Building to the new relaxed climate standards

Tim Padfield

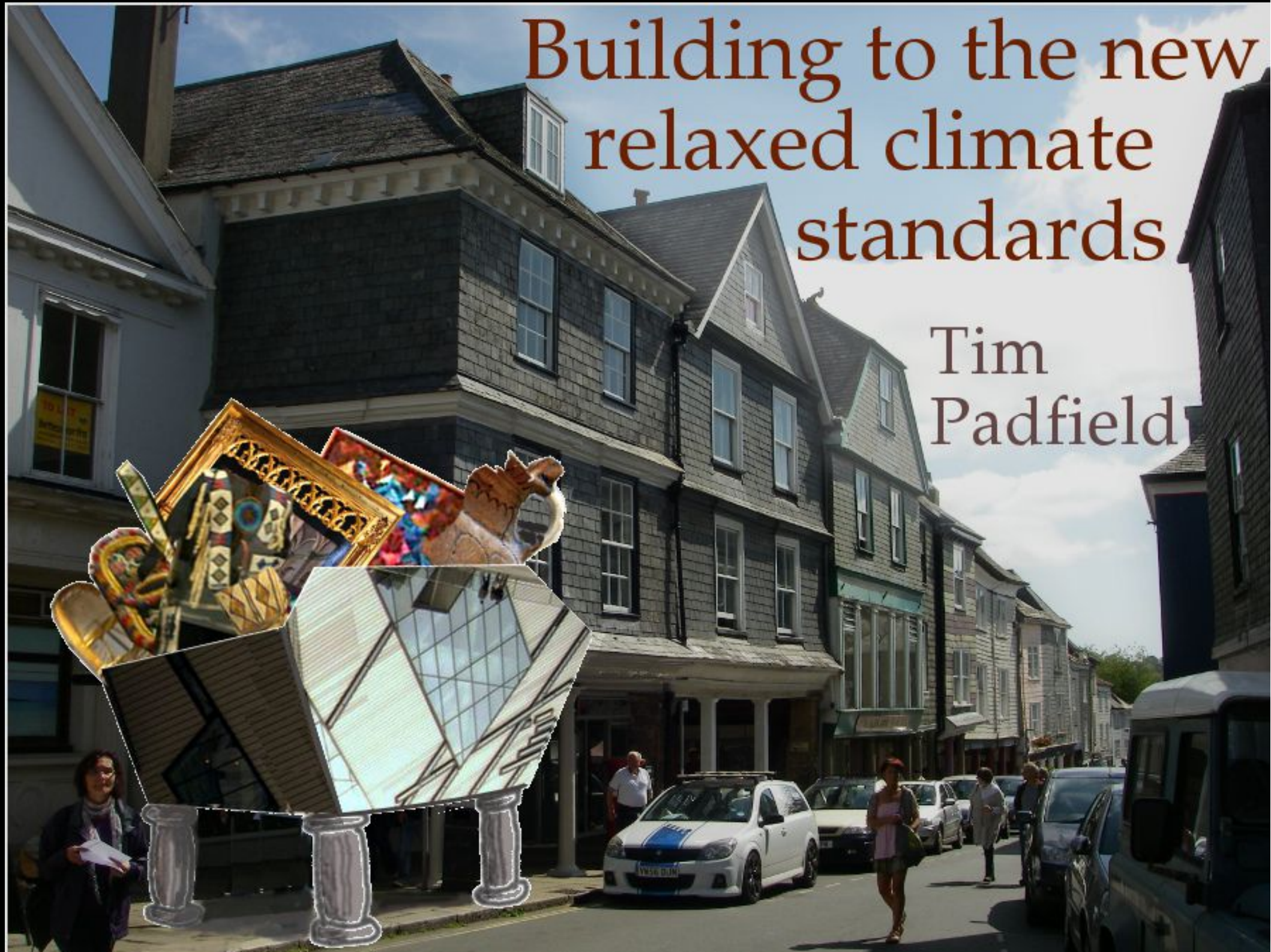
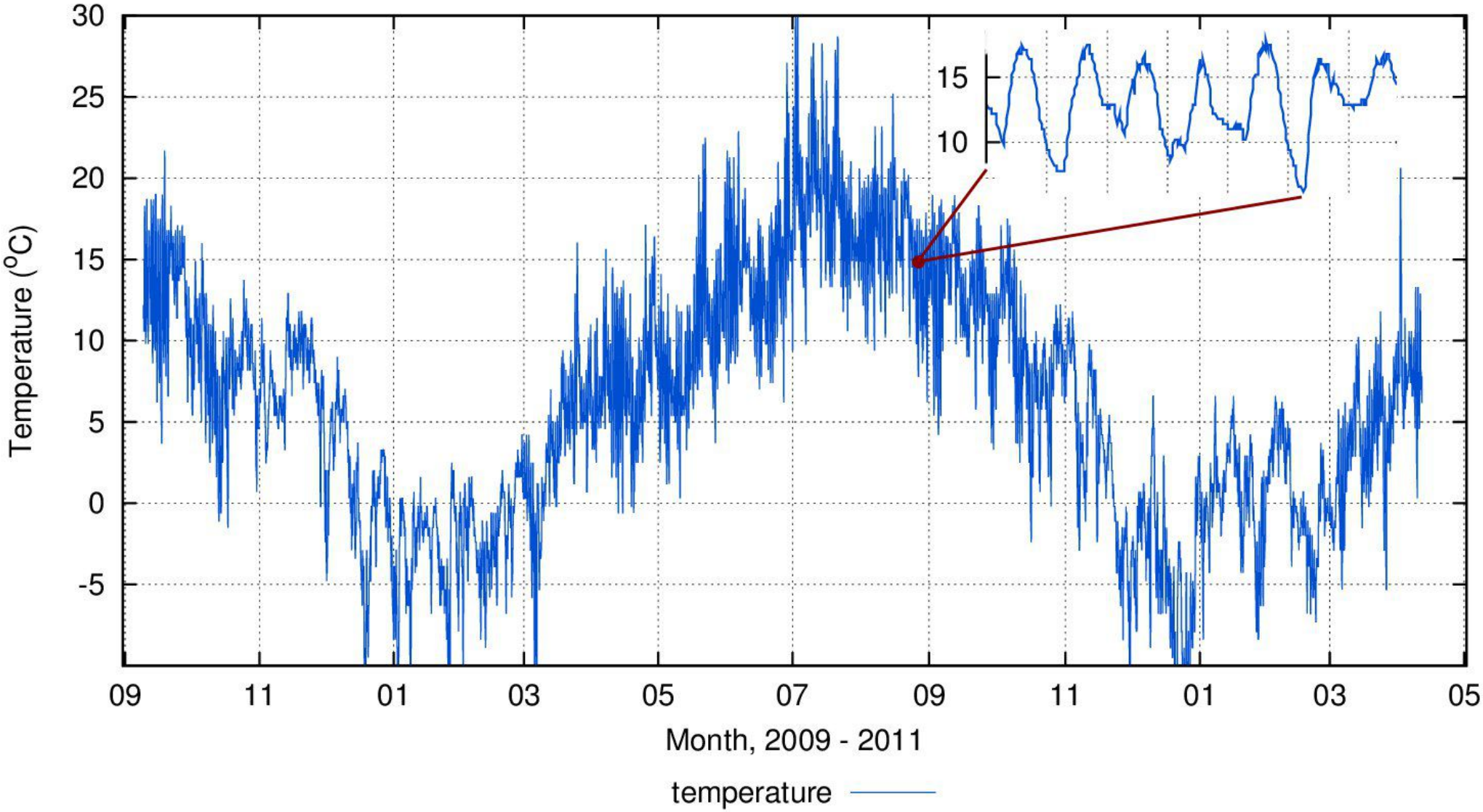



