
# REPORT ON THE TESTING OF SEALED UNITS

# TO VERIFY THE IMPACT OF PRESSURE

# EQUALISATION ON INSULATION VALUES.

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## 1.0 Introduction

This report has been commissioned to independently verify data comparing the respective thermal performance of industry standard hermetically sealed double glazed units, the specification of which is noted hereafter, against that of a pressure equalized unit.

The methods employed in order to make the required analysis have been devised making use of the most accurate data and in accordance with the direction and supervision of the author.

## 2.0 Negative Deflection and Pressure Equalization

For clarification purposes, it is important to note the meaning of the terminology used within the report to describe the condition of a double glazed unit and the process employed in re-engineering one.

### Negative Deflection

This is the condition of a new hermetically sealed double glazed unit that has been affected by barometric pressure. Once a new double glazed unit has been installed and is subjected to normal daily barometric and temperature change, the air contained within the unit will contract and draw the two panes of glass that make up the unit towards each other. The resulting effect being the space between the two pieces of glass is reduced particularly at the centre pane area where there is least support.

In this particular case the testing carried out discovered that on a standard construction 28mm double glazed unit, once installed, the effect of negative deflection reduced the internal air space at centre pane from 20mm to 13mm.

The effect that this has on the thermal efficiency of the unit is noted hereafter.

### Pressure Equalization Process (PEP)

This is the process of venting a sealed double glazed unit in order that the air pressure contained within is stabilized and equal at all times. This prevents the unit from being able to go into negative deflection as air is vented from or drawn into the cavity of a unit as and when required according to barometric change.

The result that pressure equalization has on a unit is to keep the space between the two pieces of glass constant regardless of changes in outside temperature and pressure. In this testing it was confirmed that a standard 28mm (4-20-4) double glazed unit that was pressure equalized had a constant internal air space at centre pane of 20mm.

PEP is carried out to remove the condensation from failed units and to prevent its return. Special coatings are applied to the glass surface to prevent the moisture in the air passing through the unit from fogging on the glass. This coating has no effect on the thermal performance either way but is a vital component for long term stability of the re-engineered unit.

The positive effect this has on the thermal efficiency of the unit is noted hereafter.

## 3.0 Test Method and Equipment.

A window was selected in a first floor office. The window was replaced with a brand new 1800mm x 1220mm PVCu frame. The window design consisted of two fixed panes of equal size, the frame was then glazed with two brand new double glazed sealed units manufactured to BS EN 1279. The specification of the units is 2 x 4mm annealed glass with a 20mm airspace using an aluminium spacer bar. The specification of the unit represents the majority of sealed units fitted in the UK prior to 2002; these are the type of units that represent the majority of sealed units failed today.
The units were then fitted with two K type self-adhesive thermo couplings, the couplings were fitted to the centre of the units, the couplings were then connected to a calibrated data recorder that monitored the two couplings and recorded the temperature and the differential at 5 minute intervals. The Manufacturer and Calibration details of the thermo couplings are included as Appendices to this report.

3 separate periods of testing were then carried out over 8 days in total as follows:

The identical units were monitored for a period of two days and readings recorded throughout.

After this initial period of 2 days, one of the units was re-engineered using the CCWW restoration process incorporating pressure equalization. Once pressure equalized the unit was re-tested along

