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Ancient Monuments Laboratory  
Report 63/94

ENVIRONMENTAL MONITORING AT  
BATTLE ABBEY, EAST SUSSEX

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Summary

Results of monitoring temperature and relative humidity in the display cases in the Gatehouse at Battle Abbey, East Sussex, since 1991 are reviewed, and recommendations for the quantities of desiccated or buffered silica gel to be placed in each case are made. The use of adequate quantities of correctly conditioned silica gel has resulted in a general improvement in the stability of the relative humidity in each case.

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## **Environmental monitoring at Battle Abbey**

An environmental monitoring programme started in the Gatehouse at Battle Abbey in June 1991, prior to the installation of the exhibition. It continued after the opening of the exhibition in April 1992, and is still running. This note provides a review of the results to date.

The exhibition occupies two rooms on the first floor of the Gatehouse, reached by a spiral staircase to the east. The first room is directly over the gateway while the second is to the west. Both rooms have north and south facing windows. There are four Dimplex heaters in each room, controlled by their own thermostats. The heating is apparently controlled by a timeclock, with over-riding frost-stats in each room.

There is a free flow of air through the door at the bottom of the spiral stair (even when it is closed!), through the two rooms and out through the chimney in the west wall of room two which is partially blocked.

ACR loggers were placed in room 1, initially on top of the model of the Battle of Hastings which used to be displayed there, and latterly on the south side of the fireplace hood, and in three of the cases in room 2. Although external conditions are not being monitored, this does enable a comparison to be made between the room conditions and the conditions inside the cases.

Room 1: data exist for June 1991 - January 1992, April - May 1992, March 1993 - March 1994.

Room 2, NW corner, high level: data exist for June 1991 - January 1992.

Room 2, case containing ivory objects: data exist for April - June 1992, September 1992 - January 1993, March 1993 - March 1994.

Room 2, case containing excavated objects and modern equivalents: data exist for April 1992 - January 1993, March 1993 - March 1994.

Room 2, case containing parchment prickers etc: data exist for April 1992 - January 1993.

Room 2, case containing iron keys etc: data exist for March 1993 - March 1994.

### **Room 1**

Graph 1 shows the conditions in this room before the display was installed. During the summer of 1991 the heaters were not operating and the temperature and RH are fairly

steady, averaging 18.0° and 86.4%, with a daily fluctuation of about 1° and 2%. The violent fluctuations during November and December 1991 are the result of the heating being turned on at full power while workmen were installing the exhibition. Since the exhibition opened in April 1992 the fluctuations have been smaller, but still larger than before the heating was in use. (Graphs 2 & 3). The control of the temperature does not appear to be very precise, and the fluctuations in relative humidity, though partially caused by external weather conditions, are correspondingly large. Graph 4, which compares the temperature in room 1 with that inside one of the cases, shows that the temperature goes out of control from time to time -- this needs investigating.

## **Room 2**

The graphs for June 1991 to January 1992 (not reproduced) are very similar to those for room 1, except that the fluctuations caused by the heating are much less violent.

### **Room 2: case containing ivories**

(also known as Tau cross case and The Abbot)

These objects are very valuable and environmentally sensitive. The crozier knob in particular is badly degraded. Ideally the RH should be kept at 60 +/- 5%, with minimal daily fluctuations. The case contains 2kg of buffered silica gel in order to try to maintain these conditions.

Graph 5 shows that when the silica gel was first put into the case in April 1992 the RH fell rapidly as water vapour was taken up by the materials of construction. After a week the silica gel was changed and a fairly stable RH ensued. During the autumn of 1992 the RH drifted gently downwards in response to the falling temperature, but the change was less than 5% over four months (Graph 6). Graph 7 shows that over a period of one week the daily RH fluctuation was less than 1%. During the spring and summer of 1993 the RH changed very little, but during the autumn and winter it fell by about 10%, and is currently about 55% (Graph 8). It would probably be sensible to replace the silica gel with some more conditioned to 60% RH. Nevertheless, the daily fluctuations are still less than 1%.

### **Room 2: "Then & Now" case**

(panel labelled Archaeological Remains)

This case contains excavated objects and their modern equivalents. It is constructed of oak-veneered MDF, and it was feared that this might emit formic acid which would attack the artefacts. However, small coupons of silver, copper and lead which were placed in the case have remained untarnished for nearly two years, which suggests that this is not a serious problem. As this case contains excavated iron objects it is desirable that its RH should be as low as possible. Initially it was filled with 3kg of desiccated silica gel, which reduced the RH to about 40% (Graph 9). However, the RH then drifted upwards, reaching 70% in the summer of 1992 (Graph 10) before drifting downwards to about 56%

the following winter. The RH again rises to around 70% in the summer of 1993 before falling to around 50% in the winter (Graph 11). Desiccated silica gel was placed in the case in March 1994; it should be changed at least every six months if it is to be effective.

### **Room 2: case containing parchment prickers** (The Monastic Scribe)

This case contains bone parchment prickers and copper alloy book clasps. It should be buffered to 60 +/- 5%: the results for May 1992 to January 1993 (Graph 12) show that this has largely been achieved. The case contains 1kg of silica gel which was not changed. Using a larger quantity of silica gel would give greater stability.

### **Room 2: case containing iron keys**

Since it contains archaeological ironwork the RH in this case should be as low as possible. Graph 13 shows that in the summer of 1993 the RH reached about 63% before falling to about 50%. 4.5kg of desiccated silica gel were placed in the case, which should be changed at least every six months.

The case containing tuning pegs contains 2kg of buffered silica gel. The conditions inside it have never been monitored. The case containing gilded bronze objects contains 3.25kg of desiccated silica gel, and this too has never been monitored. It would be desirable if this could be done in the future. The cases containing the fragment of stone with the Browne arms, the Estate Sale Catalogue and the farm tokens have no environmental control and have never been monitored. It would be desirable to check on the conditions of the catalogue.

### **Silica gel**

It is important that silica gel intended for desiccating showcases should be thoroughly dried before use. It should be stored in a sealed container, or in a stout polythene bag secured with a plastic tie.

### **Dust problems**

The walls of the Gatehouse are about 3ft thick and were saturated until the roof was repaired about 5 years ago. Since then the walls have dried out slowly, and although fungus and soluble salt growth are no longer a problem (which they were initially), the surface of the sandstone is now powdering badly. The dust is affecting the open stone display in Room 1 and settles on the showcases in Room 2. As far as possible the displays should not be brushed (which will only raise dust which will settle later) or dusted (which will scratch the Perspex case tops) but should be vacuum cleaned using a soft nozzle. The floors likewise should be vacuum cleaned and not swept.

## William the Conqueror

The conditioned frame for the panel painting of William the Conqueror is now almost ready to be installed in the exhibition: it remains to be decided where it should be placed. For reasons of conservation it must not be placed in direct sunlight; for reasons of security it must be placed where it can be seen by the custodians and the security cameras. It should also be placed in a logical position in the exhibition, should not disturb any original plaster or involve drilling into stonework. One possibility is in room 2, on the dividing wall, between the "Wealth of the Abbey" display case and the door. In this position it would fit reasonably well into the logical flow of the story, direct sunlight would not fall on it, there is no original plaster on the wall, and it would be in the field of view of a security camera if it were to be fixed in the corner above the door through to the garderobe.

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