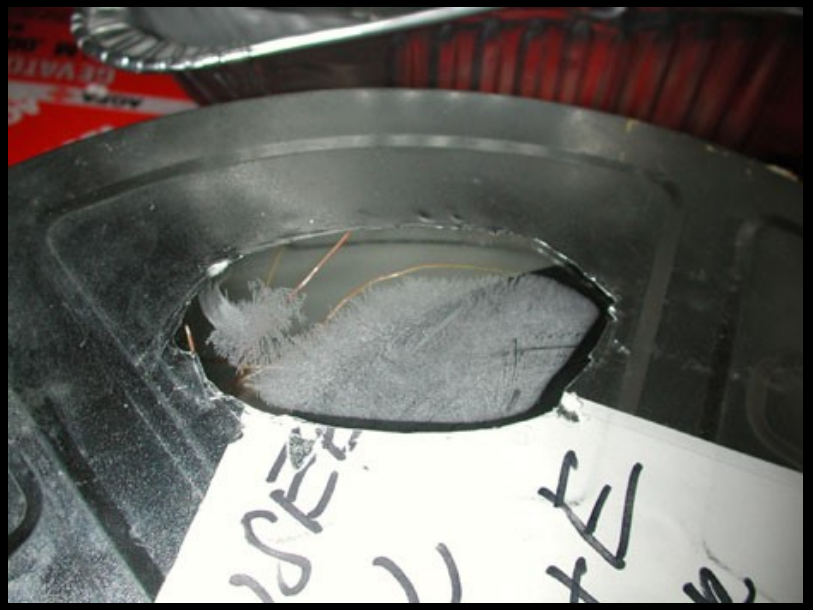
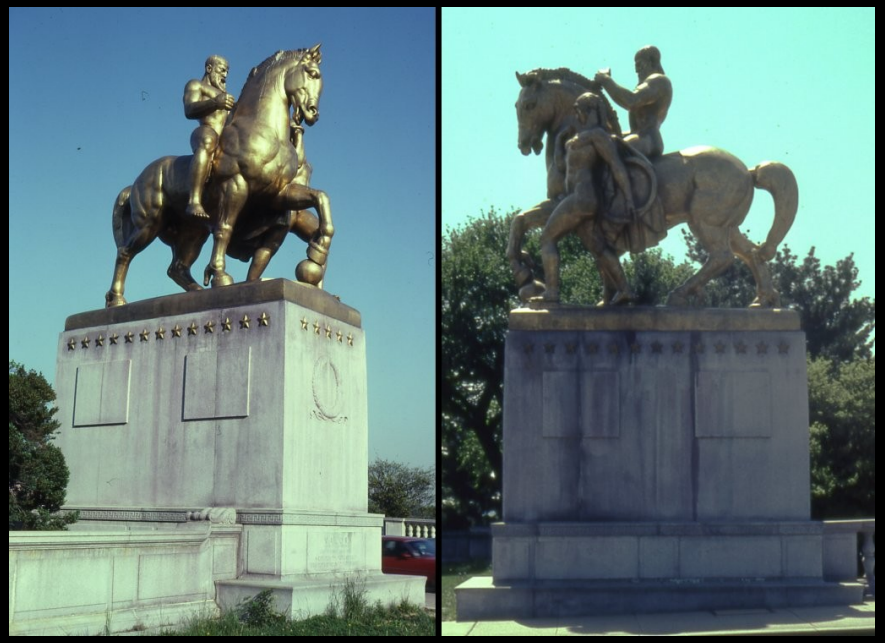
Most museum objects are in boxes, or are themselves boxes

