Regngenomslag i tegelmurverk

Nyttan med omfogning i slagregnsbelastat tegelmurverk

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Part 1: Background

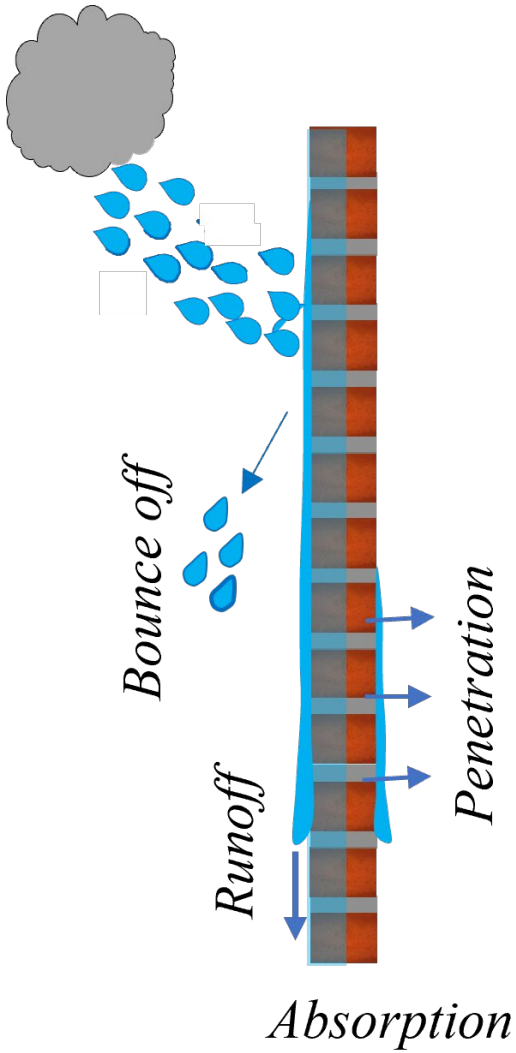
Part 2: Experimental & Numerical Studies

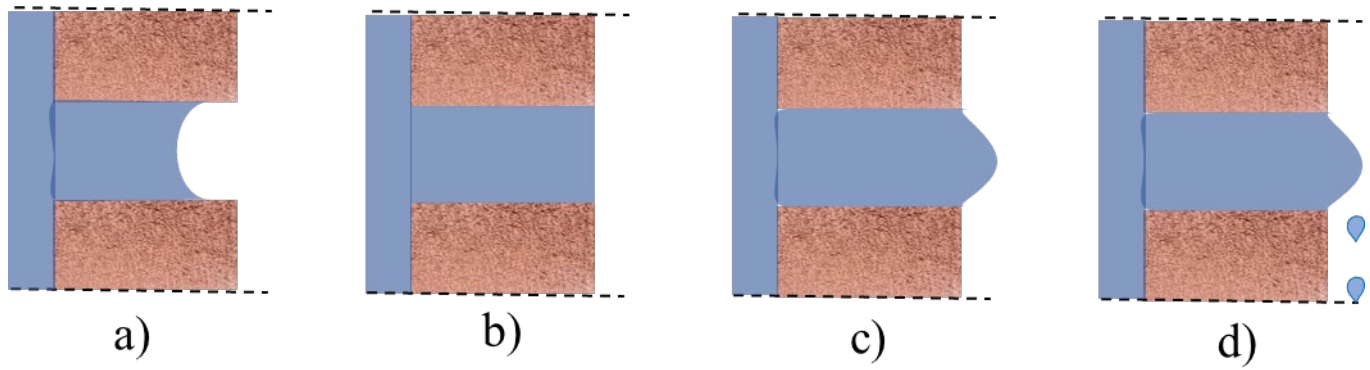
Part 3: Results & Discussions

Clay Brick Masonry Façades

- Durability
- Long-term performance
- 200 – 300 million square meters of façades in Sweden

Response of masonry façades to WDR





Impacts of WDR on masonry façades

- Increase in moisture content and water penetration
  - higher risk of freeze-thaw cycles
  - microbiological growth
  - corrosion of reinforcement (if unprotected)
- Mortar joint erosion (Erosion av murbrukfog)

Maintenance might be necessary

Repointing (omfogning) of eroded mortar joints

Replacing the outer part of the mortar joints, approximately 25 mm, with new mortar:

a. eroded joints are raked out
b. new mortar is applied

- Often carried out after 40-50 years from the erection of façades
- When eroded mortar joints are observed

60-year-old façade

before *during* *after repointing*

Repointing
Pros & Cons

- ✓ Mitigate moisture-related issues due to eroded-cracked mortar joints **!**
- ✓ Improve aesthetics **?!**

- ✘ Costly
- ✘ Labor intensive

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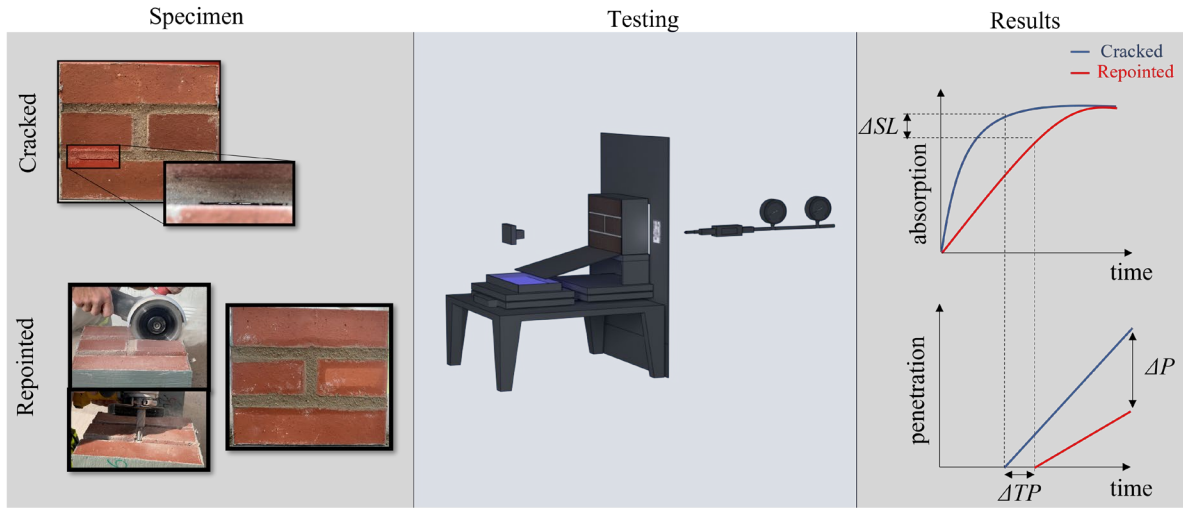


