Flood resilience: improving building drying times

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Research Background

In the UK, 1.8 million people live in homes that are likely to flood at least once in 75 years (Sayers et al, 2015). Flooding can come from a number of sources, including rain, rivers, the sea, ground water or accidental discharge from pipes. Flood resistance measures such as air brick covers and door boards could prevent some homes being flooded but uptake is low particularly where householders have not previously experienced flooding (Owusu et al, 2015). Design standards set acceptable leakage rates (Garvin and Hunter, 2014) with an expectation that some water will enter even a well protected property. Where flood depths exceed 0.6m , it may also be necessary to admit water to avoid structural damage (Bonfield, 2016). There is therefore an ongoing need for resilience measures and recovery techniques, that reduce the impacts of flooding for buildings that are inundated. (Figure 1)

Previous research to quantify the flood resilience properties of walls suggests there is scope to improve flood resilience by informed selection of standard materials and construction technologies (Escarameia et al, 2007). Building simulation models have also been used to explore drying scenarios for a range of typical London building types (Taylor et al 2012).

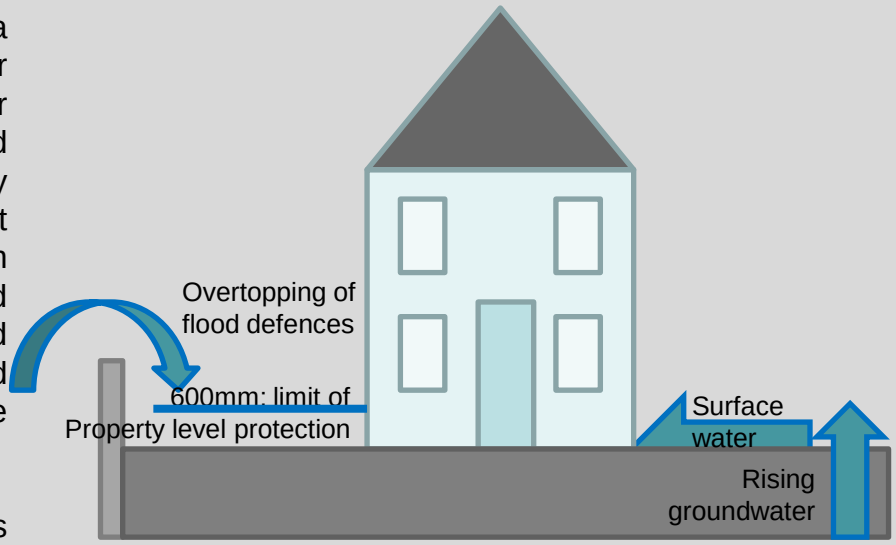


Figure 1 Residual risks of flooding

Research Programme

It is proposed to construct a set of stub walls, which will be subjected to a simulated flood event followed by a period of monitored drying. The materials used in the construction of the walls have been selected to allow comparison with previous tests on floodwater ingress (Beddoes & Booth, 2015) and flood resilience properties (Escarameia et al, 2007).

Constituent material properties

Bricks, blocks and mortar are porous materials and can be characterised by the combined property of sorptivity (Hall and Hoff, 2002). Comparisons will be made between different types of brick, block and mortar, including consideration of the interface between mortar and masonry units, using gravimetric methods (Figure 2), gas absorption tests and microscopic inspection of polished cross sections.

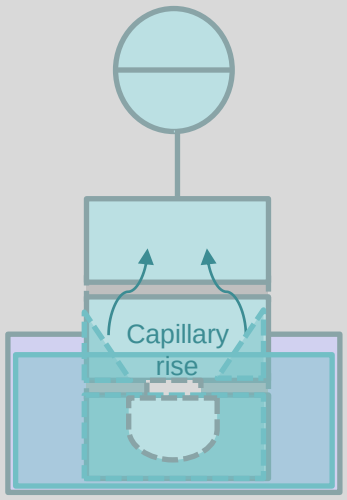


Figure 2 Gravimetric assessment of moisture uptake in brick triplet

Simulated flooding of stub walls

A series of stub walls will be constructed, using different combinations of brick andand block, in the flood tank at the HIVE testing facility. Water level will be raised to approximately 600mm, the limit at which structural renovation is anticipated for flooded buildings, and maintained overnight before draining Moisture movement within the wall and reduction of moisture content with time will be monitored using impedance testing, wooden plugs and localised samples.

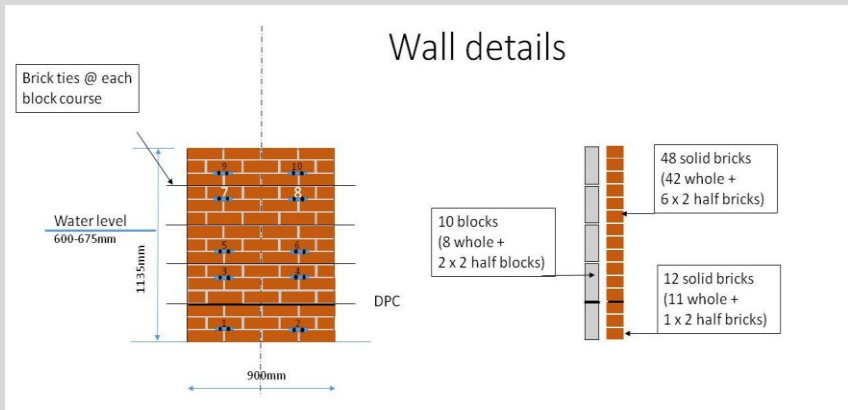
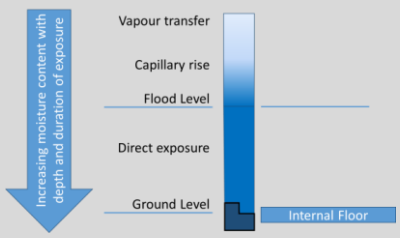
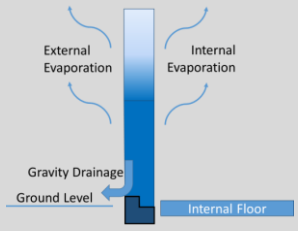


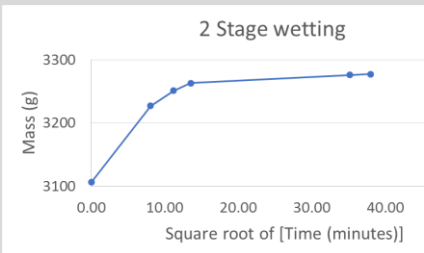
Figure 3 Typical test wall assembly

Project Outcomes

Initial tests have verified that both wetting and drying occur in two distinct stages. The stub walls will allow the interaction of the various elements to be considered, allowing recommendations on material selection and key time scales in the drying process.







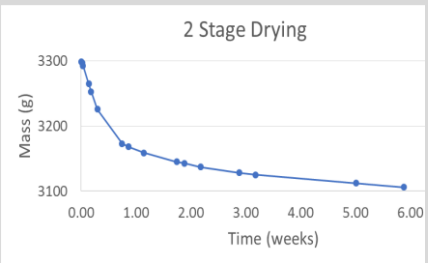


Figure 4 Wetting and drying behaviour of bricks

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