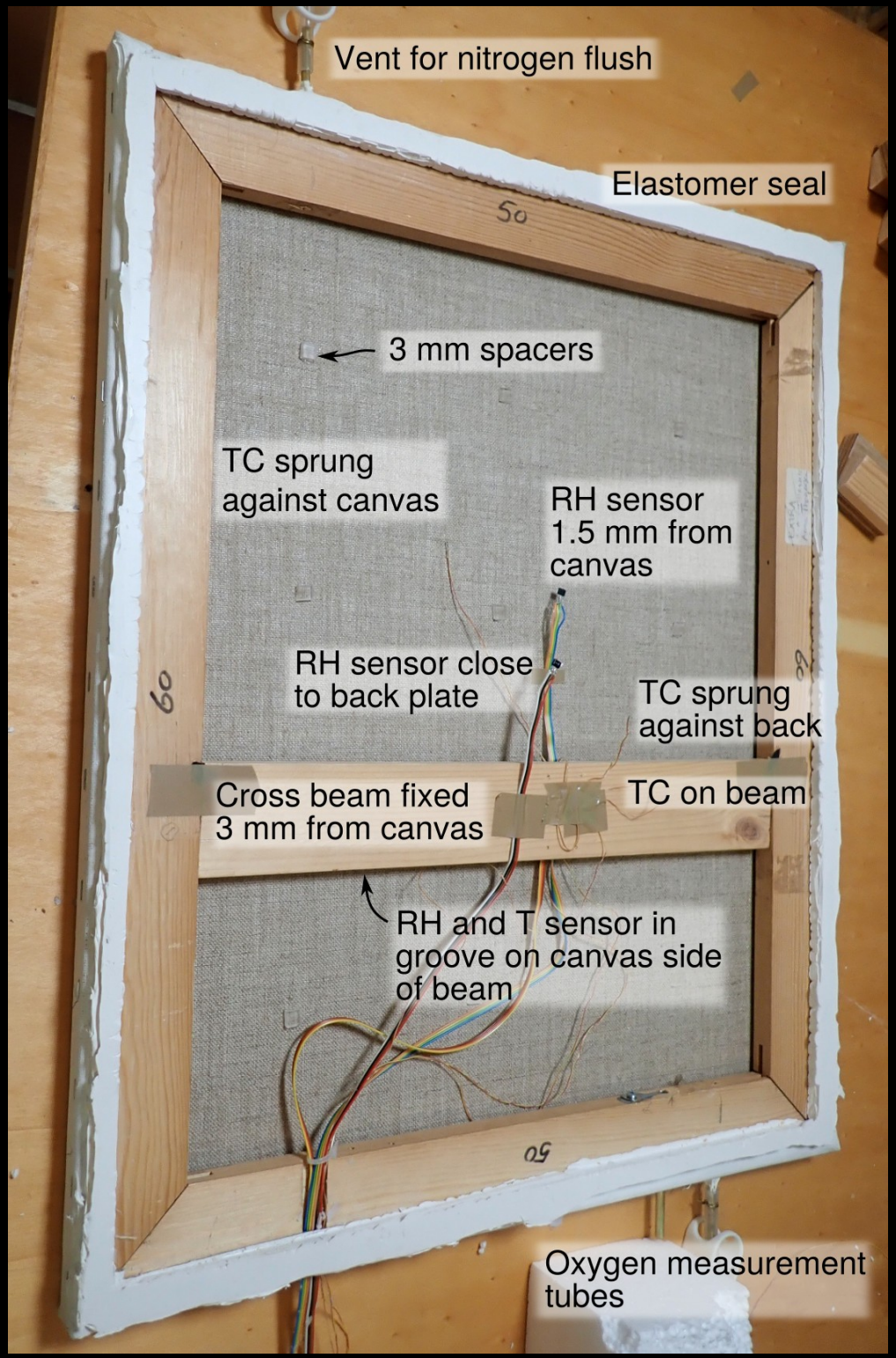
Glass fronted paper poster in evening sun.