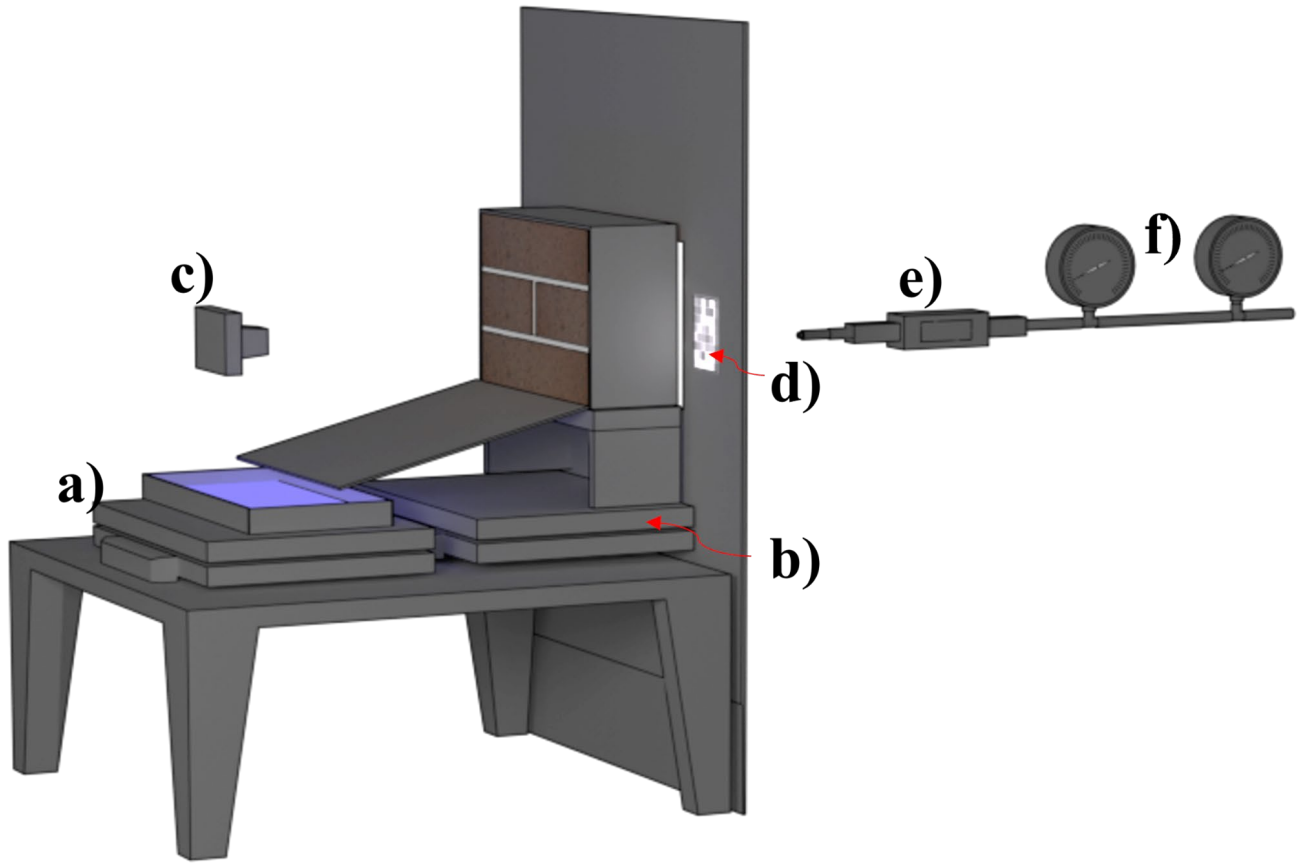
*P: penetration; *SL: saturation level at penetration; *TP: time to penetration

Research questions

How does the presence of cracks or imperfections in clay brick veneers impact water penetration?

