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INGEKOMEN 03 APR. 1997

27 March 1997

Dear Anne,

I so much enjoyed my visit to the Huis ten Bosch and Oud Amelisweerd last week. Thank you and Tonnie very much for inviting me.

I have written down a few thoughts about the Huis ten Bosch which I enclose with this letter. I would be inclined to do as little as possible to change the climate control system. I am very nervous about making changes and inadvertently making things worse. It seems to me that the system that they have got is mainly doing a good job. I will take Ruth Jongsma to Petworth when she is in England to show her the motorised double blind system that we have installed for the four lanterns in the North Gallery. It might be possible to do something similar in the Oranjezaal. J.H. Hennis, one of the architects who we met from the Rijksgebouwnedienst gave me his card, and the other architect, who left early, wrote his name down, but I can't read his writing. I hope that neither of them are expecting me to write to them? What do you think?

With best wishes,

Sarah

Sarah Staniforth

HUIS TEN BOSCH : ORANJEZAAL

1. Relative humidity (RH) control

An air handling unit was installed in the 1950's which provides heated and humidified air through two inlet ducts in the gallery of the cupola. There are four extract ducts under the tables on the floor of the room. A refrigerant dehumidifier stands in the middle of the room.

The control system was upgraded in 1985. The control strategy is set to provide a room temperature (T) of 17C. The humidifier is set to switch on when the RH falls below 45%. The dehumidifier is set to switch on when the RH goes above 55%.

The Building Management System (BMS) logs readings from four T/RH sensors approximately 2.5 m from floor, four T/RH sensors at cornice level and three in the cupola. The graphs that we saw for January - February 1997 show reasonable control between 45-55% with periods of constant RH at 50%. T is also stable at around 18C.

Conclusions: The existing climate control system is capable of providing an environment of acceptably constant T and RH in the Oranjezaal.

There a number of concerns about the performance of the existing system:

1. Air is introduced at high level and extracted at low level. This goes against the natural circulation of air in the room. However, it seems to be working.

Recommendation: One year of data from sensors in all locations should be examined and checked to see that reasonably constant T/RH can be maintained in all external climate conditions. For this, it will be necessary to install an external T/RH sensor.

2. The air flow is fast near the tables. This may be causing damage to the gilding and gesso. Reversing the air flow will not help and could make things worse. Unfortunately relocation of the grilles would involve major building works. Perhaps deflectors could be built into the ducts to divert the air flow away from the tables.
3. The system is noisy because of fans and air speed. It is usually turned off when the room is used for receptions. Arguably this is when the system is most needed. However, short excursions outside the recommended T/RH limits probably will not be felt by the paintings.

4. The dehumidifier has to be moved in and out of the room when there are receptions.

Recommendation: Investigate providing dehumidification within the air handling unit.

5. It is a great advantage that almost all walls in the Oranjezaal are internal. There is one painting on an external wall above the doors to the Terrace (Gerard van Honthorst, Allegory on the marriage of Frederick Henry and Amalia of Soms). There is a small risk that humidified air penetrating behind the painting could create a damp environment or even condensation when external temperatures are low. Similarly, the space around the cupola is poorly sealed and humidified air could escape into the unheated roof space and condense on the unheated surfaces in cold weather.

Recommendation: Monitor air temperature and RH, surface temperatures and wood moisture content in unheated roof space.

2. Light control

2.1 Ultraviolet radiation

Recommendation: Ultraviolet filtration should be fitted to all windows. Including those at the Ground Floor level and those in the cupola.

2.2 Black out

Recommendation: A method of providing black out when the Oranjezaal is not used should be installed. Curtains and shutters can be closed at the Ground Floor level. The cupola is more difficult. Black out roller blinds could be installed inside the lantern.

2.3 Daylight control

Recommendation: Sunlight should be prevented from falling on any painting or painted surface with sun blinds or sun curtains. This is relatively straightforward at Ground Floor level but more difficult in the lantern. A double system of blinds could be installed in the lantern with internal black out blinds and external sunblinds.