Photo: Helen Coxon

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?

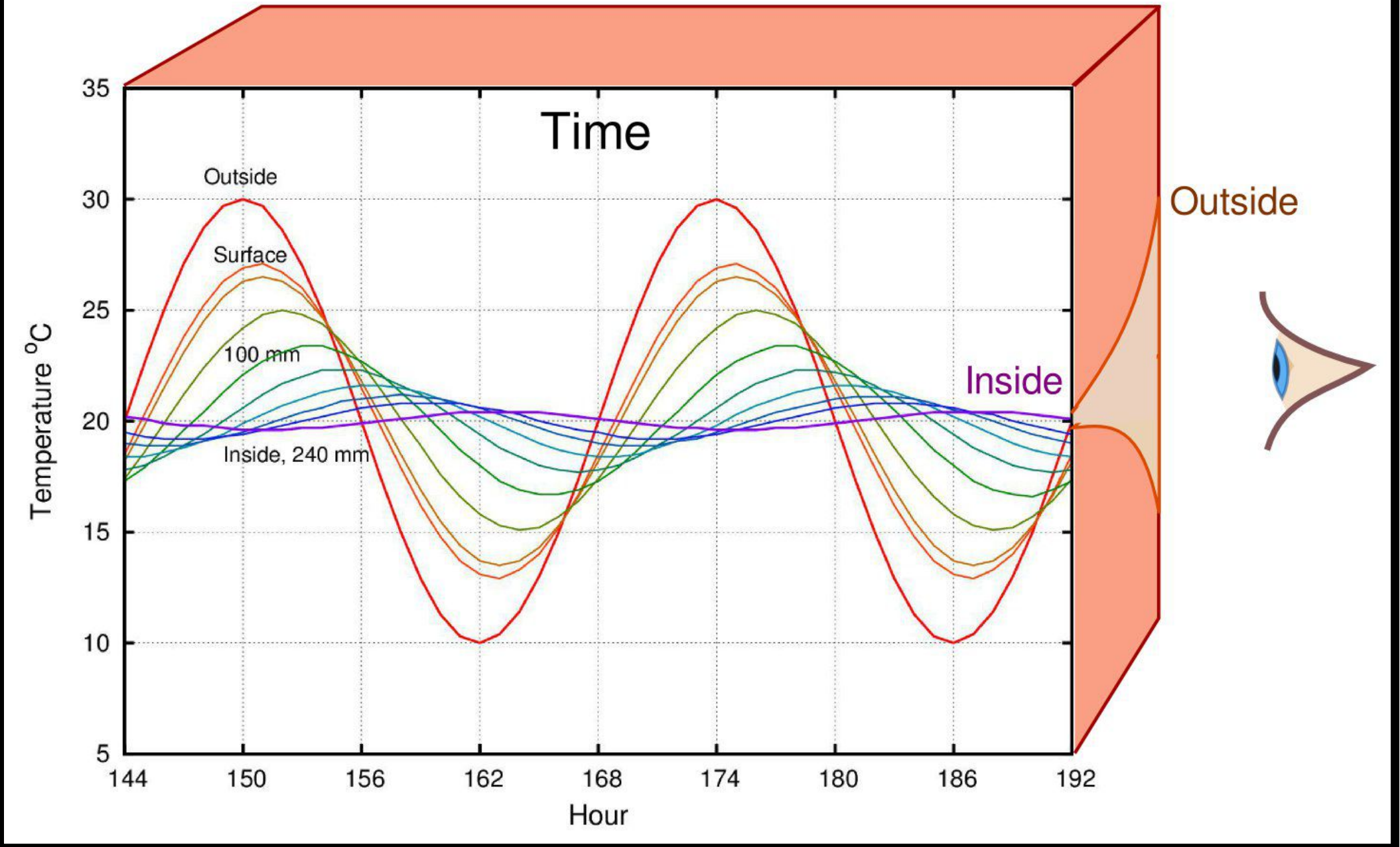


The temperature in Ribe, Denmark
The daily cycles are expanded in the insert

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.