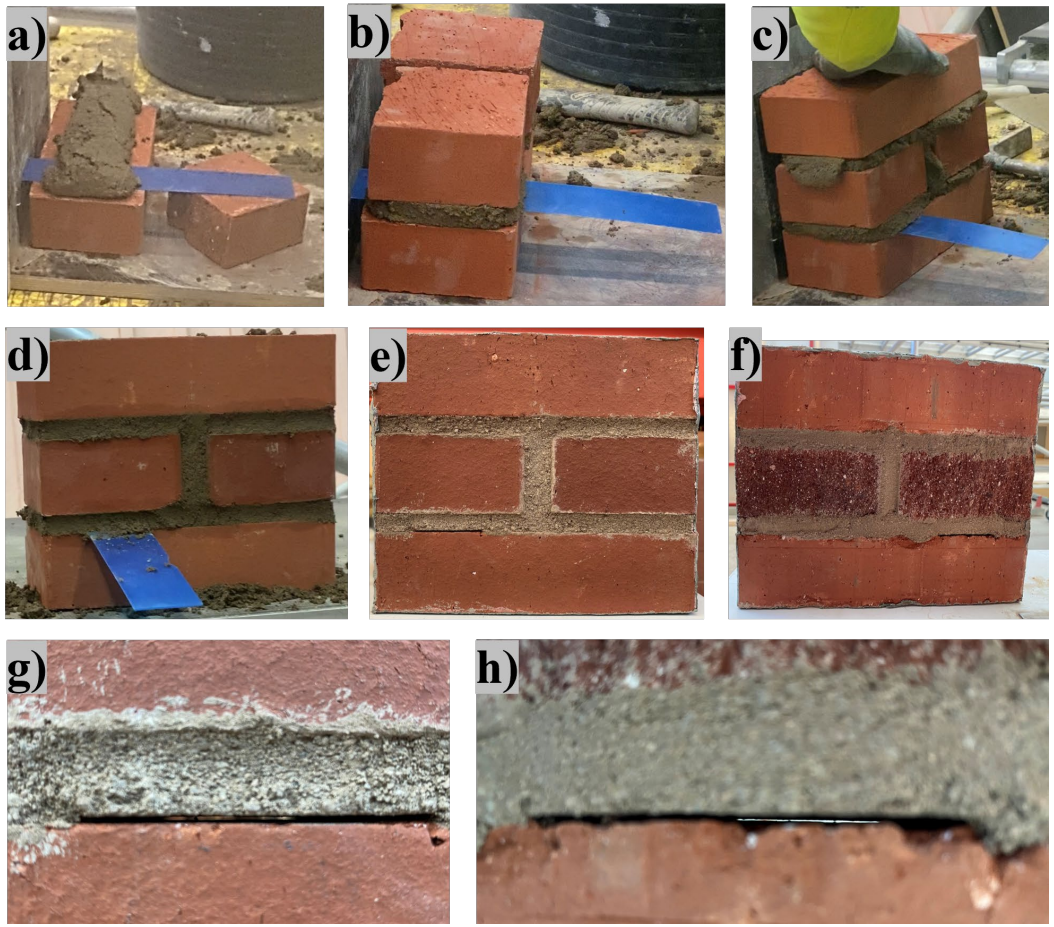
How does repointing influence brick masonry's response to WDR regarding water absorption and penetration?

Experimental studies – Test setup

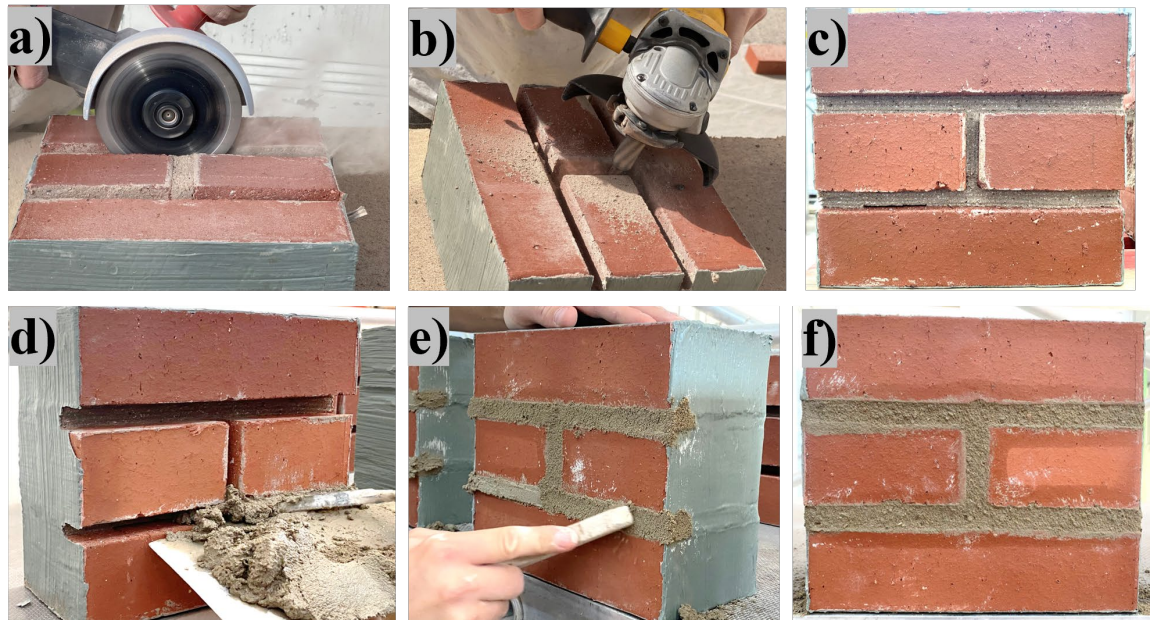


Schematic of the test setup: a) scale measuring water penetration, b) scale measuring water absorption, c) digital camera, d) ColorChecker, e) water flow meter, and f) water pressure regulators