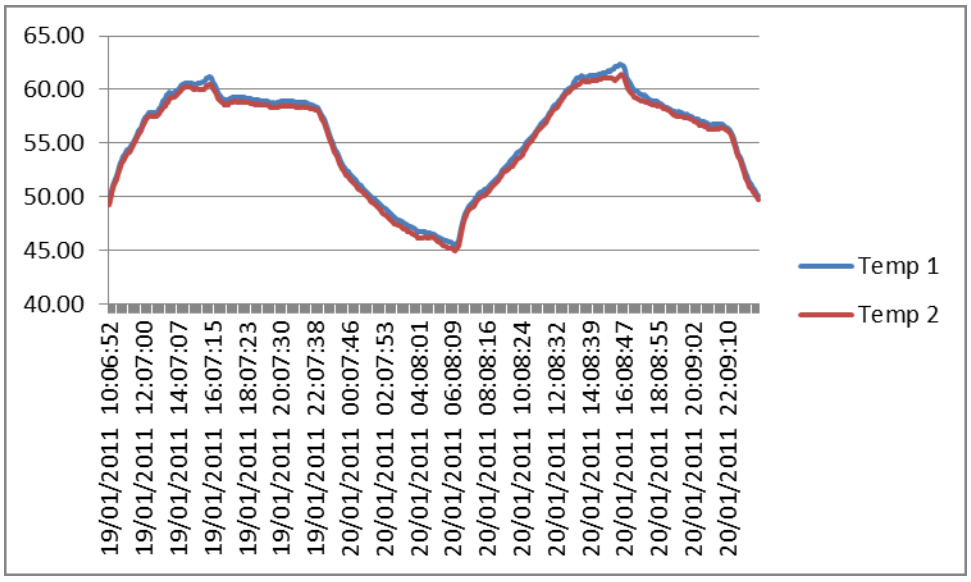
with the other remaining unit that remained unchanged for a further period of 3 days and readings recorded throughout.

For the remaining 3 days, the so far untreated unit was also equalized and resealed (removing the negative deflection but maintaining a permanent seal) then readings recorded for the remainder of the test period.

## 4.0 Test Results and analysis

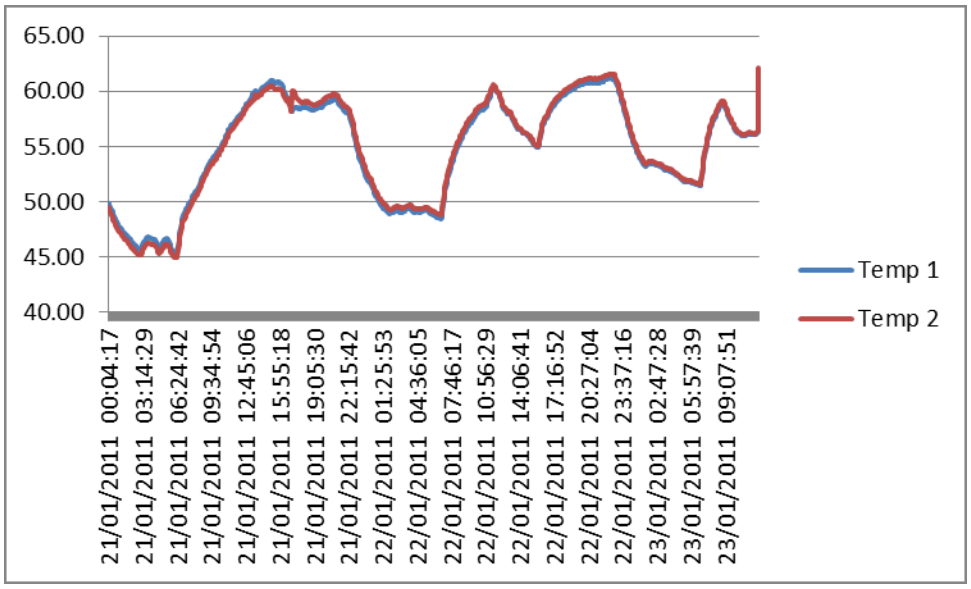
The results obtained during the test are presented in three graphs as follows. In each graph, the scales show temperature (vertical axis) vs. results of time taken at 5-minute intervals (horizontal axis).

