

Building to the new relaxed climate standards

Tim Padfield

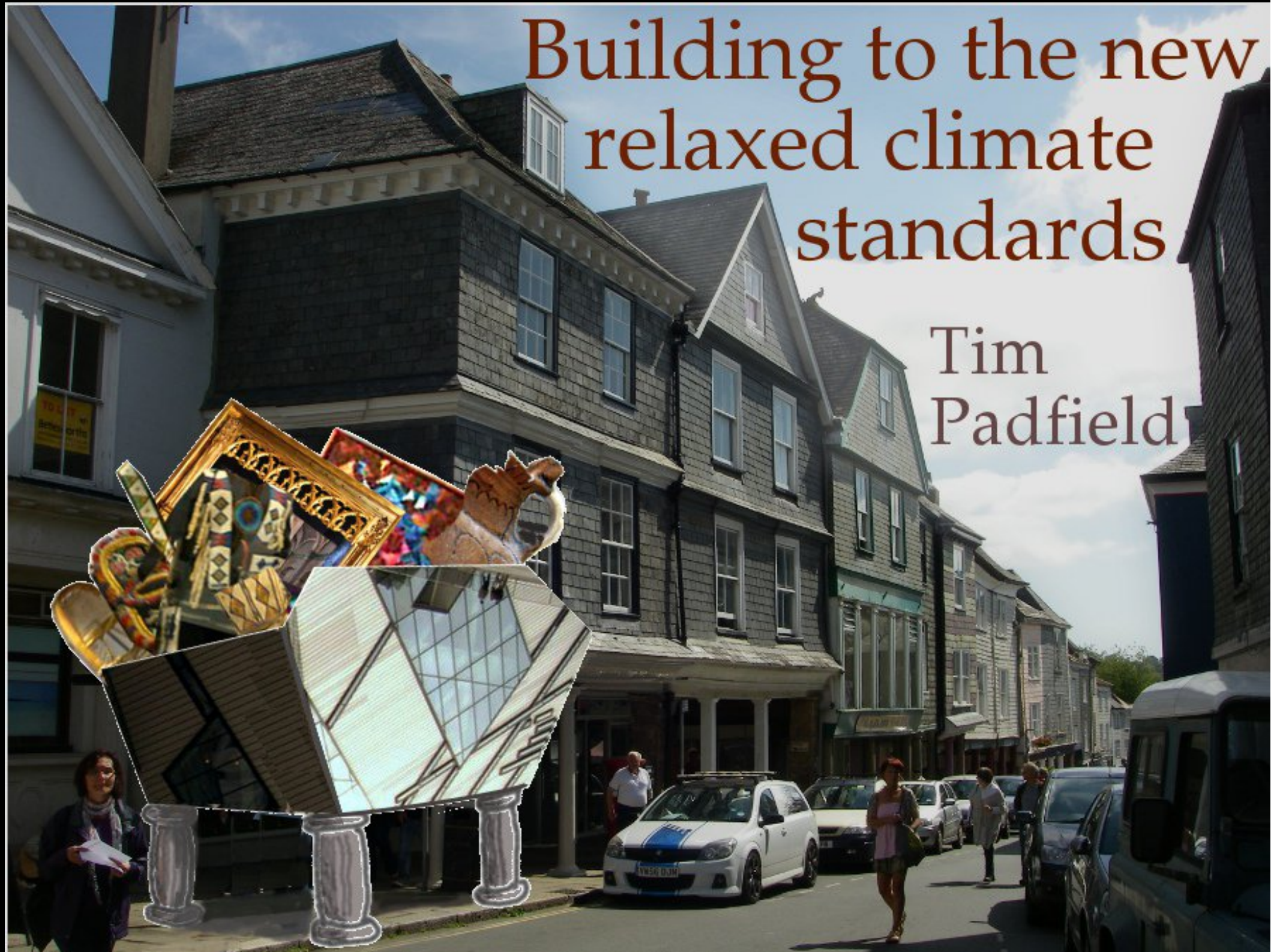




Photo: Helen Coxon

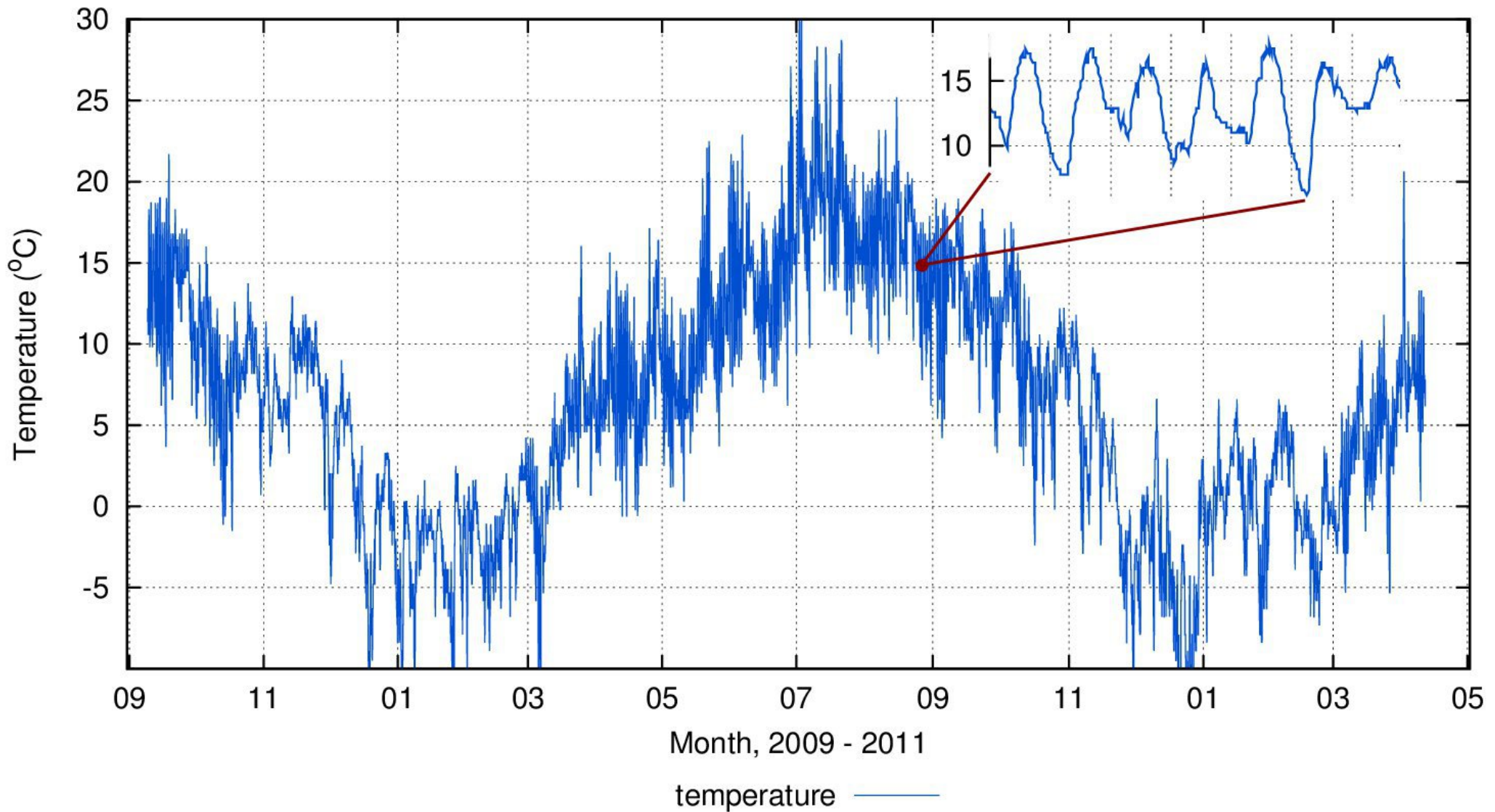


Photo: Helen Coxon





Will PD5454 set us free to design low-energy museum buildings - or is it a disastrous concession to the energy pessimists, or is it not quite as generous as it seems?