Acetate film roll in cold can

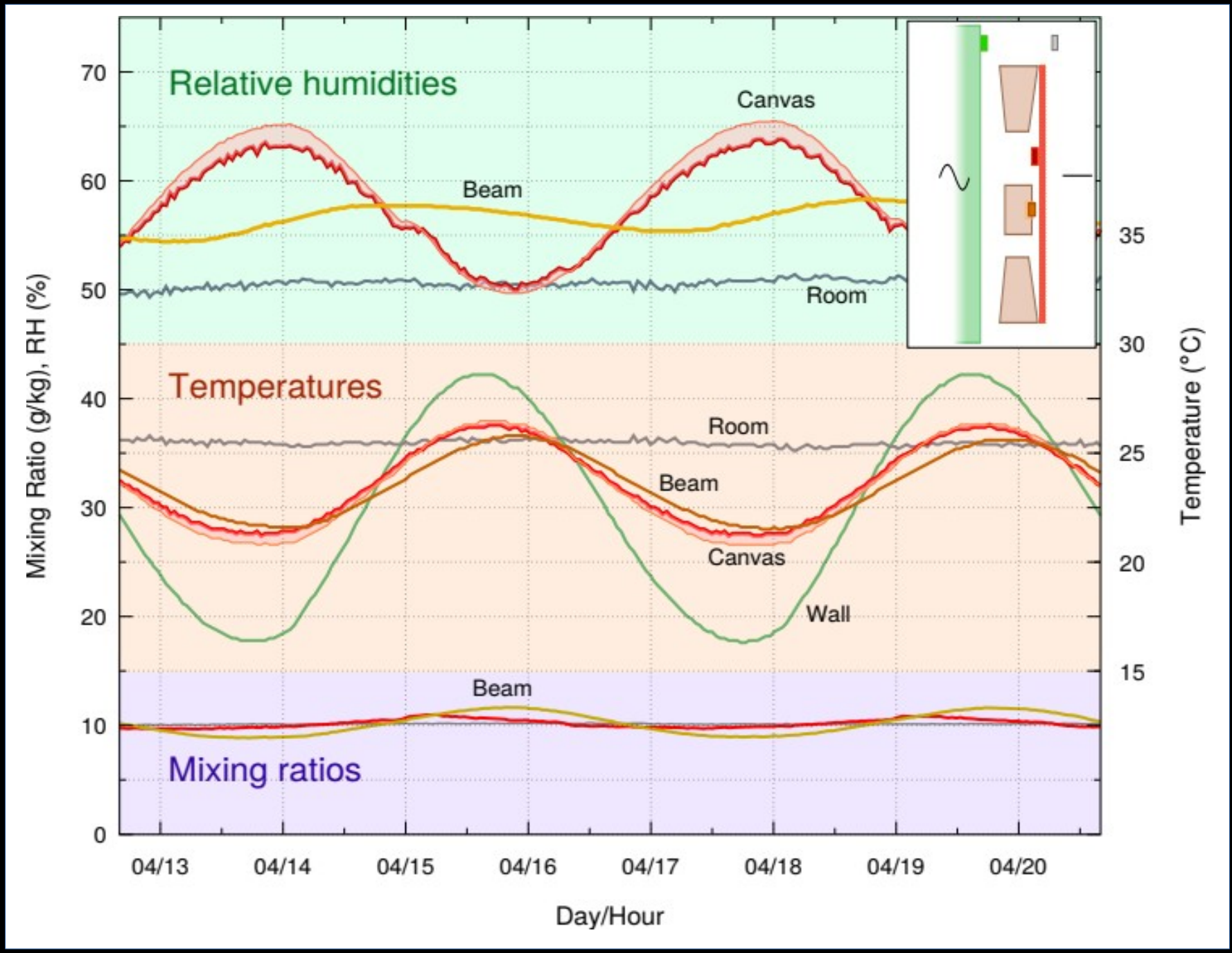


Gilded bronze statue, Washington DC

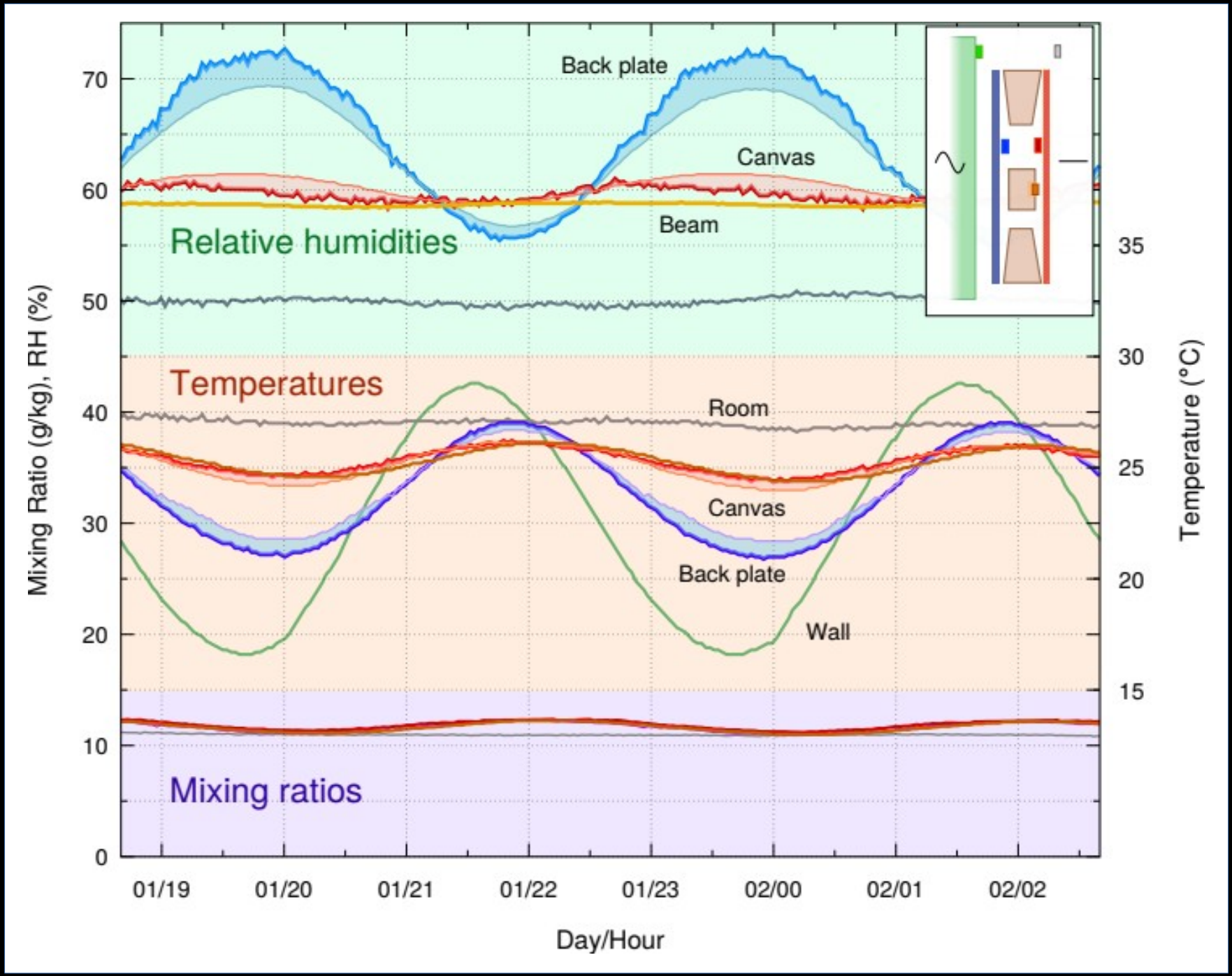


The painting is mounted against a ‘wall’ of painted