Experimental studies - Specimens



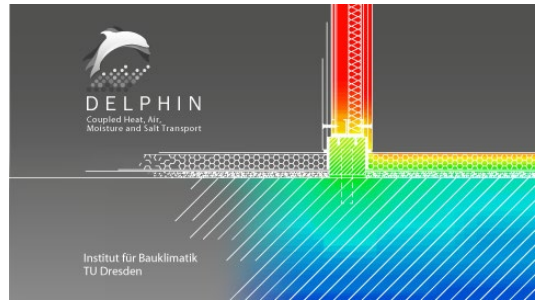
Cracked

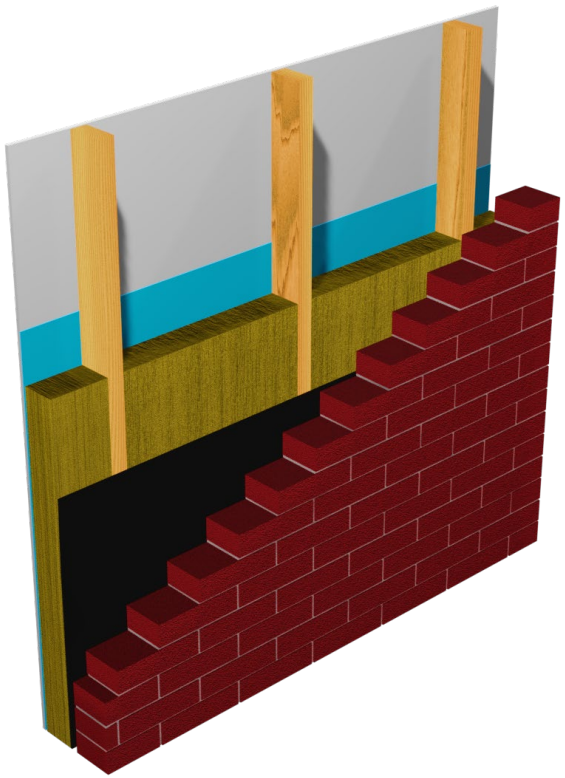


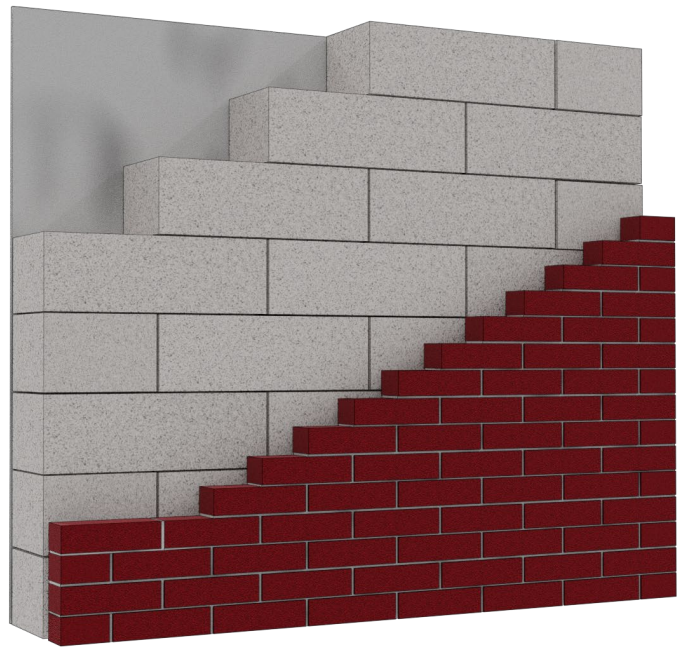
Repointed

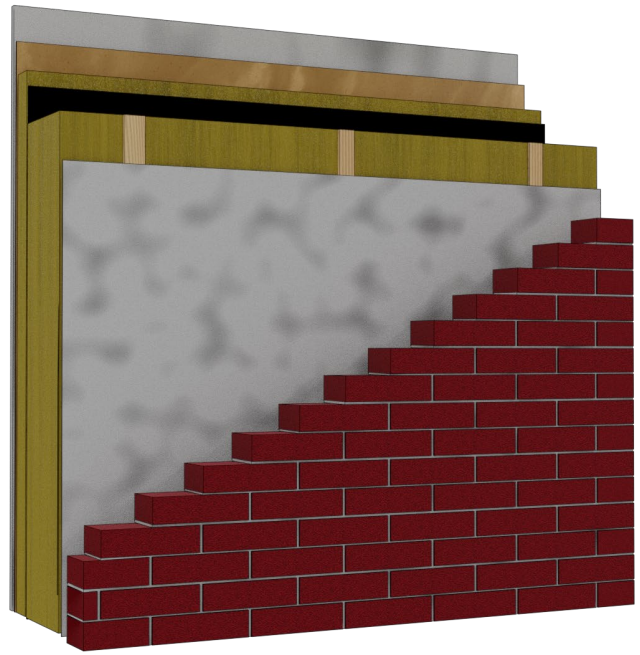
Numerical studies

WUFI® Pro 6.4









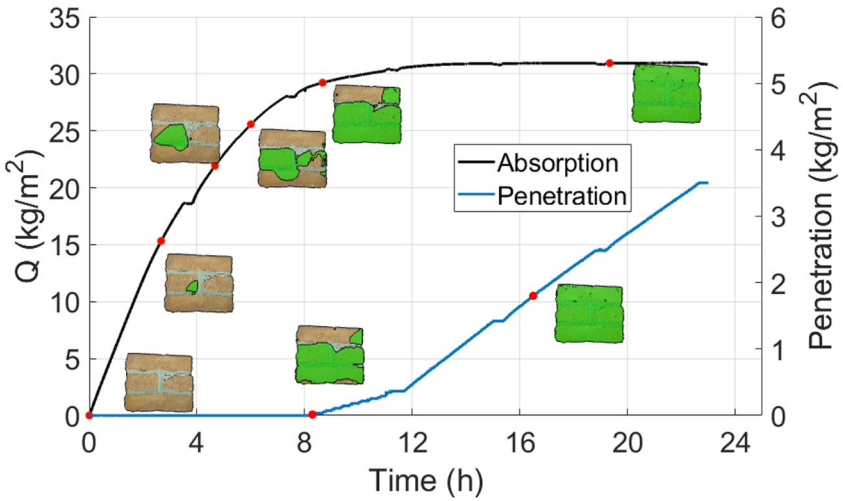
Paper IV & VI

Part 1: Background

