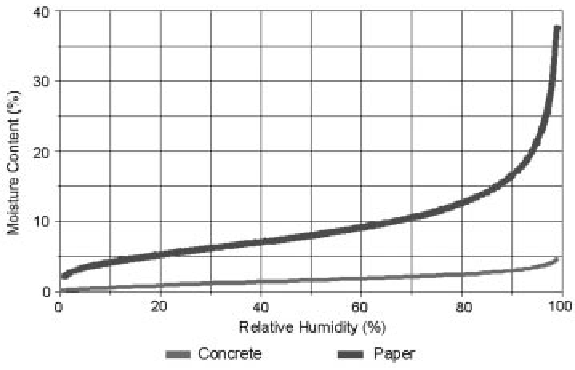

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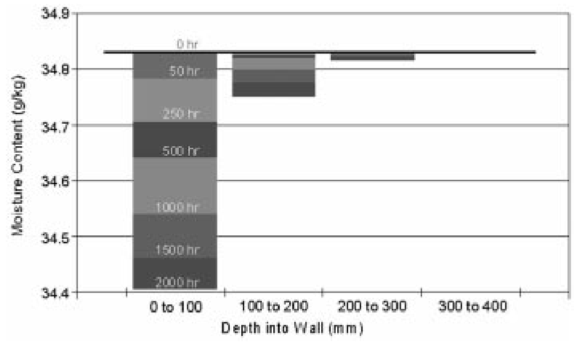
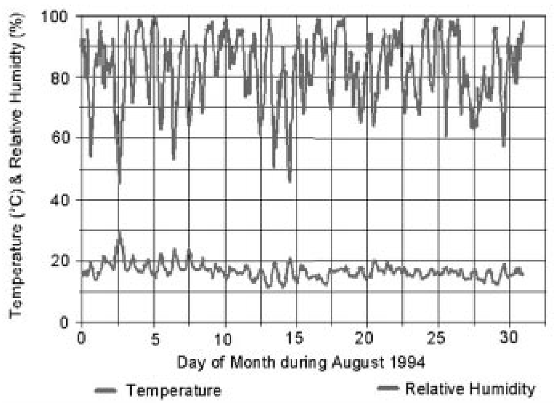
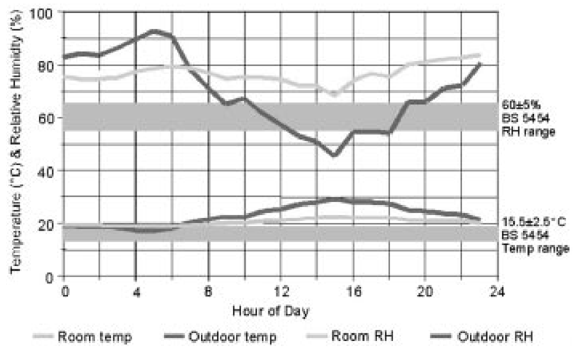


22



21a



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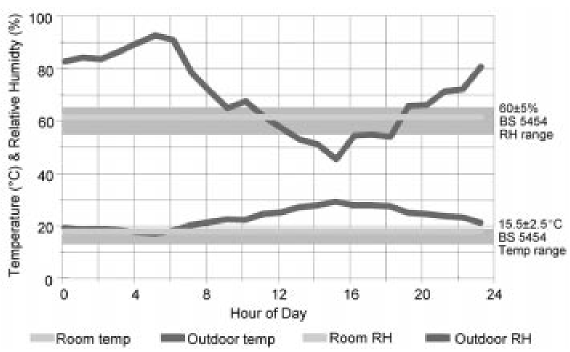

21b

20 Concrete and paper sorption isotherm. Similar moisture data was considered for each material

21 Weather data and predicted conditions
a Jersey recorded weather data. See 18 for UK standard data.
b Repository top floor predicted conditions over a summer peak design day using the passive approach

22 Change in concrete moisture content following a 70 to 60% change in room relative humidity. The first 100mm responds over a time-scale measured in weeks, the second over one measured in months. This gives the flywheel effect

23 Influence of outside air infiltration at the common rate of two air changes per hour – this would rapidly overwhelm the speed with which the building could absorb or emit moisture. It was decided that the target rate should be 0.05 changes per hour – comparable to the Swedish standard

in Figure 20 provided the additional moisture data needed for each material. Based on the actual performance feedback from passive cooled buildings, the modelling used real weather sequences instead of simple cyclic data, to provide a more realistic peak design sequence. Recorded Jersey weather data provided important information on the coincidence of temperature and moisture, particularly given that Jersey's humidity levels are higher than those on the U.K. mainland [Fig. 21a].

The modelling indicated that room environmental conditions could be maintained within the 60±5% relative humidity and 15.5±2.5°C limits for the summer peak design day [Fig. 21b]. Key parameters were an appropriate choice of materials and building form, the outside air infiltration rate, the influence of the archive material itself and a level of material moisture content preconditioning.

The following sections describe the main results of the computer modelling and the building design provided.

Moisture migration into materials

The speed and progress moisture makes as it is absorbed by a typical building material is shown in Figure 22. The moisture movement is considerably slower than that to be expected of absorbed heat. In principle, the first 100mm of fabric responds over a time scale measured in the order of many weeks with the subsequent 100mm responding over many months. On this basis one can see how in heavy-weight construction buildings a proportion of summer room air moisture excesses can be absorbed for subsequent emission during winter room air moisture deficiencies, effectively creating an annual flywheel effect. The building fabric selected for the Jersey Archive has the potential to hold summer moisture sufficient to bring the winter air