The temperature in Ribe, Denmark
The daily cycles are expanded in the insert

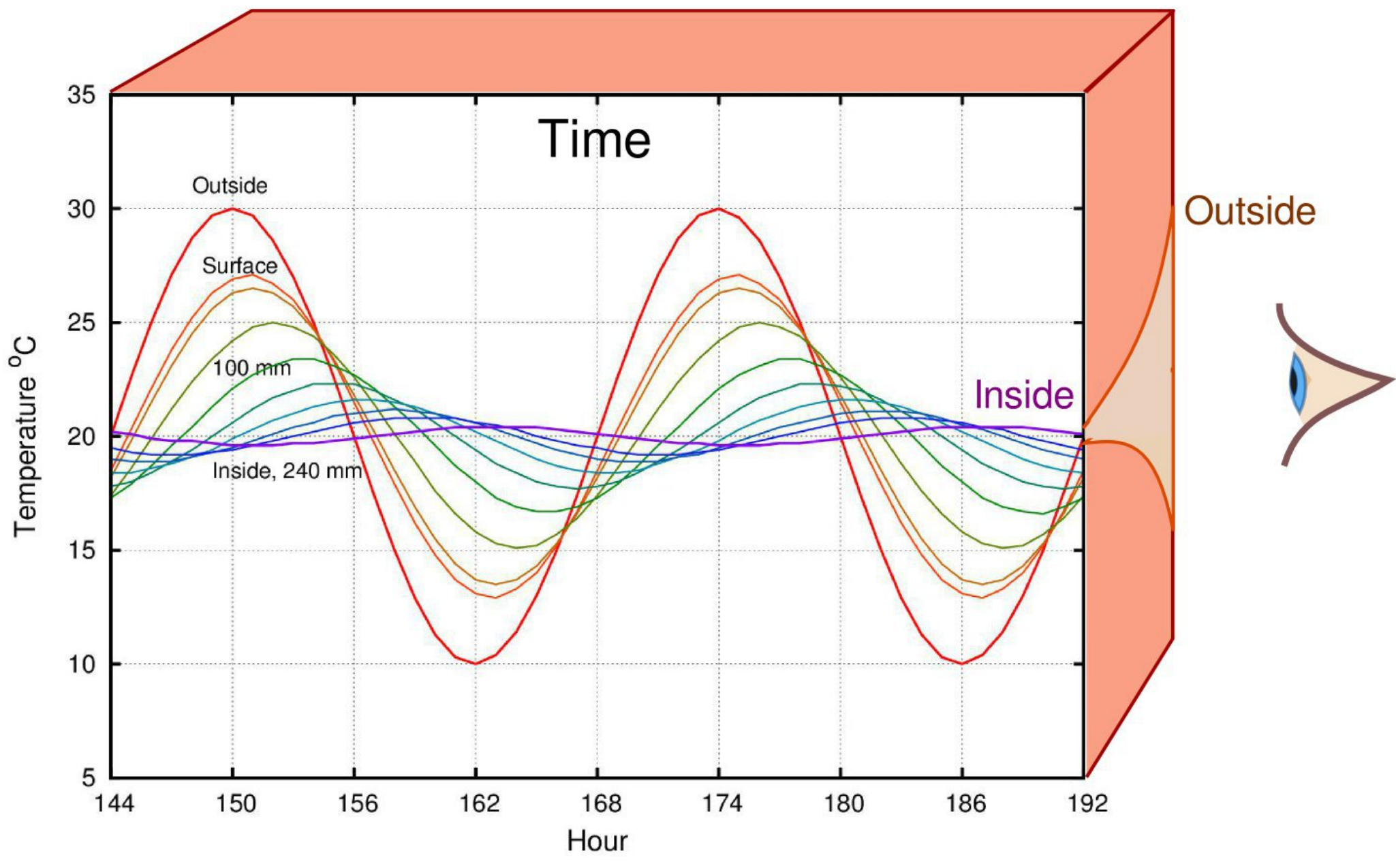
6.3.1 Thermal stability

The construction should be of sufficient density and have air infiltration rates low enough for the temperature and RH to remain stable and within the recommended ranges given in **4.2** for a minimum of 24 hours in the event of exceptional weather conditions or the failure of environmental control equipment.

COMMENTARY ON **6.3.1**

High thermal inertia is recommended irrespective of whether natural means or air-conditioning is used in the construction to achieve environmental stability.