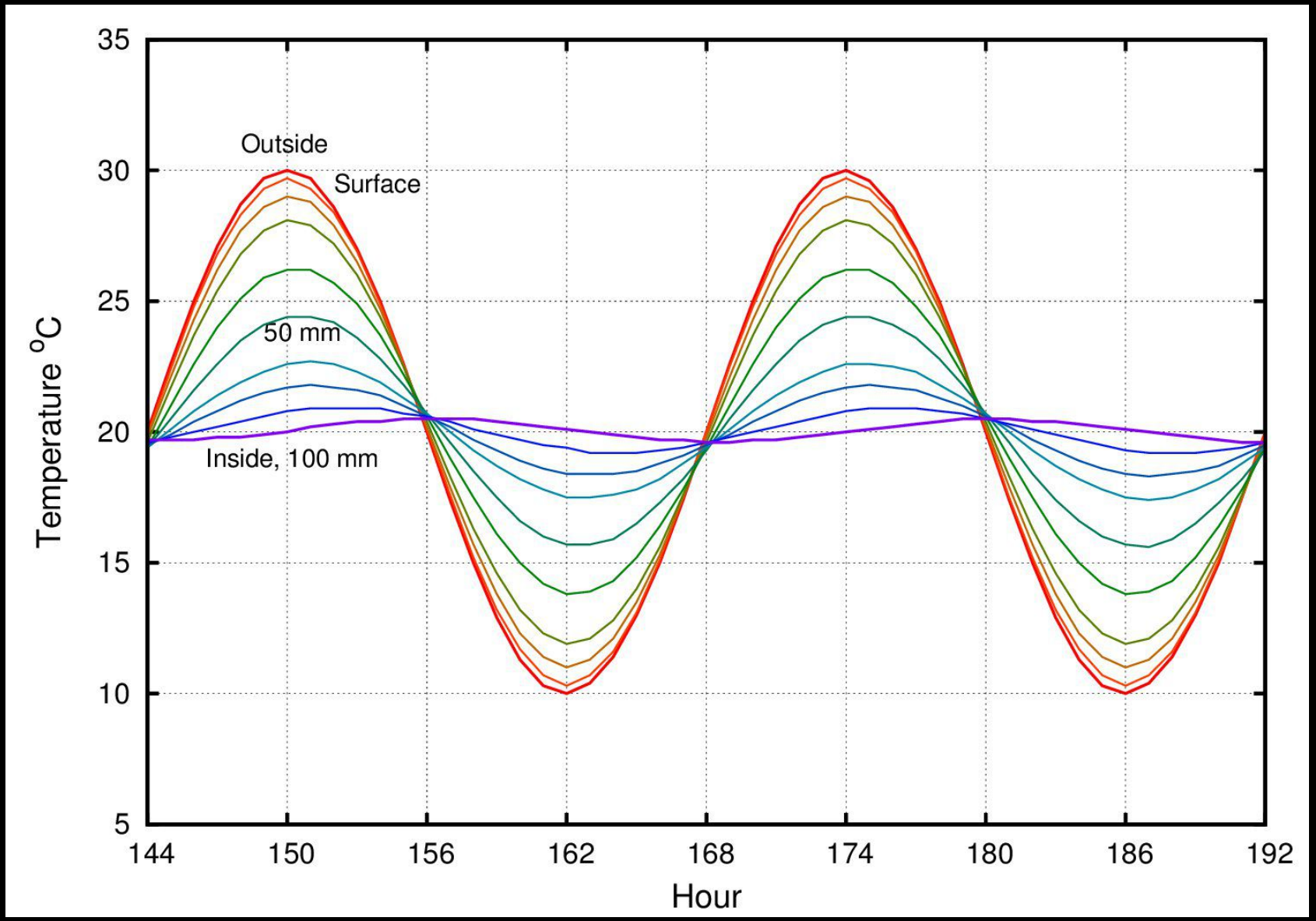
From PD5454:2012



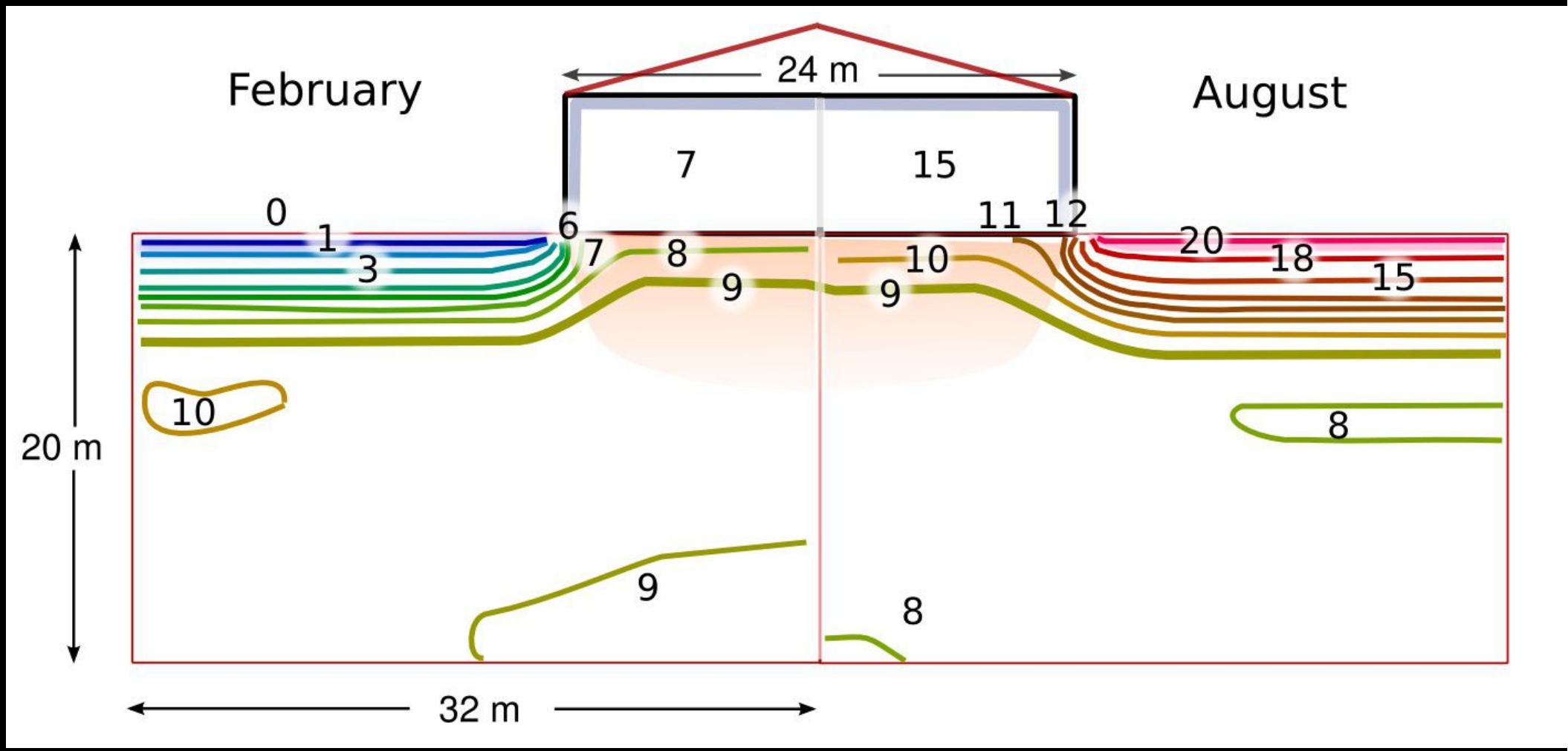
How the daily cycle of temperature penetrates a 240 mm thick solid brick wall