aluminium whose temperature is set by copper pipes circulating tempered water from the control apparatus on the right.

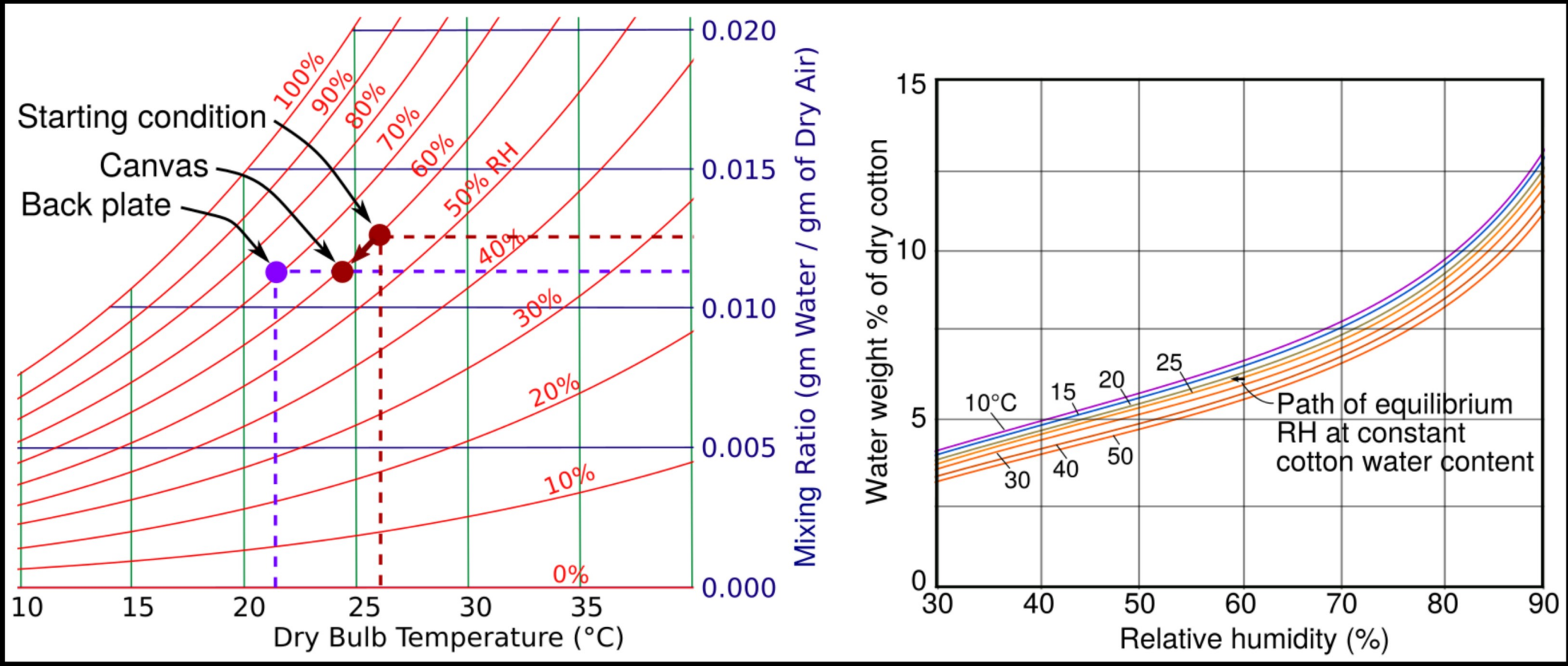
The painting frame dimensions:
500 x 600 x 30 mm



