Characterising the moisture buffering potential of clay plasters

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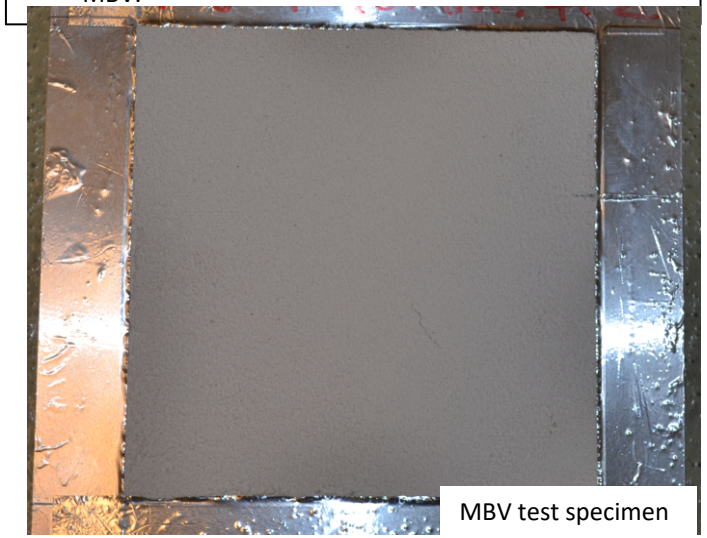
Abstract: The beneficial moisture buffering characteristics of clay plasters have been well known for some time amongst the earth building community, and now this characteristic of passive moisture regulation is also increasingly recognised by the wider construction industry. However, acceptance of the moisture buffering performance of clay plasters relies on universal acceptance of a simple quantifiable characteristic that allows comparison between different materials and products, and sets the basis for specification, regulation and certification. Moisture Buffering Values (MBVs) quantify the response of materials to changes in the Relative Humidity (RH) of the surrounding environment. Presently there is no universally accepted methodology for measuring the MBV, with specimen details, moisture cycles and other test details varying. This paper presents results from an experimental study to characterise the moisture buffering performance of two different clay plasters, focussing on the influence of specimen thickness on the measured MBV. The experimental results of the MBV tests are presented in detail together with recommendations for future work.

1. Aims and Objectives: The overall aim of this study has been to evaluate further the influence of clay plaster thickness on MBV but has been extended to study the significance of chamber temperature and RH variation, as well as test repeatability. The specific objectives of this study were to:

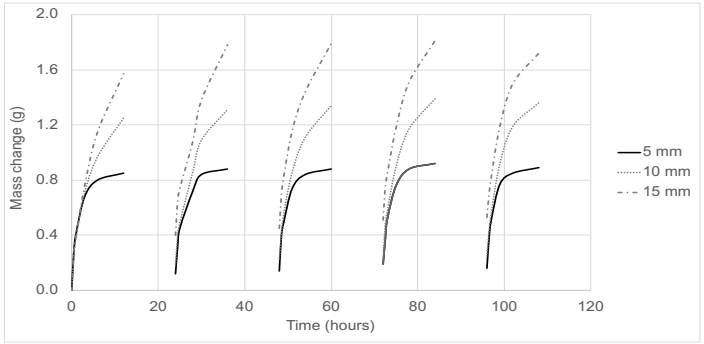
- Complete MBV testing of two proprietary clay plasters in accordance with DIN 18947 (2013) using specimens varying in thickness between 5 mm and 15 mm
- Evaluate the repeatability of MBV testing using DIN 18947, JIS A 1470-1 (2002), and NORDTEST [Rode et al., 2005] procedures.
- Explore the influence of test chamber temperature on MBV.



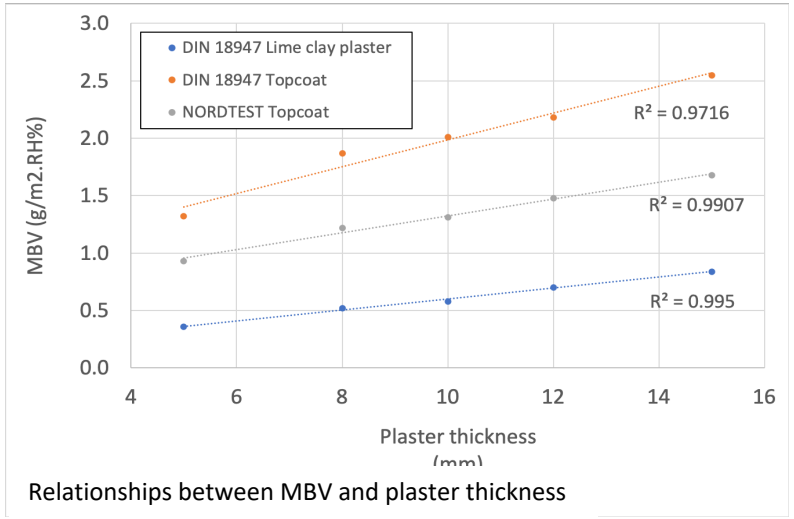
MBV test specimen

2. Methodology: Two series of tests, comprised of 15 specimens, made up of 3 x 5 specimens of nominal thickness 5, 8, 10, 12 and 15 mm depth. Two proprietary clay plasters were used in the study. The first was a natural clay plaster 'topcoat' containing chopped straw particles. The second plaster series were manufactured using a 'lime (stabilised) clay' plaster product. 150 x 150 mm plaster specimens were cast into acrylic moulds.

3. Results: In response to the stepped changes in chamber RH all specimens tested here developed a characteristic saw tooth non-linear curve response to increasing mass with time. Typical response curves, from the DIN 18947 series of tests, are shown in Figure 2 below; only the 5, 10 and 15 mm results are shown for clarity. As mass changes were only measured during the adsorption phase the non-linear responses during desorption phases are not shown.



Adsorption curves for topcoat plaster (DIN 18947 test)



Relationships between MBV and plaster thickness

4. Conclusions:

- The MBVs increased linearly with plaster thickness over range 5-15 mm. Optimal plaster thickness is evidently dependent on environmental conditions.
- MBVs for earth plasters vary depending on many factors including specimen thickness, environmental test conditions, and testing regime.
- The DIN 18947 test procedure recorded the highest MBVs, whilst the NORDTEST recorded the least.
- The lime stabilised plaster showed significantly lower MBVs than the natural topcoat with straw

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