msc. Thesis, Technical University of Denmark, Kgs. Lyngby, Denmark.

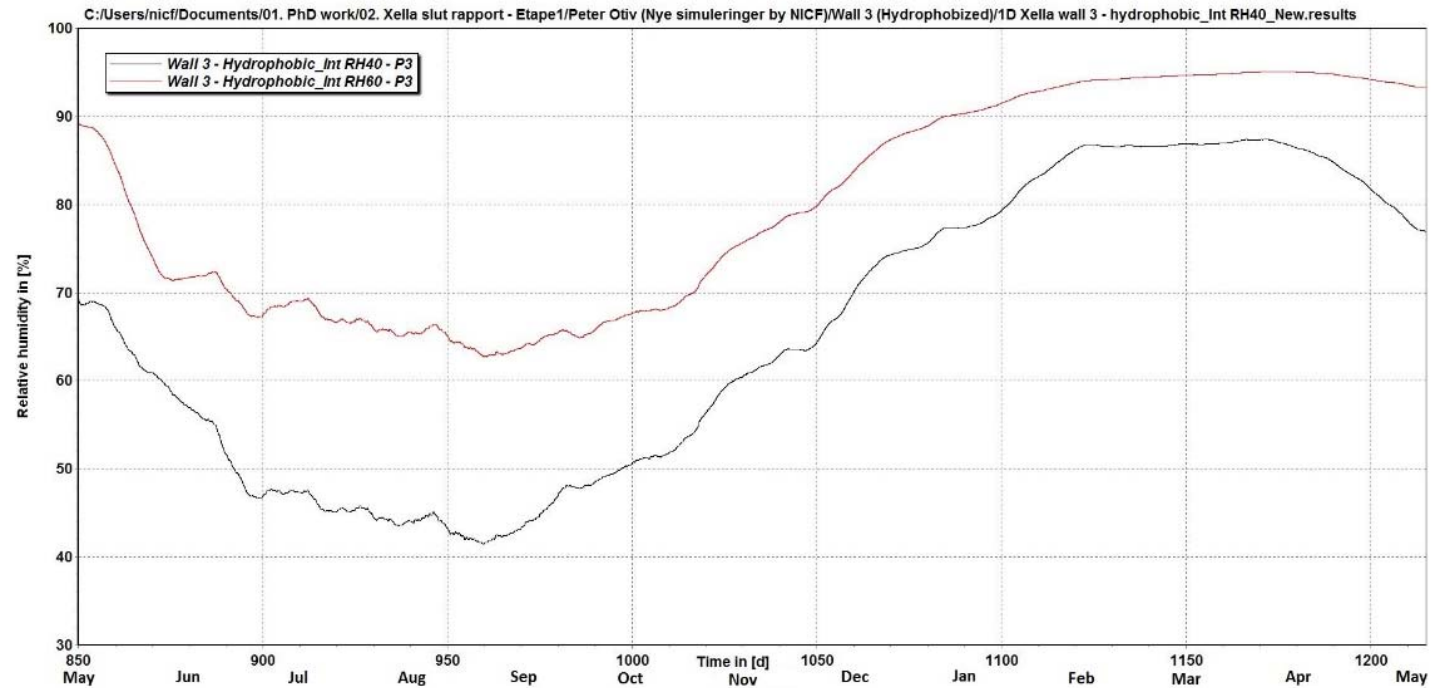
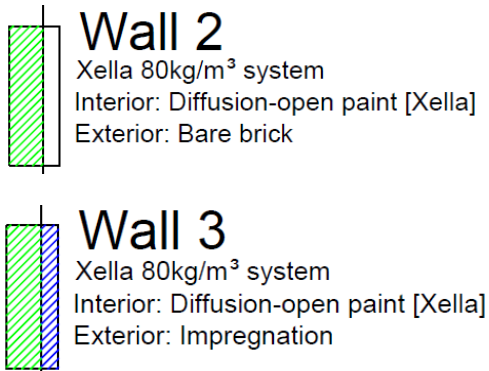
# Simulerings resultater



Resultater af:

Nickolaj Feldt Jensen  
Ph.D. studerende, DTU Byg

# Simulerings resultater

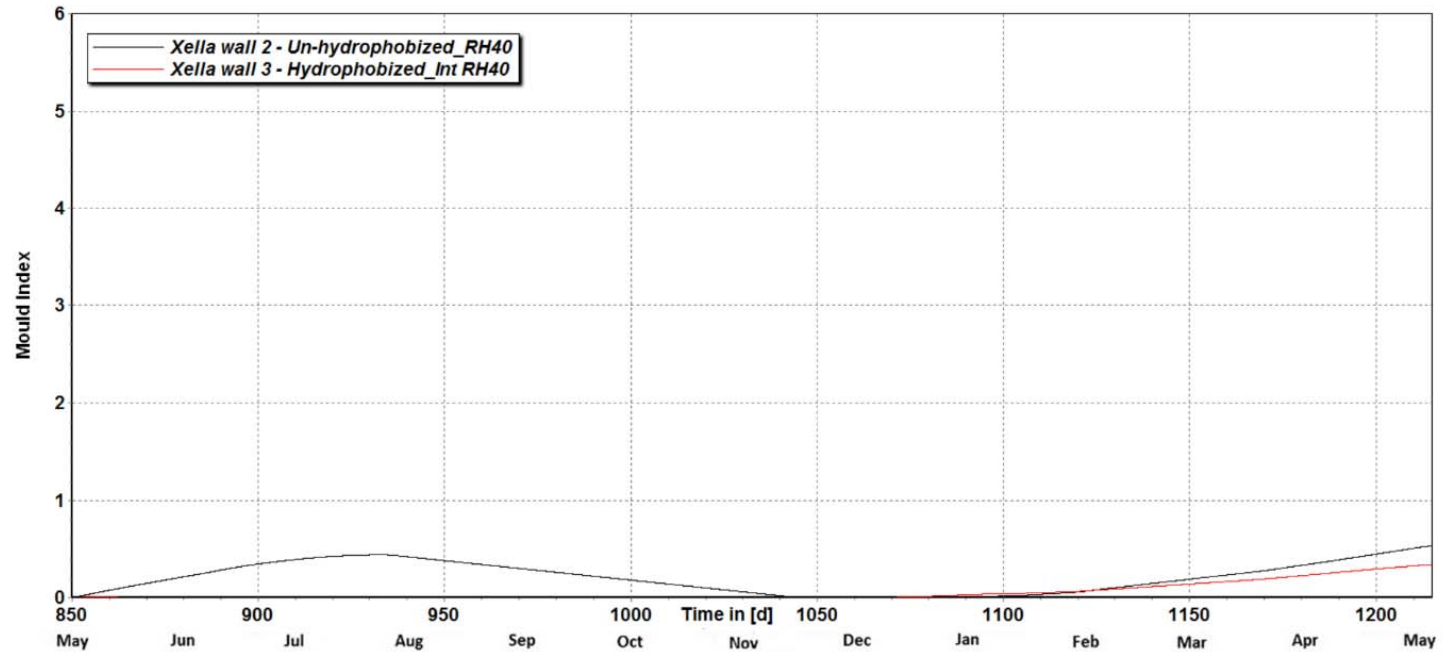
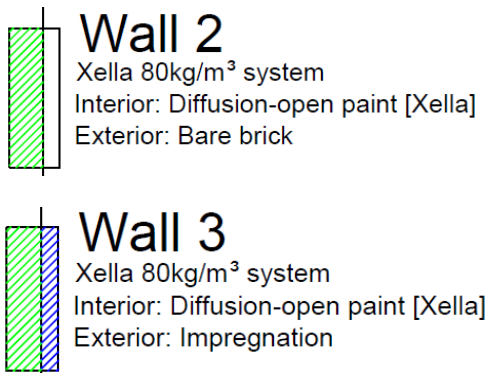


Resultater af:

Nickolaj Feldt Jensen  
Ph.D. studerende, DTU Byg



# Simulerings resultater



Resultater af:

Nickolaj Feldt Jensen  
Ph.D. studerende, DTU Byg

Sensor i overgangen mellem murstensvæggen og det indvendige isoleringssystem.

# Indikationer



- Hydroforbering af den udvendige overface reducerer fugt indholdet i væggen i sommer månederne, men fugten stiger dog igen i løbet af vinter månederne. Resultaterne er baseret på en høj indendørs relative fugtighed (60%).
- Den tilsigtede kuldebro installeret foran de indbyggede træ elementer reducerer fugt indholdet I træ elementerne.
- En kombination af hydroforbering af den udvendige overface og et sænket indendørs fugt indhold (fx. til et fugt indhold tilsvarende klima klasse 2 ifølge EN ISO 13788, med et fugttilskud til indeluften på 2-4 g/m<sup>3</sup>), kunne være en mulig løsning til at nedbringe risikoen for både skimmelvækst og råd et acceptabelt niveau i den kritiske overgang mellem murstensvæggen og det indvendige isoleringssystem. Denne teori understøttes af Delphin simuleringer med en indendørs relative fugtighed på 40%.