From PD5454:2012

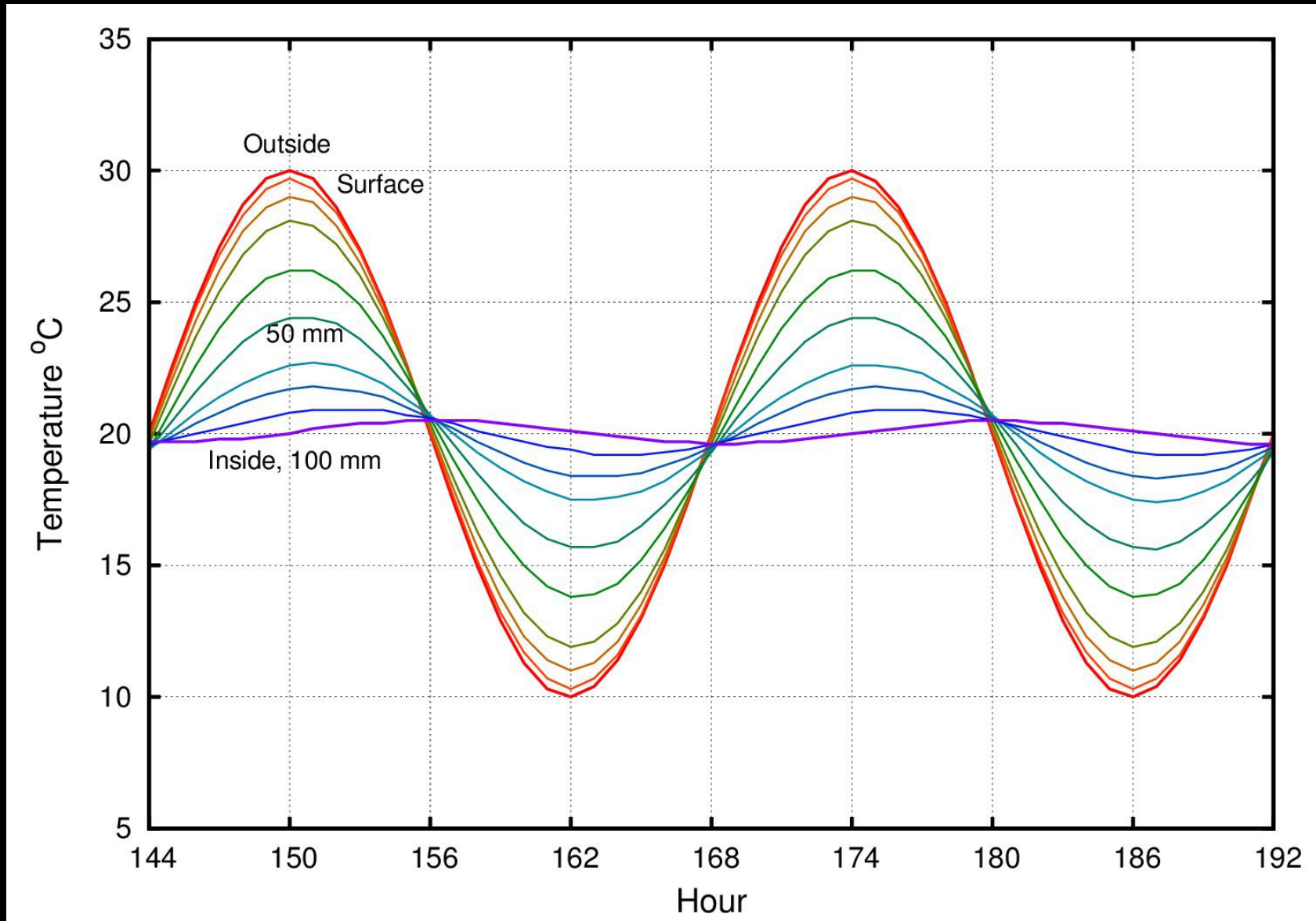


How the daily cycle of temperature penetrates a 240 mm thick solid brick wall

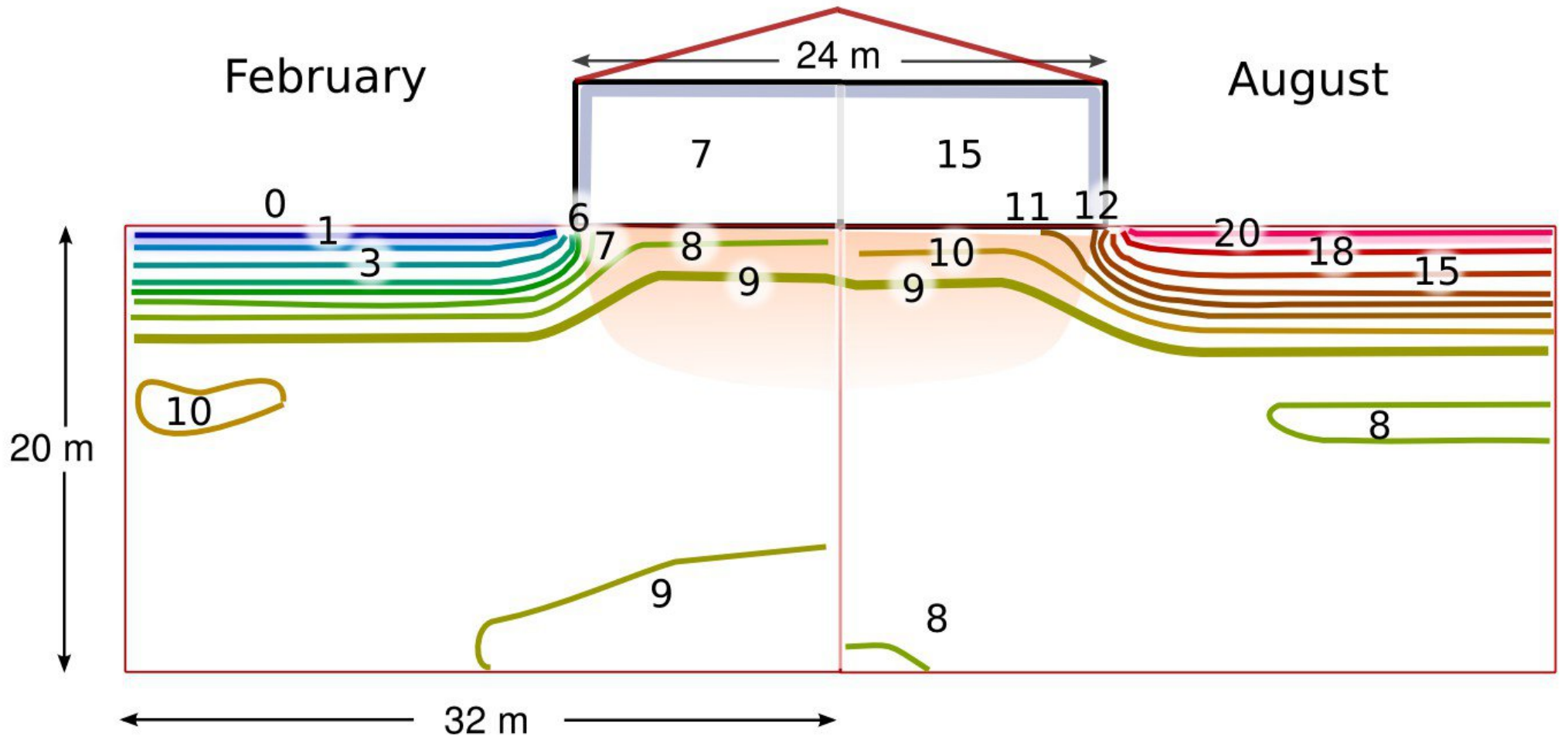


Wall sections of the Cologne city archive

Photo: Der Spiegel