The painting, without back protection, is held 10 mm away from the wall, exposed to a 4 hour temperature cycle.
The 3 mm gap between beam and painting can be regarded as a leaky box.



The same as before but with an aluminium plate behind the frame.
Note the changing, but identical mixing ratios

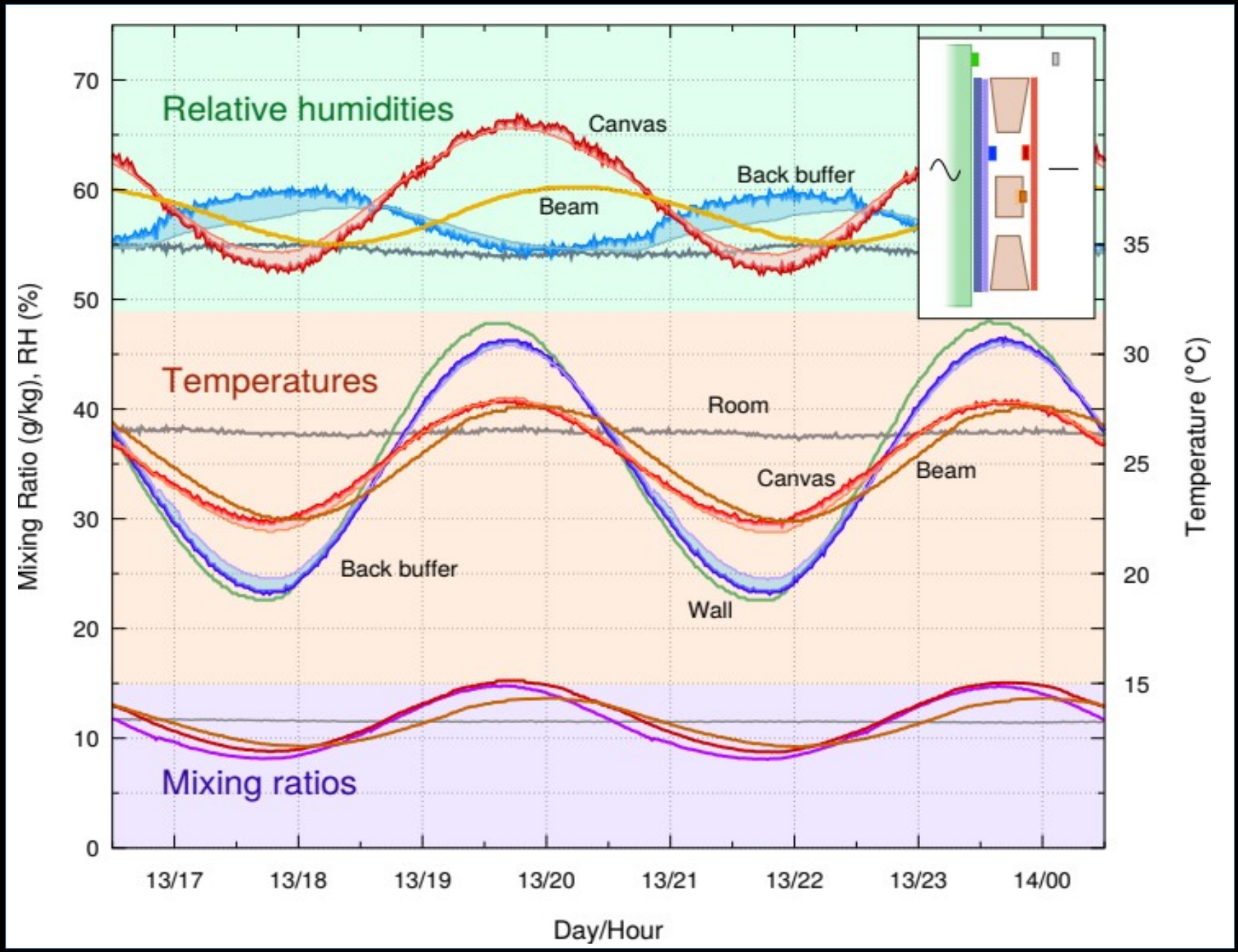


The high back plate surface RH can be explained with the psychrometric chart. From the starting condition at the left margin of the graph in the previous slide, the canvas cools