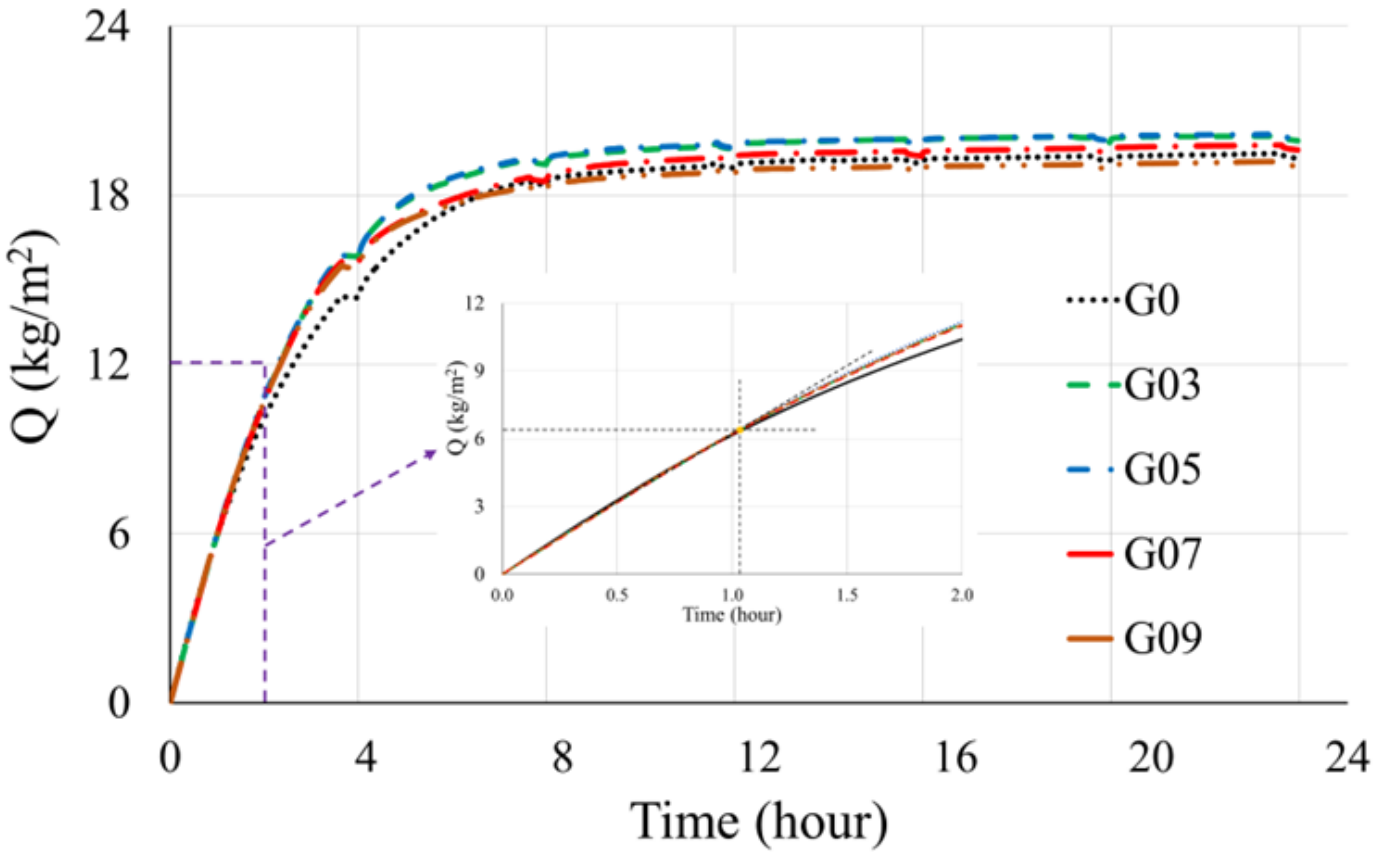
Part 2: Research Questions

- Framework for Experimental & Numerical Studies

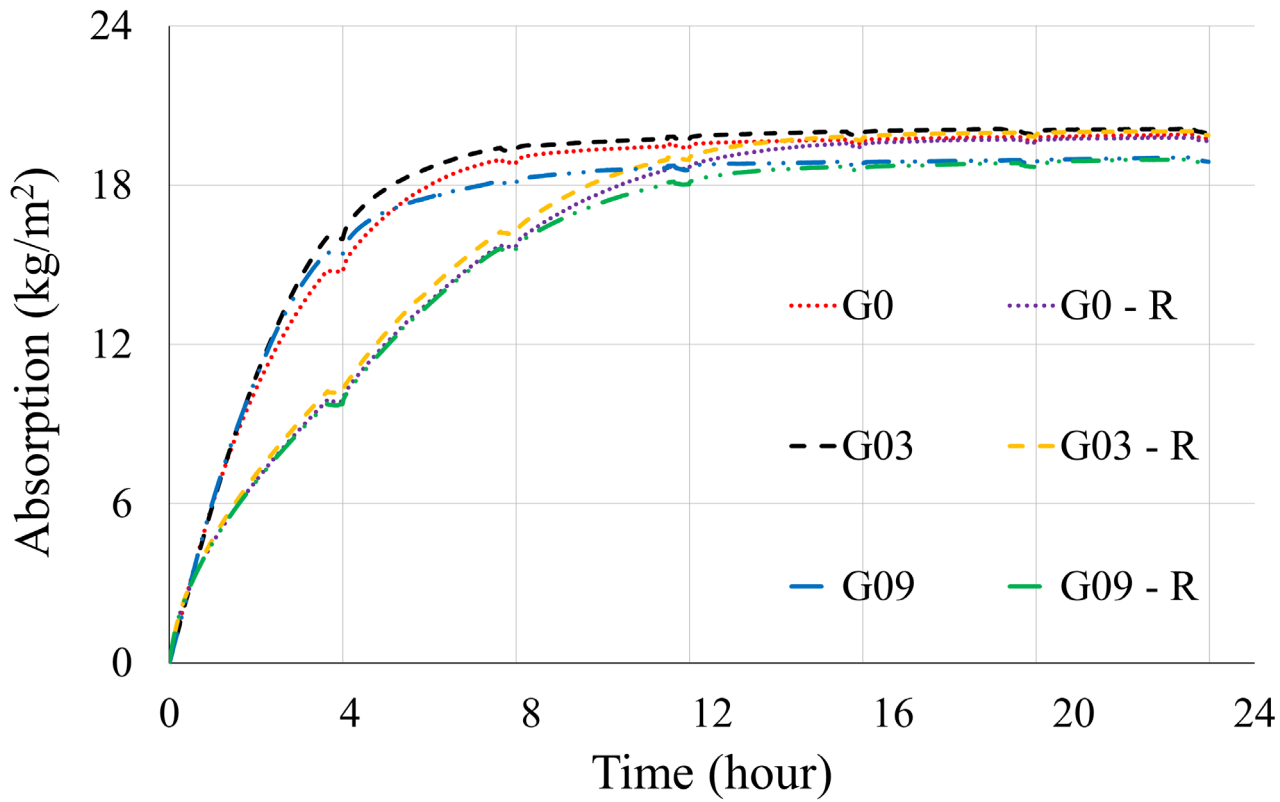
Part 3: Results & Discussions



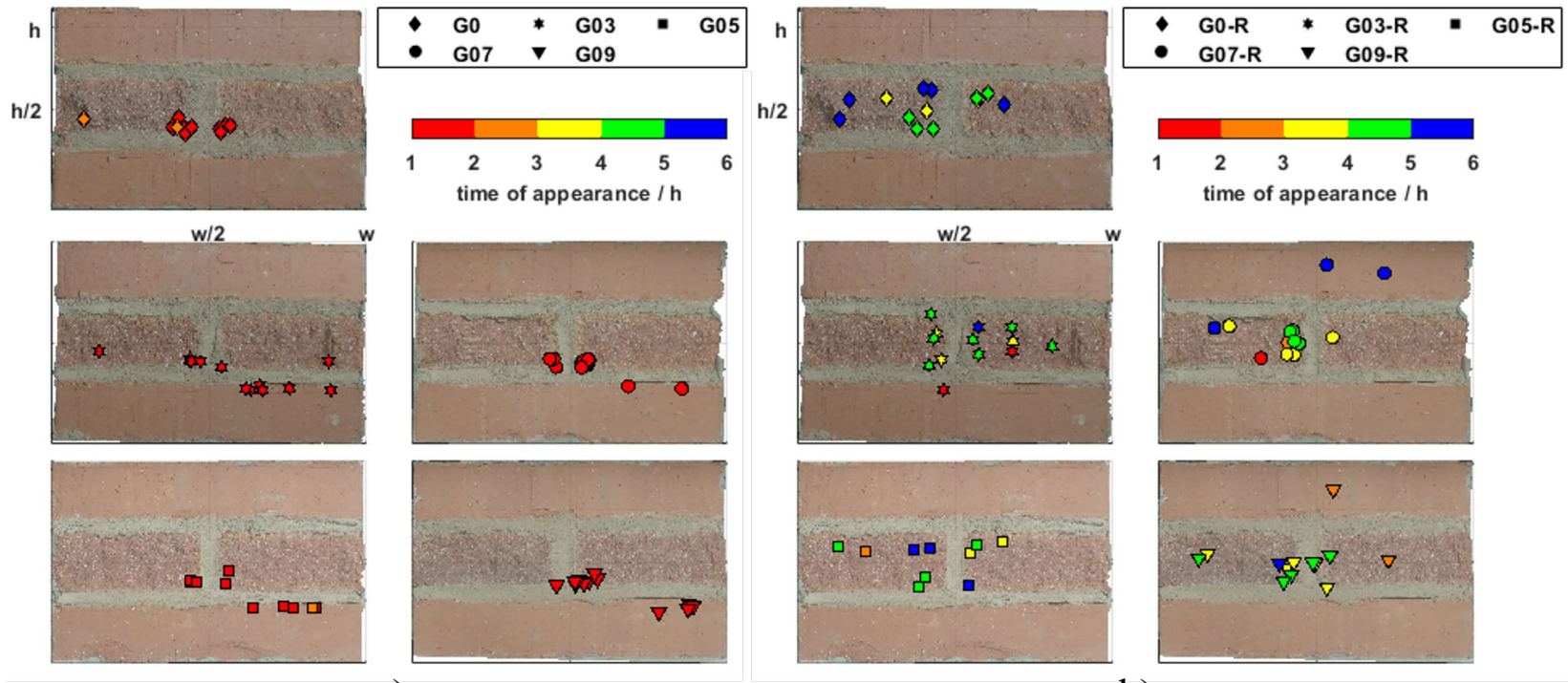
The effect of cracks on water absorption was limited.