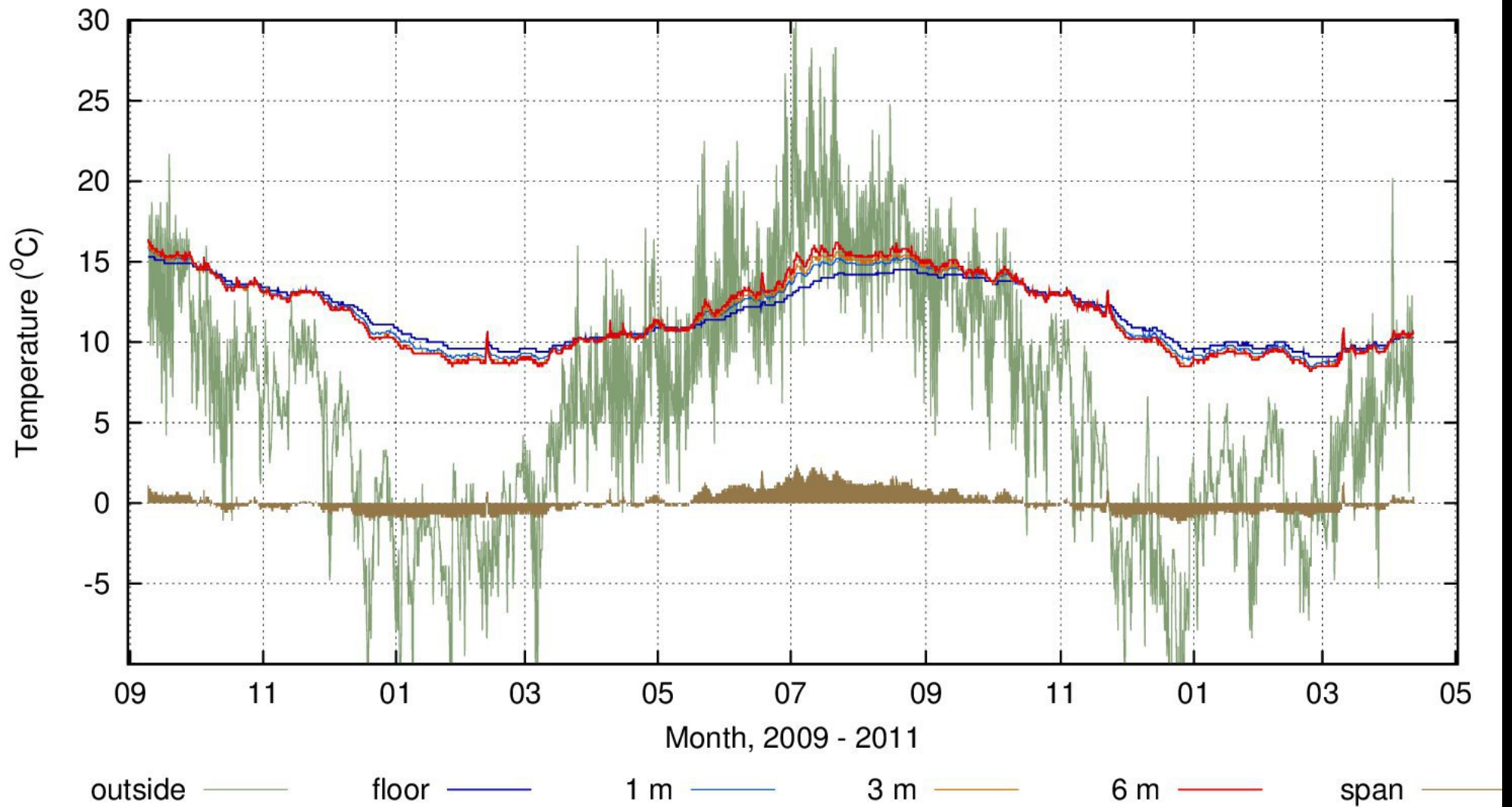


The evolution of temperature within a 100 mm foam wall



Simulation of the underground temperature contours under a museum store, showing how the ground acts as a huge thermal buffer for the building above