Wall sections of the Cologne city archive

Photo: Der Spiegel

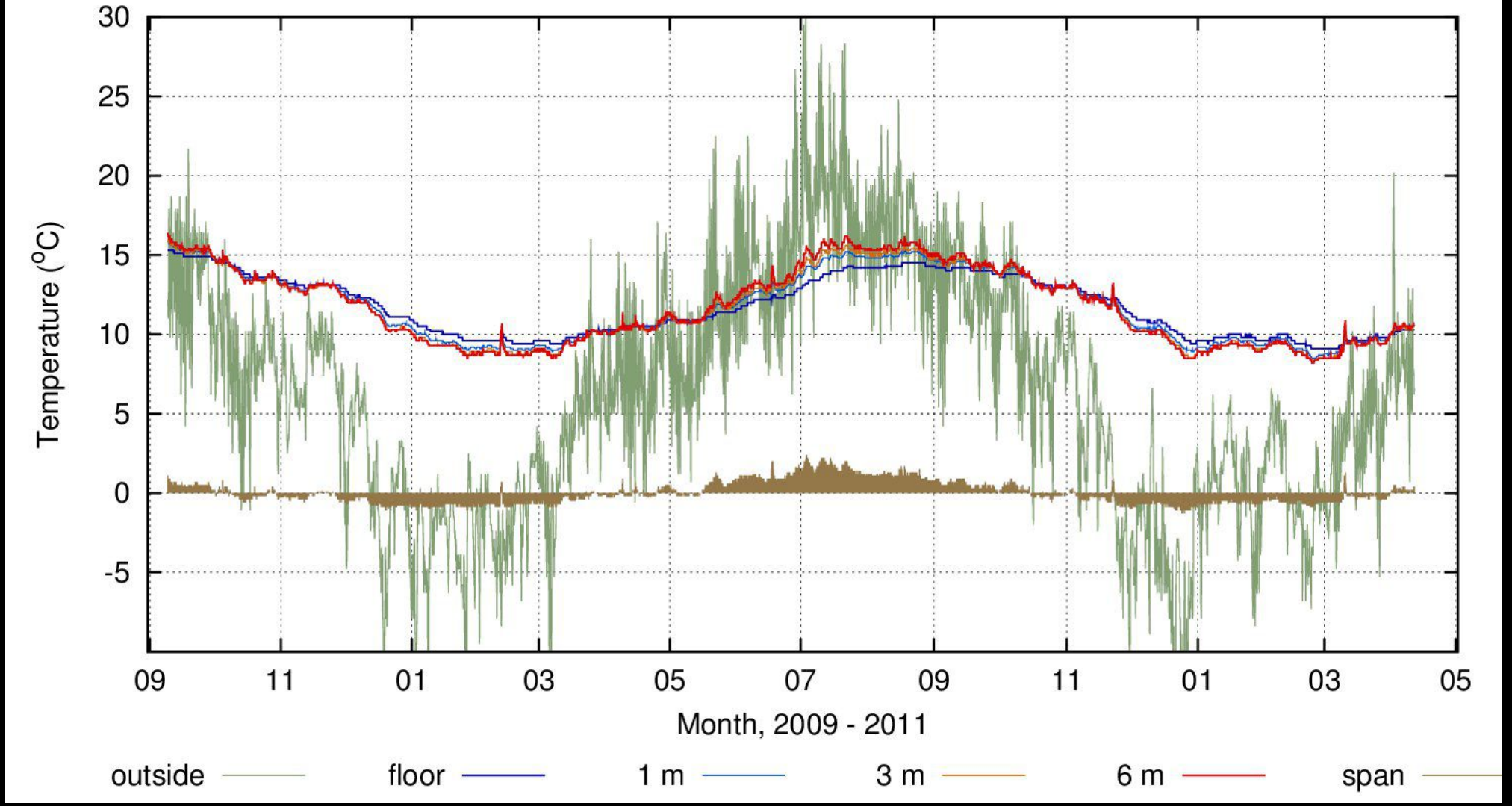


The evolution of temperature within a 100 mm foam wall



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

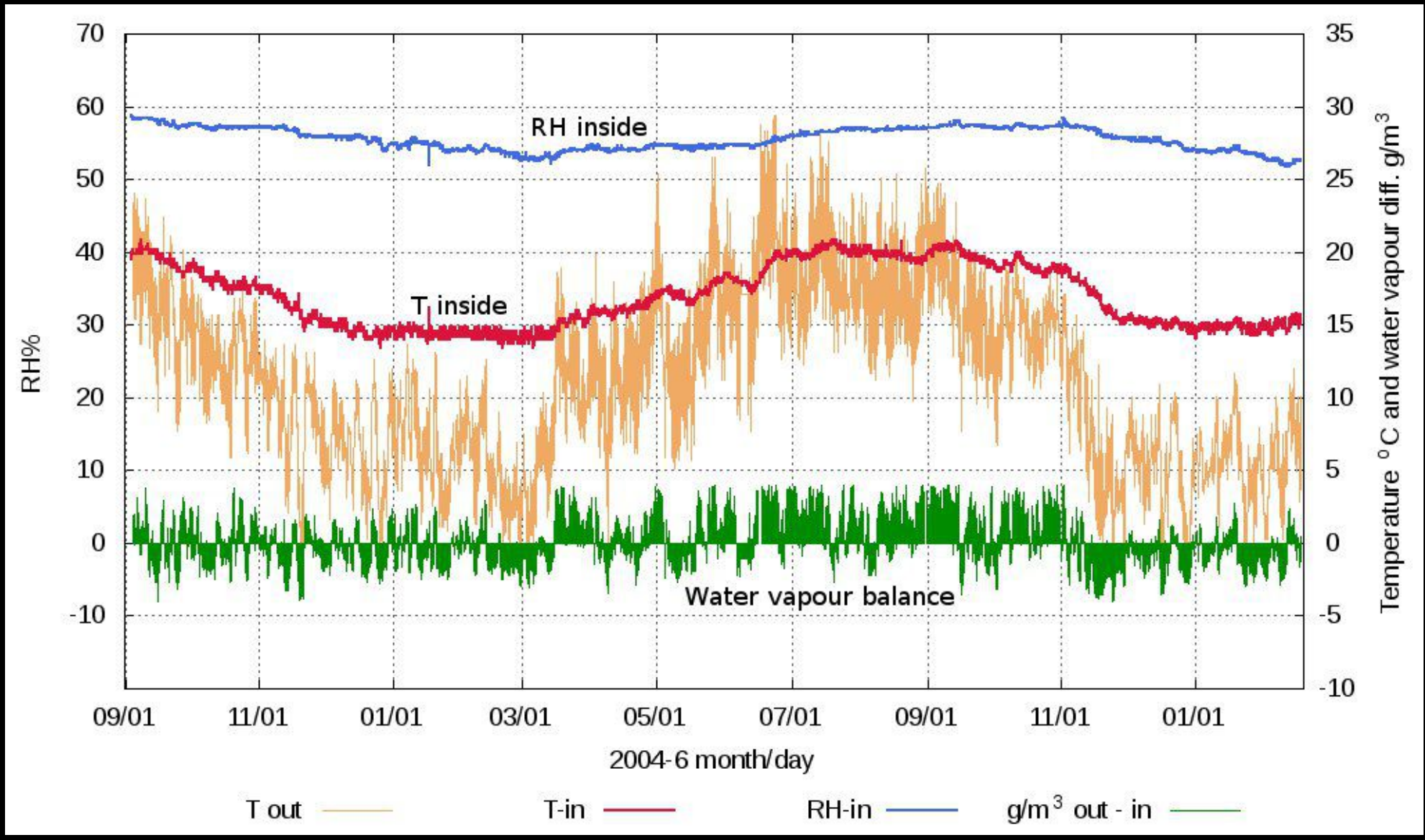