The effect of cracks on water absorption was limited. Repointing could significantly reduce the rate of water absorption.



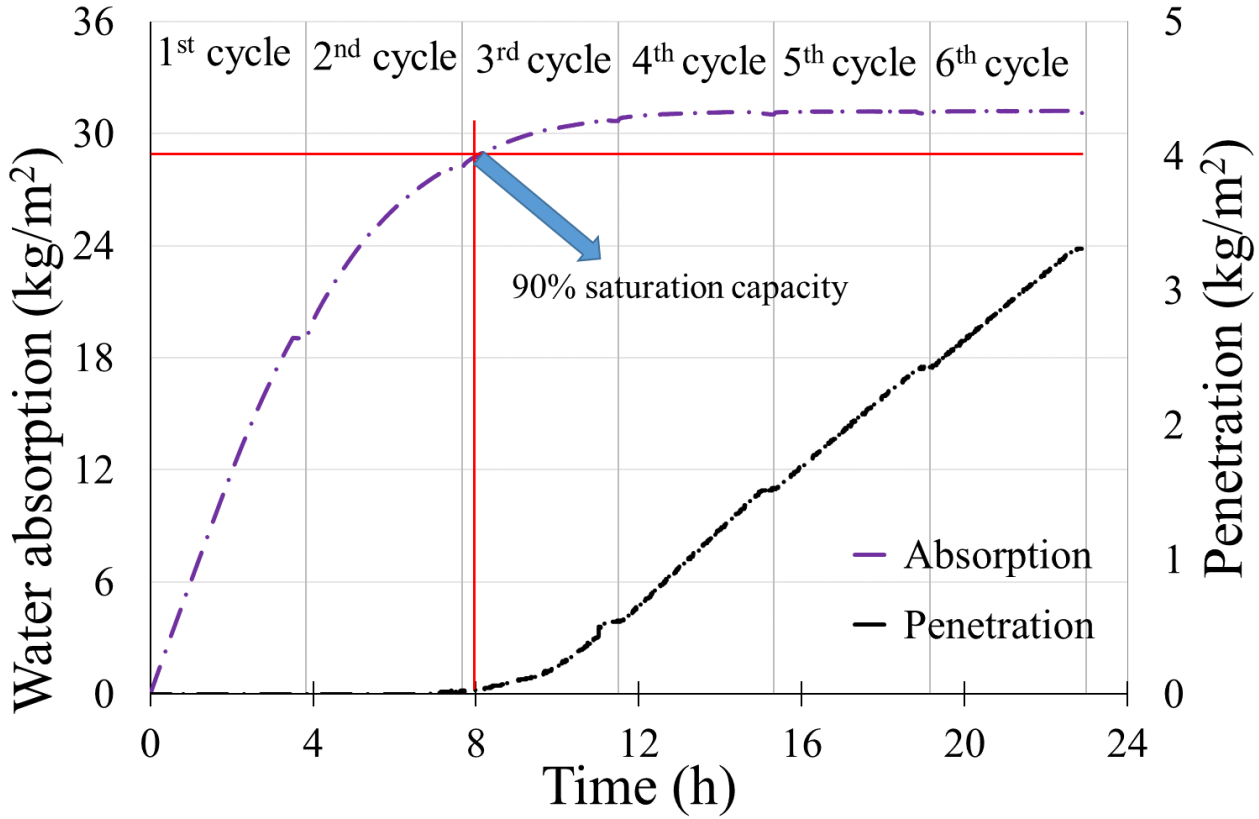
Crack width had a limited effect on the time to the emergence of the first dampness. However, repointing was shown to be an effective measure to postpone the emergence of the first dampness in brick masonry.