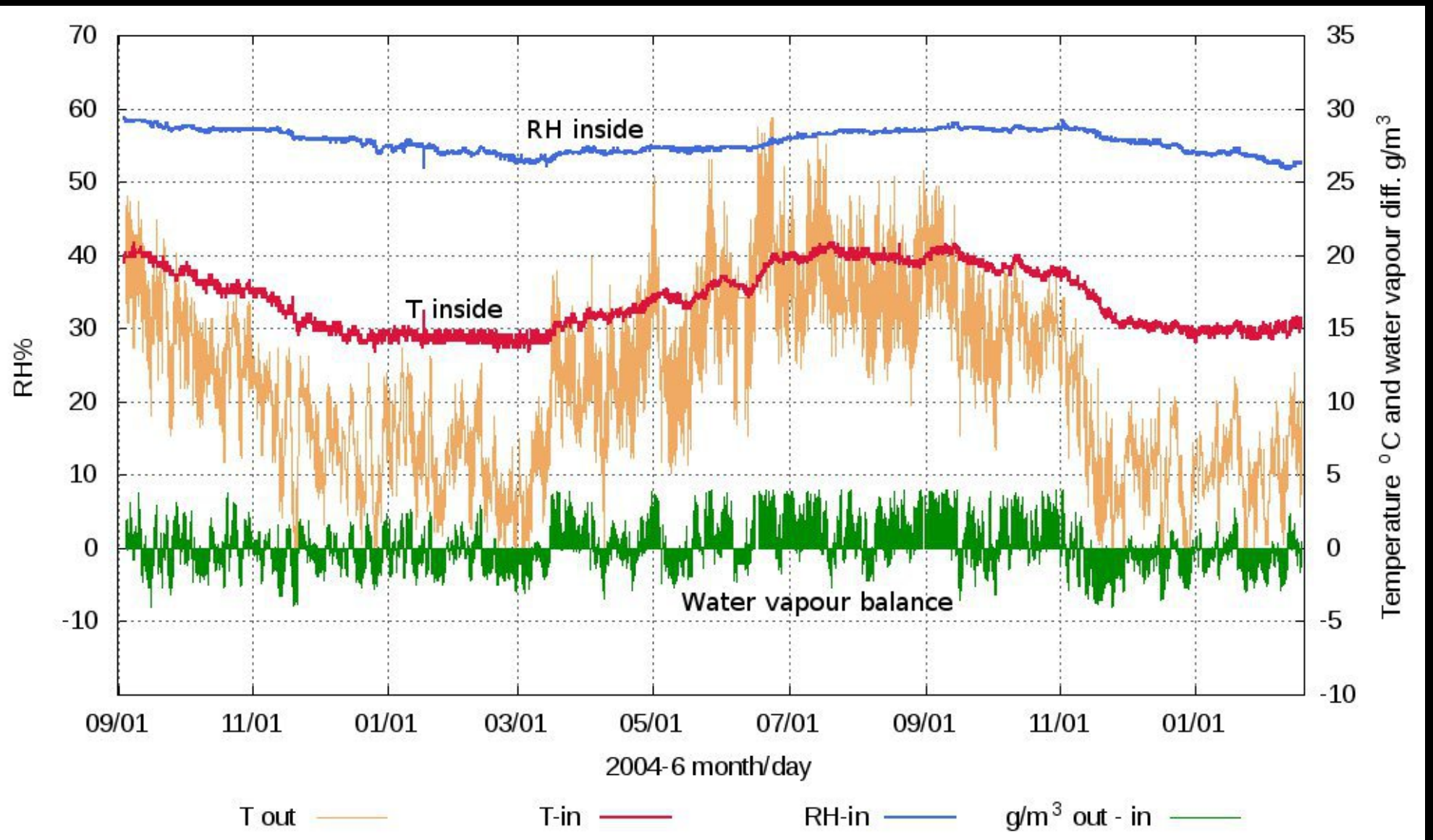
Simulation by Benny Bøhm



The annual temperature cycle at various heights within the museum store in Ribe. The annual cycle span is reduced to 8 K. There is very little temperature stratification