to a minimum temperature but its surface RH only falls 1%l, as shown on the cotton isotherms diagram. So the position on the chart slides diagonally down close to the line of constant RH to the point marked ‘canvas’. This gives a mixing ratio which is lower, about 11 g/kg. This air migrates to the back plate, *without changing its mixing ratio*. The back plate is cooler than the canvas, so this air rises in RH.

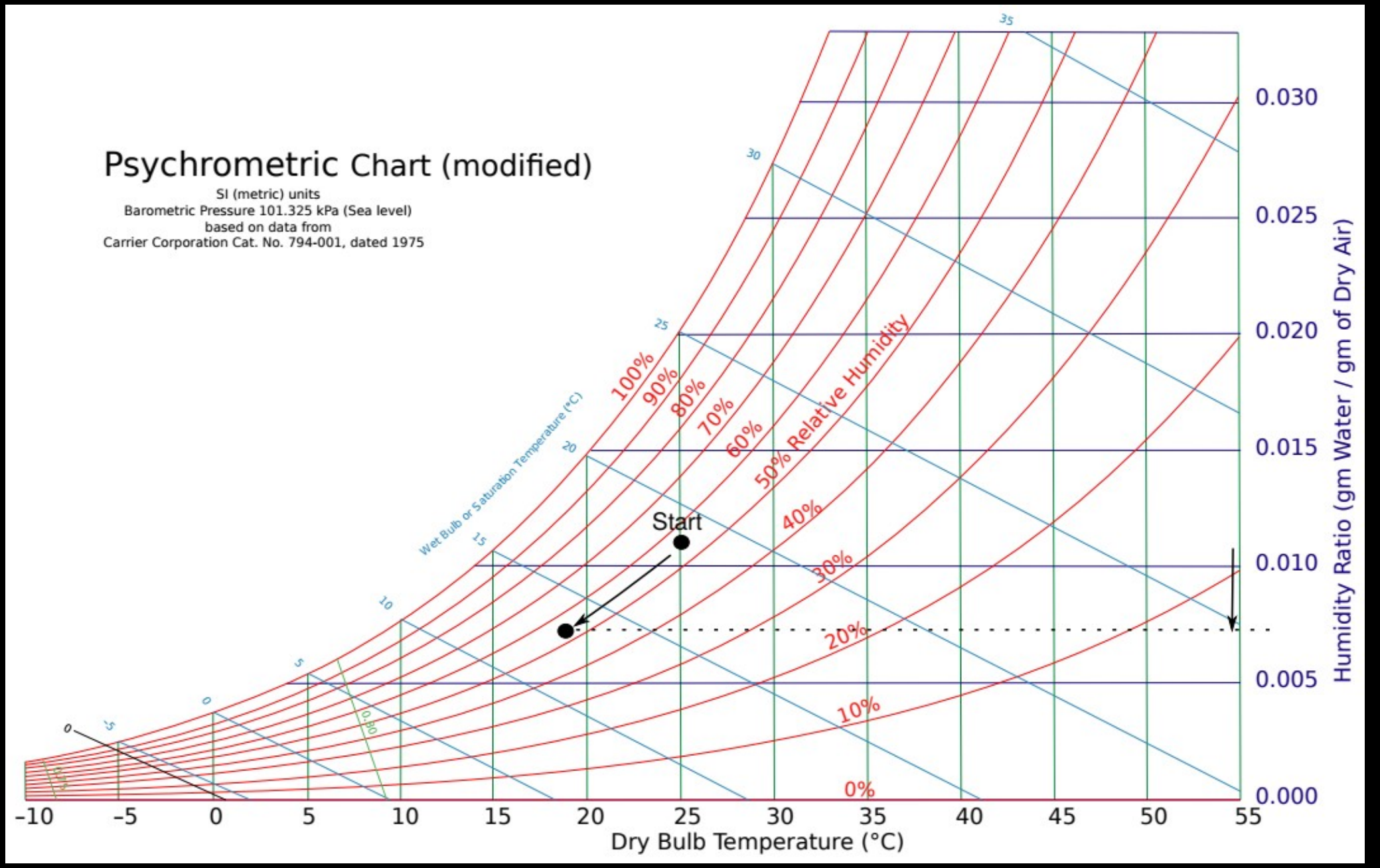
Historically, most back protection has been wood, cloth or card.