The annual temperature cycle at various heights within the museum store in Ribe.
The annual cycle span is reduced to 8 K.
There is very little temperature stratification

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:

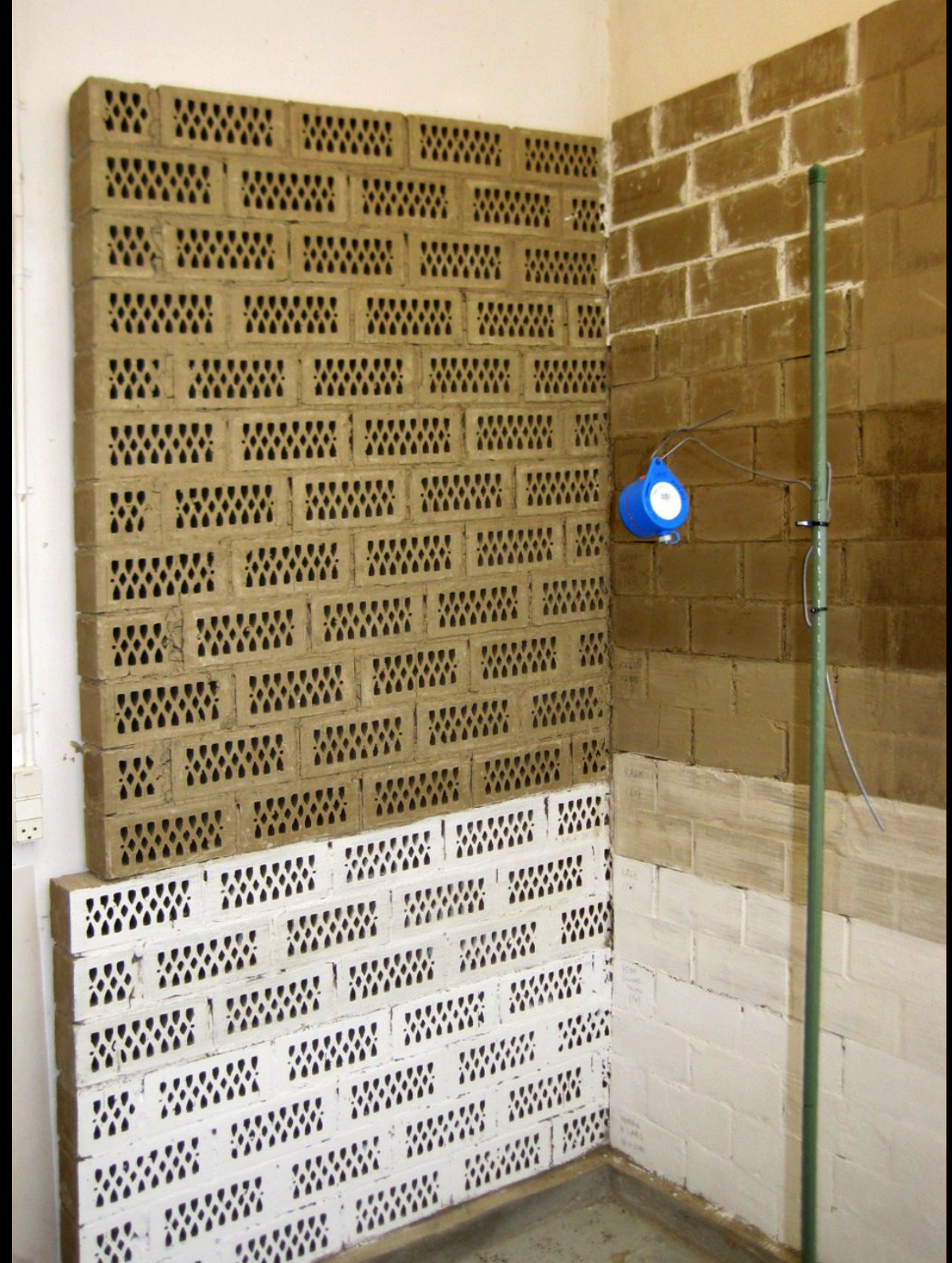
13 °C to 20 °C;
35 %RH to 60 %RH.