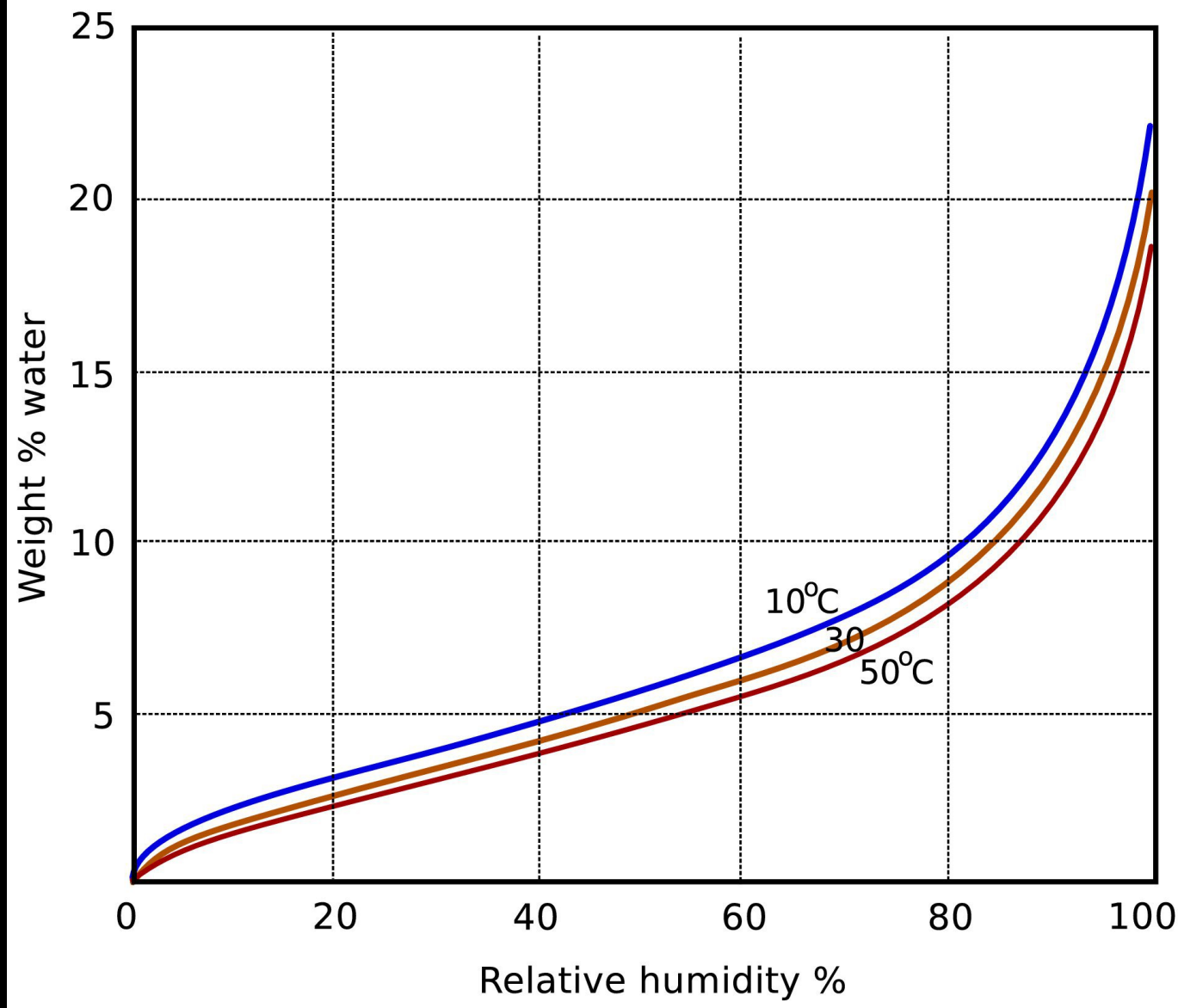
The following ranges of RH and temperature are recommended as a means of preventing even sensitive archival materials referred to within **4.2.2** from being compromised when stored alongside less critically sensitive archival material:

13 °C to 20 °C;
35 %RH to 60 %RH.