Graph 1 – Test Results for the 1st and 2nd Days Testing



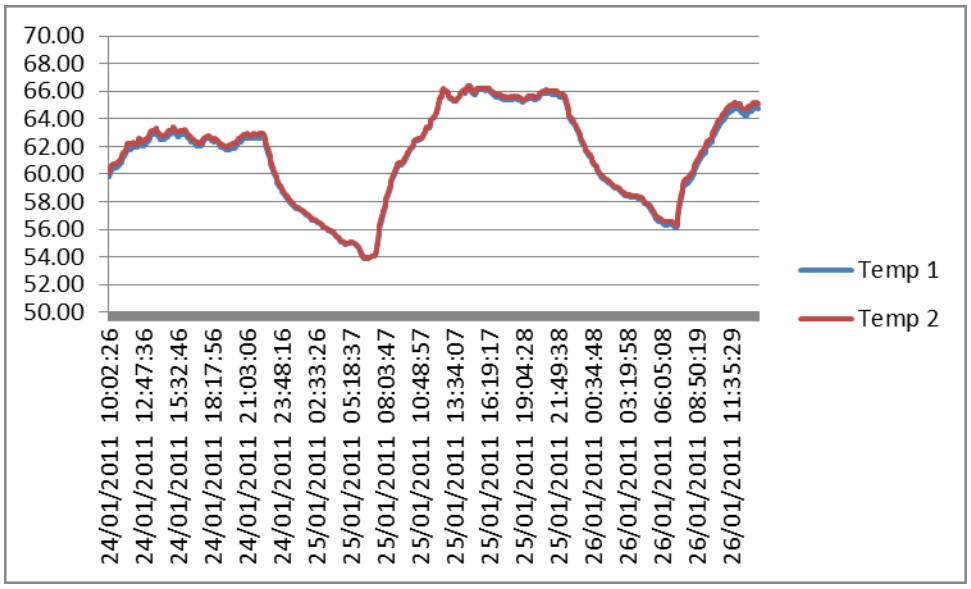

Temp. 1 refers to the temperature recorded on the first untreated unit , with the Temp. 2 referring to the temperature recorded on the second standard untreated unit. Graphs show virtually identical performance with variable temperature characteristics for the different times of the day.

Graph 2 – Test Results for the 3rd to 5th Days Testing




Temp. 1 refers to the temperature recorded on the first unit which has now been re-engineered using the CCWW restoration process incorporating pressure equalization, whilst the Temp. 2 refers to the temperature recorded on the standard (unchanged) unit.
This clearly shows that the reengineering of the unit has a small but measurable improvement . The graph shows the effect of this over a period of 3 days.

Graph 3 – Test Results for the 6th to 8th Days Testing




Temp. 1 refers to the temperature recorded on the Pressure Equalised Unit, whilst the Temp. 2 refers to the temperature recorded on the hitherto untreated unit which was now also equalized and resealed (removing the negative deflection but maintaining a permanent seal).
There is now no noticeable difference in centre pane temperature between the 2 units which are behaving in exactly the same way. Confirming that a new replacement unit must have its negative deflection removed for it to perform to the same standard as a pressure equalised sealed unit

## 5.0 Conclusion

The tests showed that the hermetically sealed units installed went into negative deflection within 48 Hrs, reducing the centre pane air cavity width by up to 35% and showing visible deflection in the glass.
After one of the units was pressure equalised and coated with the super-hydrophilic coating (required to prevent the moisture in the air entering the unit fogging on the glass surfaces) the visible distortion was removed and the unit returned to a 20mm cavity in the centre.
The three days of testing thereafter showed that the pressure equalised unit offered better insulation than the standard unit that was still in negative deflection, clearly proving that the vented unit offers better insulation than the sealed unit.

The third test was carried out to compare the vented unit against a unit that did not have negative deflection and was hermetically sealed. The results clearly show that a vented unit performance is identical to that of a hermetically sealed unit that has had the negative deflection removed after acclimatisation.

The pressure equalisation of a sealed unit does not adversely affect the insulation value and will in fact offer better insulation properties than a like for like replacement that will react to barometric pressures and go into negative deflection.