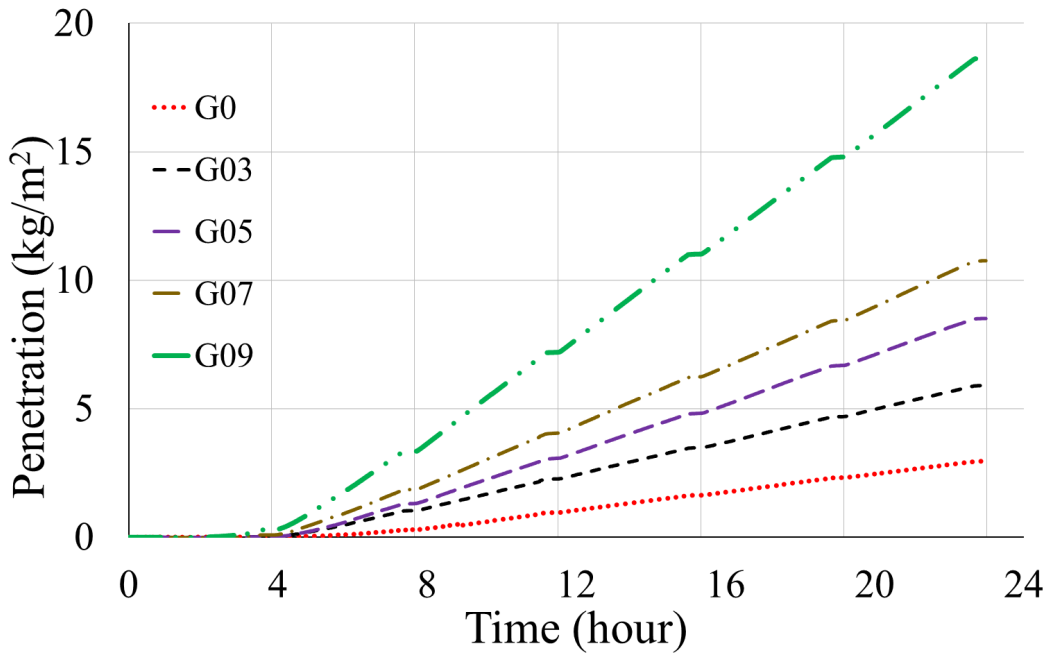
a) Cracked

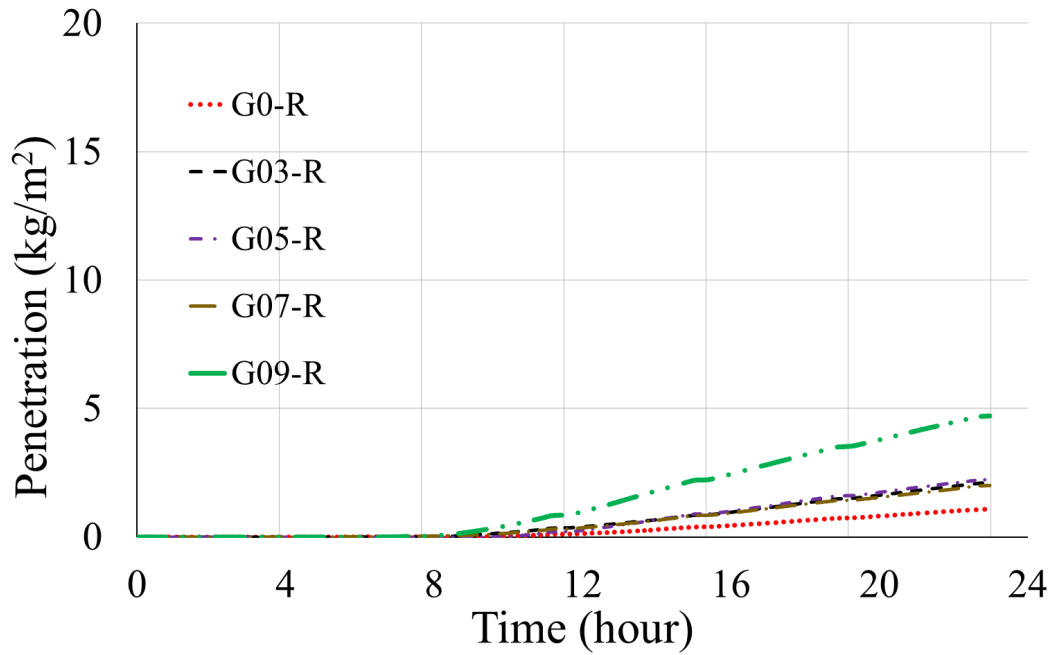
b) Repointed

In brick masonry without any known crack, water penetration consistently started at a moisture content corresponding to about 90% saturation.