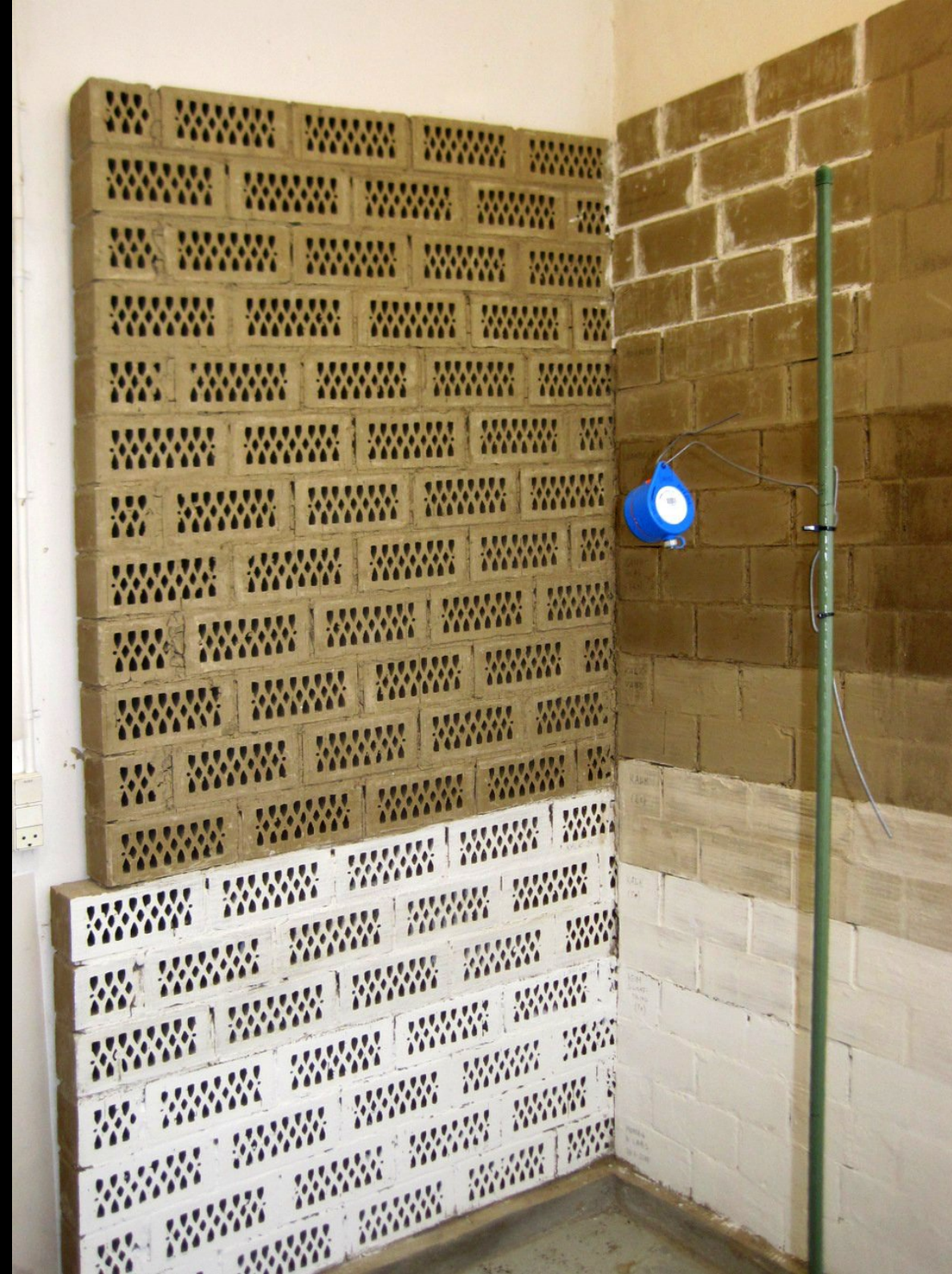


The climate within the Suffolk Record Office,
Ipswich UK.

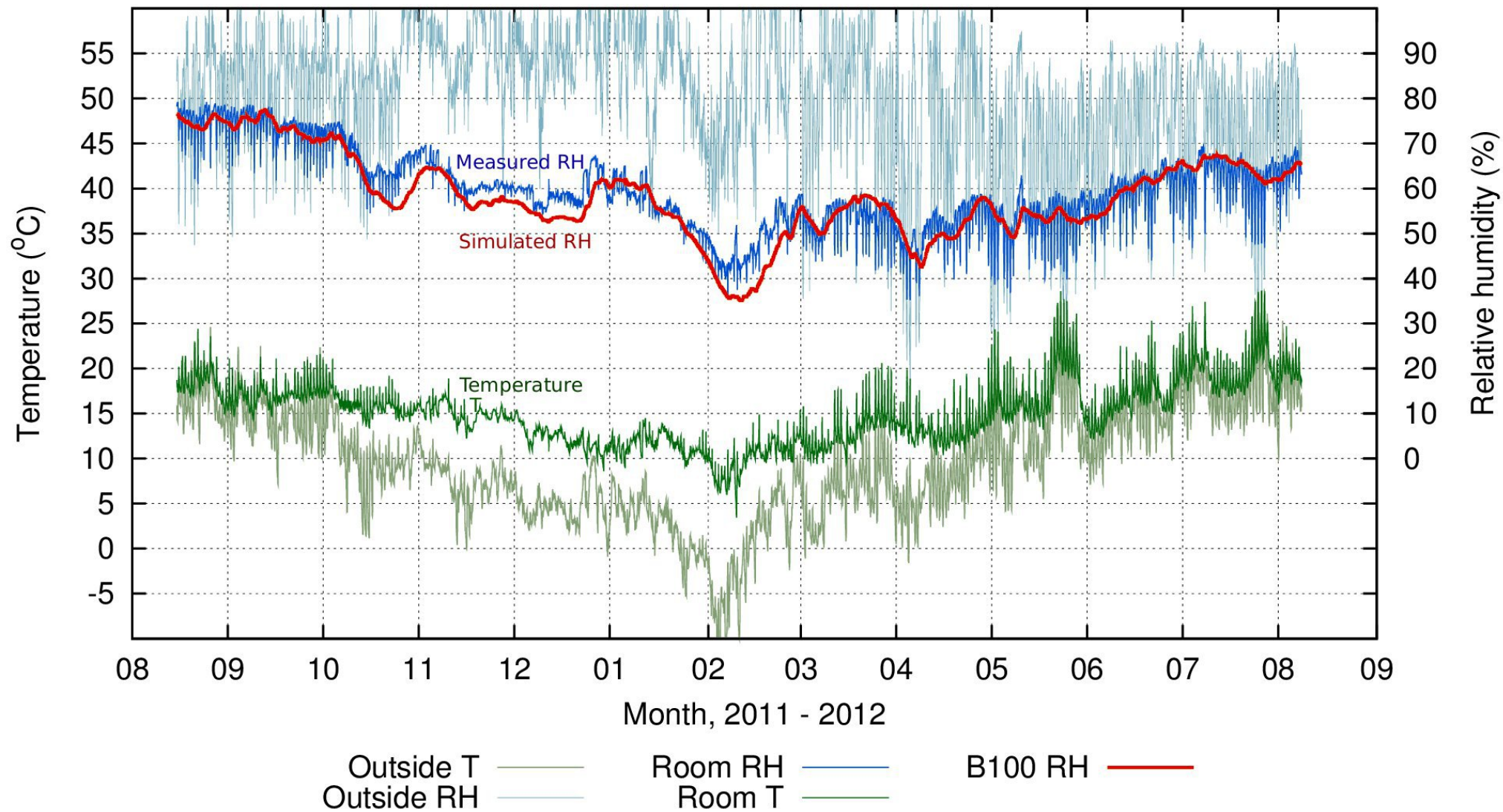
Data from Dominic Wall



The equilibrium between sorbed water in cotton and water vapour in the space around it is scarcely affected by temperature





