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Report on Comparative Measurements of Indoor Climate in Two Test Chambers Coated with Different Paints

Measurements were performed in the building of Fulda University of Applied Sciences, at Institute for Environment and Health
36037 Fulda, Petersgasse 27

Date: Saturday, 6 May 2006 and Sunday, 7 May 2006
Measurements were conducted with the indoor climate analyzer of Type MS01A.

Description of chambers: Both test chambers are identical in construction and equipped with a 45° roof window (1.1qm). They are both situated on the top floor facing the same side of the building (south side), 8 meters apart, having the same floor plan. They are furnished with PVC floor and with ceiling sound insulation panels made of plastic.

Chamber A: The walls are painted with a special white paint. Measuring location of the climate sensor: writing desk.

Chamber C: The walls are painted with a conventional white paint. Measuring location of the climate sensor: writing desk.

Both rooms have approximately 45% of free wall surfaces that have an impact on the climate.

Distance between Chamber A and Chamber C is about 8 meters.

12 indoor climate analyzers were implemented in both rooms.

Climate data are recorded in nomograms A1 – A7 and C1 – C5.

Measured values are compiled in chart A and chart C.

7 measurements **(Nomogram A1- A7) are related to Chamber A**

Measurement A1: Actual measurement

Measurement A2: After 30 minutes of heating through a 2 kW fan heater with window closed

Measurement A3: After 40 minutes of airing

Measurement A4: First measurement after the night

Measurement A5: After 30 minutes of heating with a 2 kW fan heater

Measurement A6: After 40 minutes of airing

Measurement A7: After 40 minutes of heating with a 2 kW fan heater

5 Measurements (Nomogram C1- C5) are related to Chamber C

Measurement C1: Actual measurement

Measurement C2: First measurement after the night

Measurement C3: After 30 minutes of heating through a 2 kW fan heater with window closed

Measurement C4: After 40 minutes of thorough airing (with window wide open)

Measurement C5: After 40 minutes of heating with a 2 kW fan heater

Findings:

Evaluation 1 **Cooling of Rooms** (Simulation: heating mode 'temperature drop at night')

The following chart serves to compare measured deviations before and after the nocturnal cooling of both test chambers for over 14 hours.

PROCEDURE: Prior to the nocturnal cooling period, the rooms were aired for 40 minutes with window fully open before room climate was measured (measurement A3 and C1). Room climate was measured again on the next morning (Measurement A4 and C2).

Result: Chamber C was clearly more cooled off, delta te = -3.6°C
Chamber A: delta te = -1.2°C.

Evaluation 2 **Heating of Test Chambers after Temperature Drop at Night**

The following chart records the metrological deviations which are detected with the room climate analyzer and nomogram at the beginning and after 40 minutes of heating the test chambers. With the deviations, the energy need can be determined by way of calculating the re-heating of the rooms to daily temperature.

PROCEDURE: Before measuring, both rooms were aired for 40 minutes with window fully open. The windows were then closed and the room climate was measured (Measurement A6 and C4). Afterwards, the test chambers, with window closed, were warmed up with a 2 kW fan heater for 40 minutes and the room climate was measured again (Measurement A7 and C5).

Result: Chamber A requires less time and energy to raise temperature than Chamber C.

Chamber A: delta te= + 4.65°C
Chamber C: delta te = + 3.3°C

Summary Evaluation:

Note:

My contract includes climate analysis, evaluation by nomogram and confirmation of the accuracy of measured values. **Interpretation and assessment of the measured values rest with the contracting authority.** In my opinion, the measurements allow the following qualitative evaluation:

Evaluation:

Measurement of Chamber A with the MIG – Energy Saving Paint indicates qualitatively obvious energy saving effect while at the same time having a positive impact on thermal room climate parameters compared to Chamber C which is painted with normal interior paint.

1 The comparison between Chamber A with MIG – Energy Saving Paint and Chamber C with conventional paint shows that Chamber A cools off at a slower pace over night, which means less loss of heat. On the next day, it requires accordingly less heating energy to raise the temperature in the room.

2 The room climate analysis also clearly shows that thermal comfort in the cooling period (temperature drop at night) in Chamber A lasts longer. This tends to show that the special paint has the above-mentioned energy saving effect.

3 The above-mentioned Evaluation 2, which is claimed by the contracting authority to have a 41% reduction in heating requirement, indicates only a tendency:

$$((4.65°C – 3.3°C) / 3,3°C) *100 = 40.91 \%$$

Climate analyses are space-specific snapshots without taking the possibility, thermal inertia and moisture absorption of inventory and building construction, etc. into account. Constant temperature and humidity compensation makes it difficult to calculate energy savings of building materials like the special paint, because as a general rule, conditions of living areas are always dynamic and never static. In practice, therefore, energy consumption of individual property can only be accurately determined by reading the dial meter.

Prof. Dr. P. Marx
Expert in Measurement Engineering