from PD5454:2012

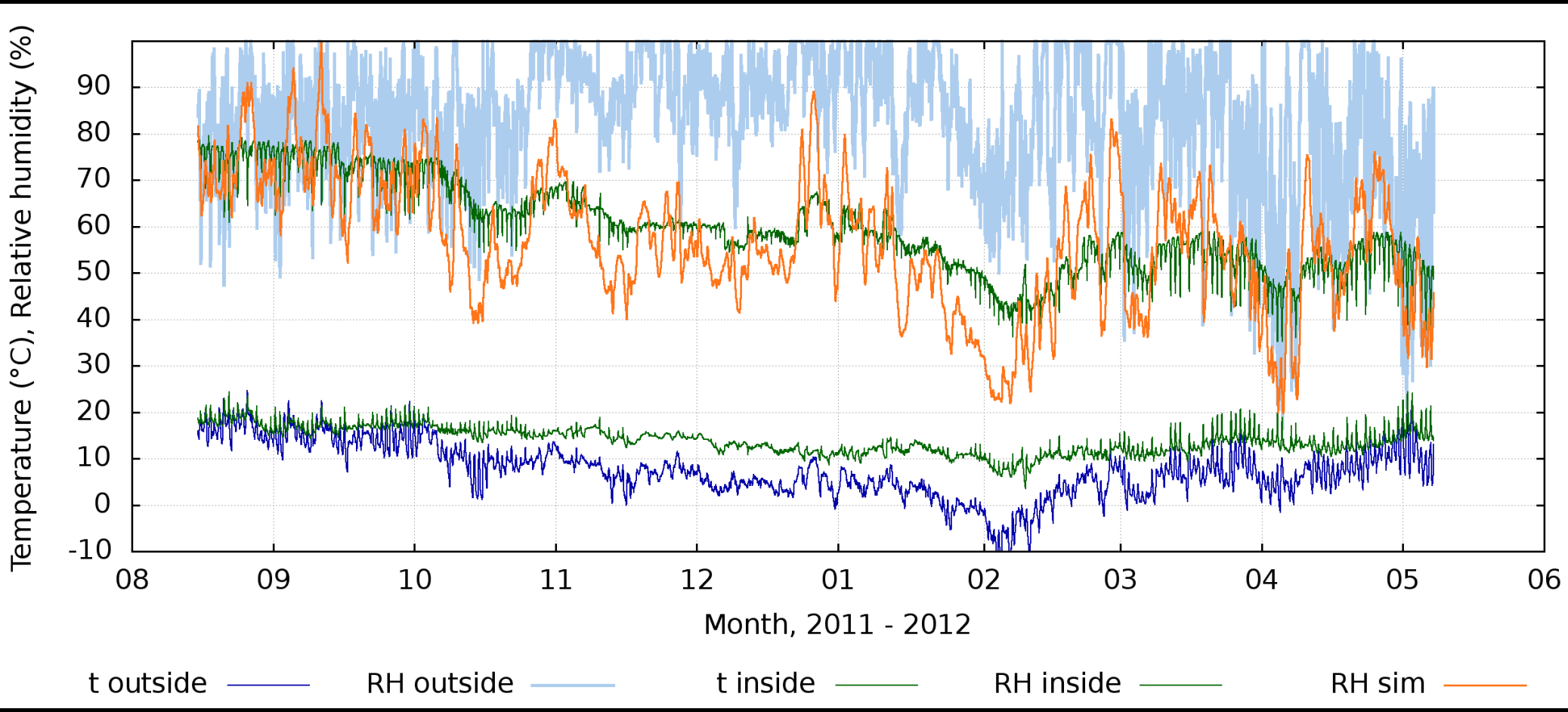


The climate within the Suffolk Record Office, Ipswich UK.