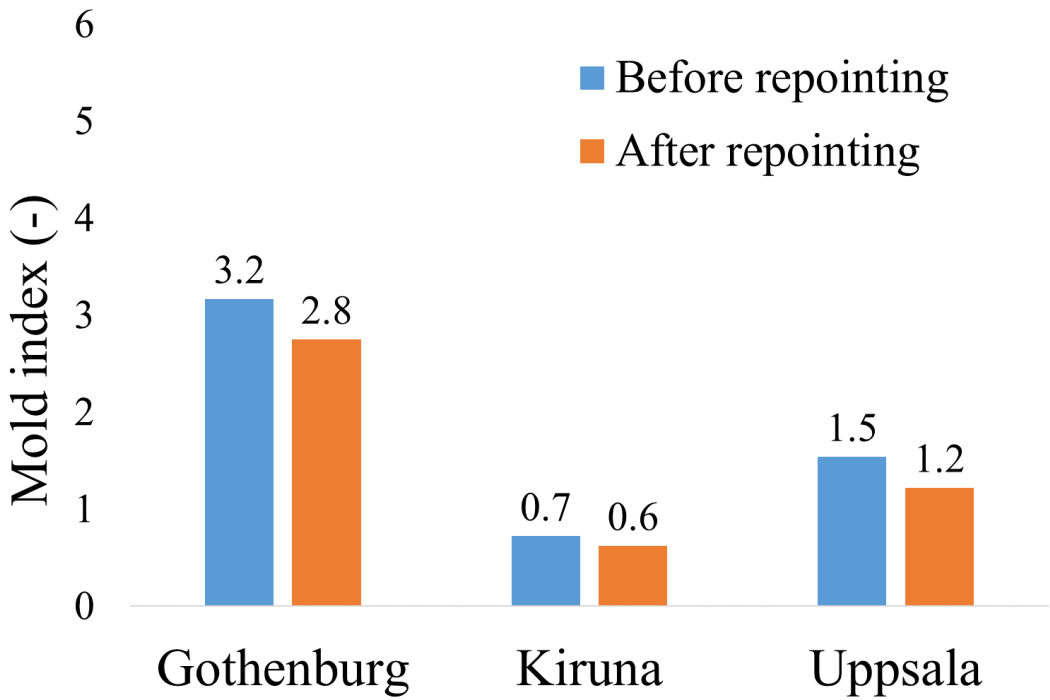
Cracks significantly affect the time to the start of penetration as well as the water penetration rate; the greater the crack width, the less time needed for penetration initiation and the higher the penetration rate. Repointing could considerably postpone the start of water penetration and reduce the water penetration rate with at least a 50% reduction in cracked specimens and specimens without known cracks.

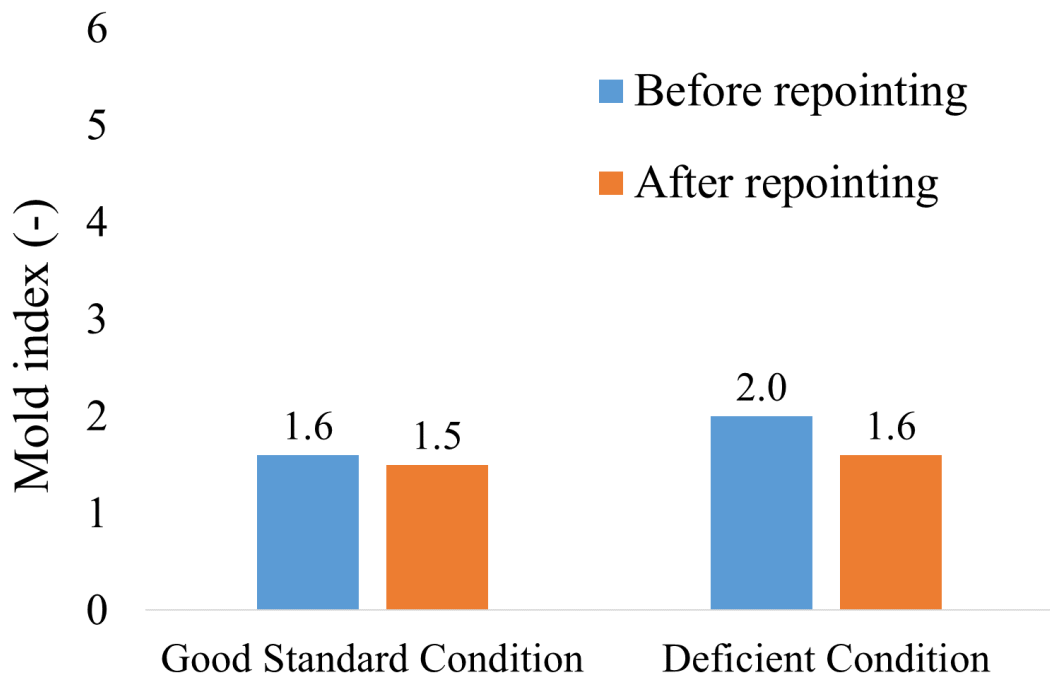




In addition to the cracks providing the least resistance pathway for water penetration, it is essential to acknowledge the potential of the brick-mortar interfacial zone to facilitate such penetration (Q1)

Repointing can be considered as a maintenance technique to reduce moisture-related risk in building envelopes with clay brick veneers, particularly those in deficient condition and located in areas with high exposure to WDR





Given the fact that repointing is a costly and laborious measure, this study recommends considering partial repointing, addressing only those wall orientations where the performance improvement resulting from repointing is evident, as opposed to repointing all façade sections and wall orientations

Think of other measures to improve façade aesthetics!

Acknowledgments

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TUNGT MURAT OCH PUTSAT BYGGANDE

LUND
UNIVERSITY