An experimental room partly lined with unfired, perforated clay brick, as a humidity buffer for stores without much absorbent material in the collection

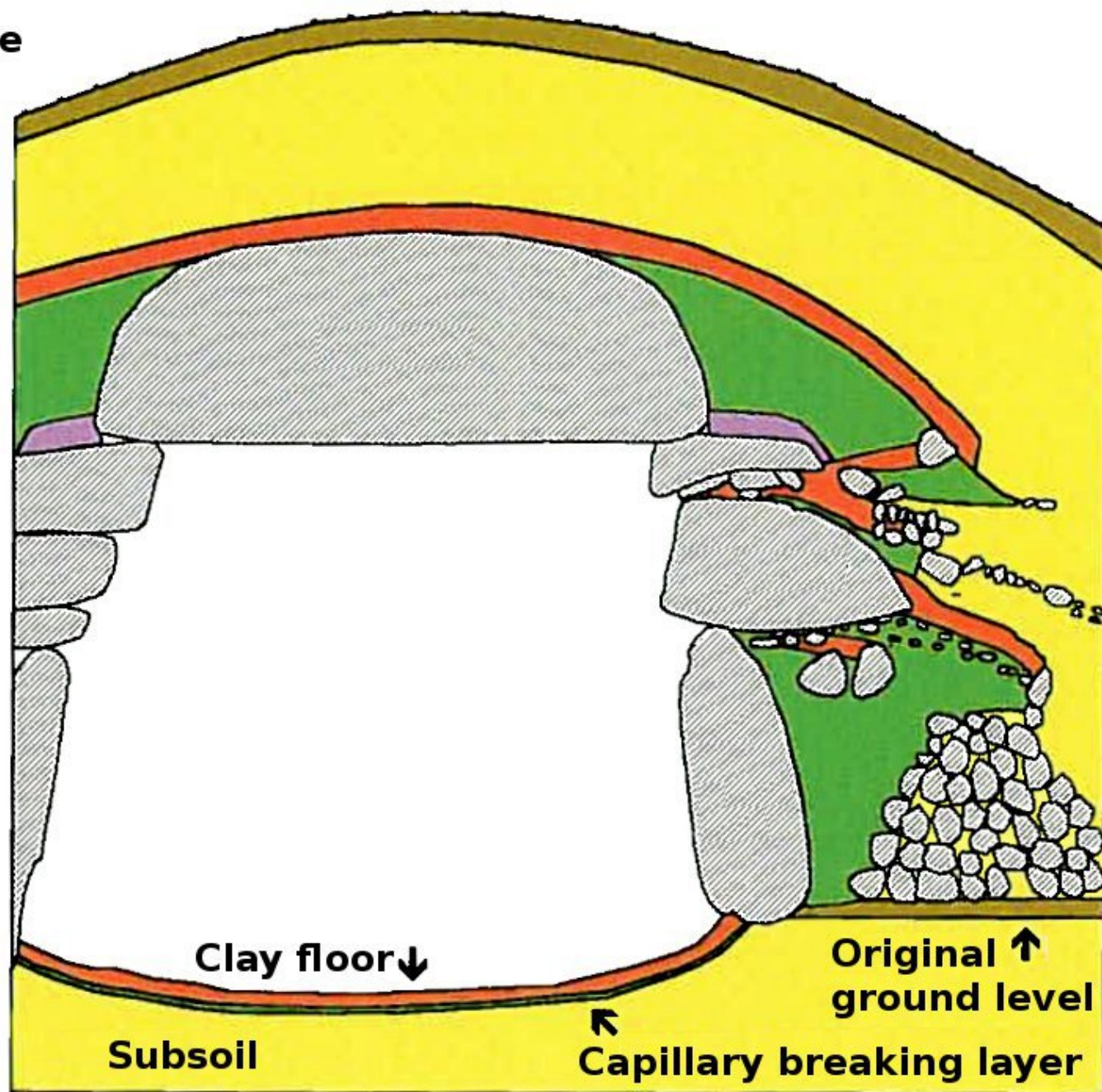
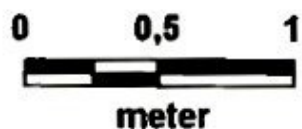


Temperature and RH outside and within the clay lined room. The red trace is the predicted RH. The spikes are due to direct sunlight temporarily overwhelming the buffer capacity of the clay

**Birkehøj passage grave
Denmark**

**Construction
technique**

-  Sand
-  Clay
-  Pebble gravel
-  Stone
-  Top soil
-  Broken flint



I thank colleagues at the National Museum of Denmark:
Poul Klenz Larsen, Morten Ryhl-Svendsen,
Lars Aasbjerg Jensen and Benny Bøhm.
Data from the Suffolk Record Office is from Dominic Wall.
Birkehøj drawing by Jørgen Westphal.

This lecture and an accompanying article which more fully
explains some tricky concepts and provides a bibliography,
are available at:

www.conservationsphysics.org

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