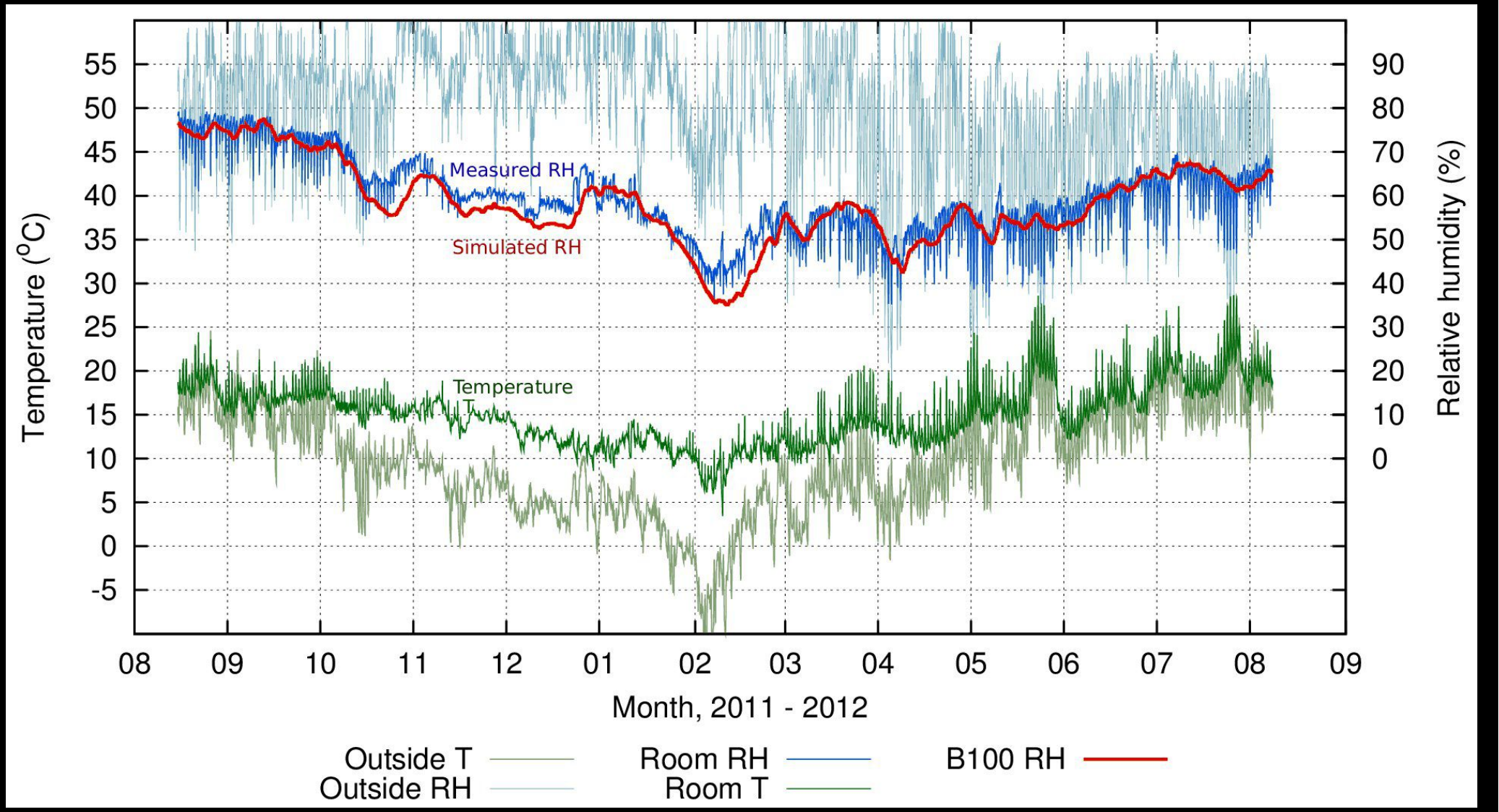
Data from Dominic Wall



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



The orange trace is the RH calculated for an empty room without content



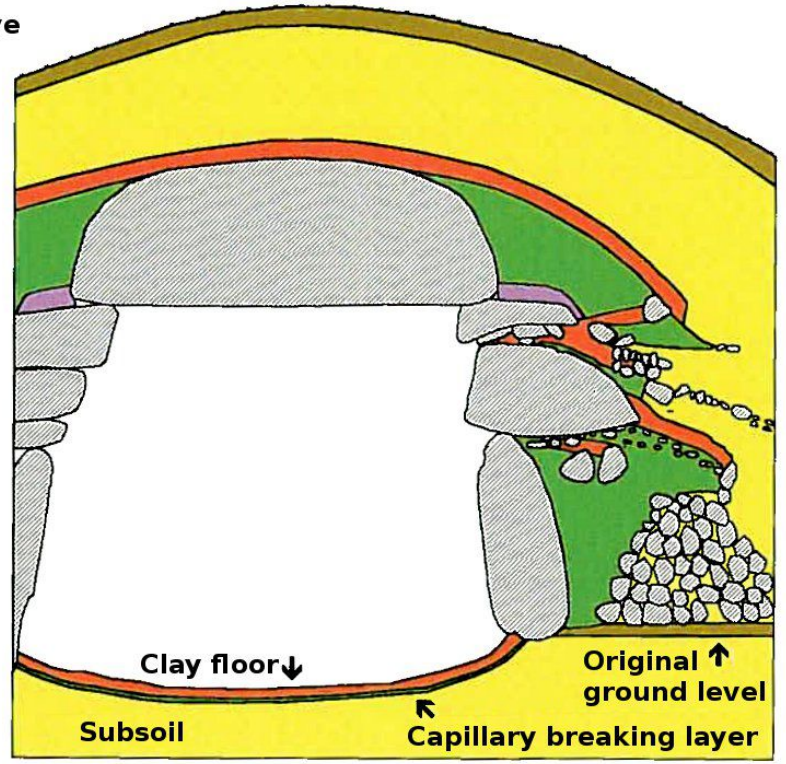
Temperature and RH outside and within the clay lined room. The red trace is the predicted RH. The spikes are due to direct sunlight temporarily overwhelming the buffer capacity of the clay

Birkehøj passage grave
Denmark

Construction technique

Sand
Clay
Pebble gravel
Stone
Top soil
Broken flint

0 0,5 1
meter



Drawing by Jørgen Westphal

I thank colleagues at the National Museum of Denmark:
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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.conservationphysics.org

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