All these are hygroscopic cellulosic materials.

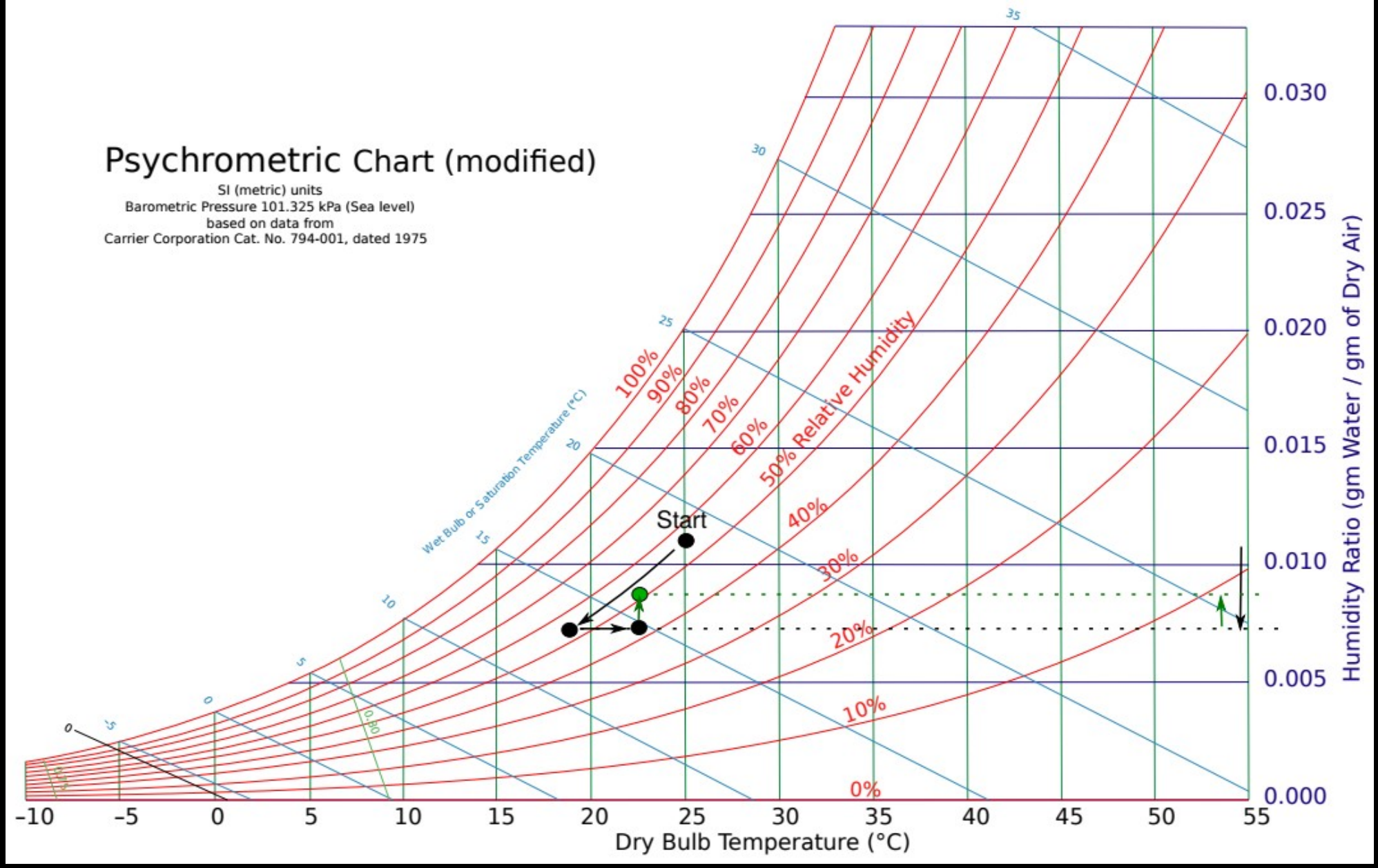
Curia church, Floriana, Malta



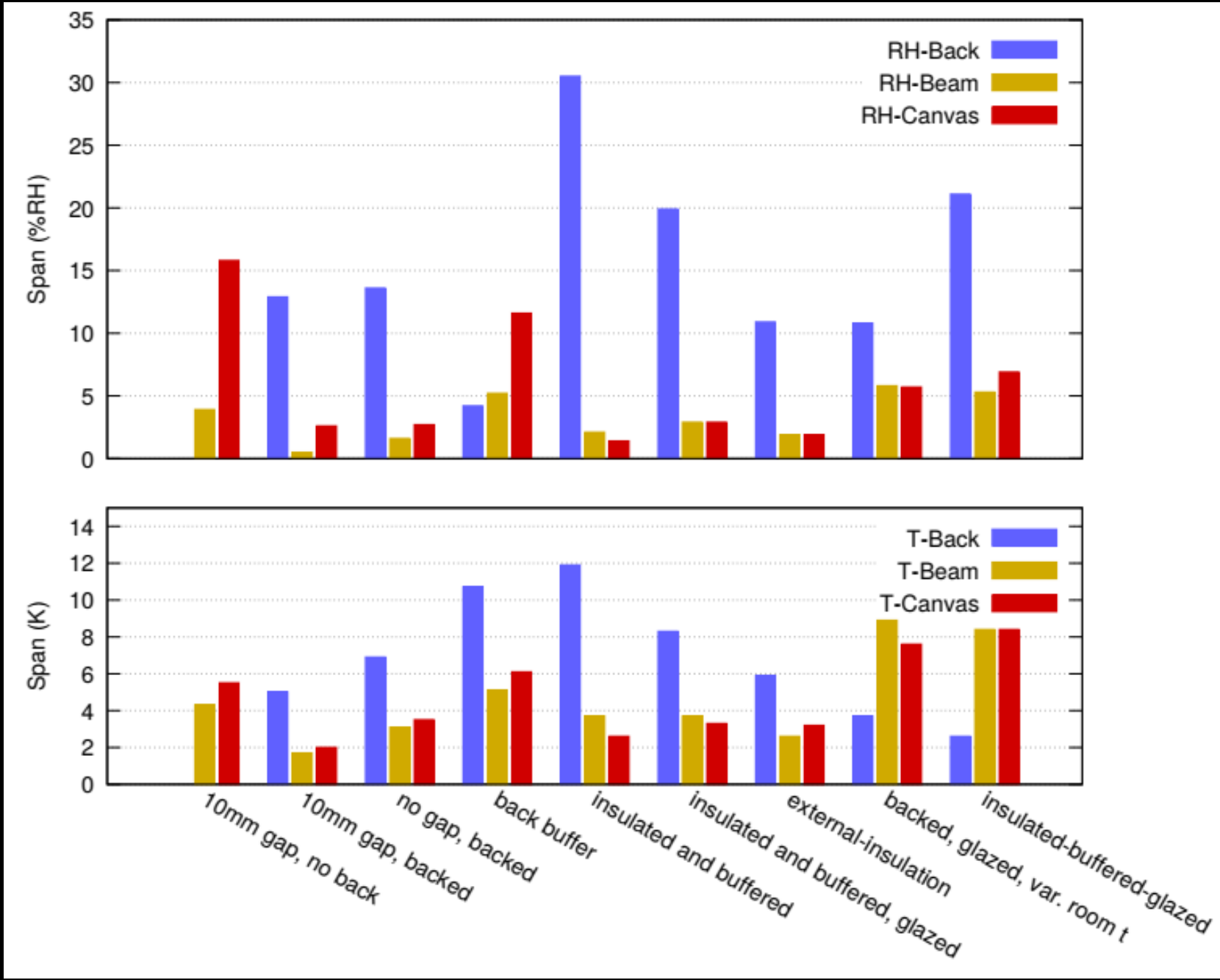
To imitate an absorbent back board, cotton canvas has been attached to the inner surface of the aluminium plate



At the temperature minimum the back buffer has dropped only 2% in equilibrium RH (see the cotton sorption isotherms diagram), so it has absorbed water from the enclosure, lowering the mixing ratio.



At the warmer canvas surface, the RH should theoretically drop to around 43%
But it releases water to move the surface towards the canvas' original equilibrium RH at 58%.
The mixing ratio rises slightly above that close to the back buffer.
The buffer and the canvas are in competition and move towards a compromise RH.
(density of dry air: 1.18 kg/m^3)



A summary of the RH spans at front and back of the enclosure, with various internal arrangements, and variable temperature at the back, or at the front.