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CONSERVATION SCIENCE 2007

"Preserving restoration of Sartorio paintings in Montecitorio Capitol"

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Fig.1 Fregio Sartorio, before restoration.

Introduction

After almost one century from the construction of Montecitorio Capitol, paintings that decorate the upper part of the courtroom walls required restoration.

At the elevation of 15 m from the floor, 50 painted panels hang on the walls, running all around the perimeter. Giulio Aristide Sartorio painted these 400 square meter of canvas, 105 m long, and 3.8 m high, between 1908 and 1912, with the aim to celebrate the newborn Italian nation. Oversize mankind is figured in a classic style, bodies interlacing each others in a soft light which enhances tension and spur of gestures. The scenes represents the energy of Italian nation, that supported "Risorgimento". Sartorio's painting technique included the use of wax, mixed with pigments and paints. In 2004 Soprintendenza per il patrimonio storico artistico ed etnoantropologico del Lazio performed a preliminary assessment and a pilot intervention on one panel, defining the guideline for further intervention on the whole masterpiece. Between January and September 2006, a study has been performed about complex process of canvas' restoration. The whole process have been achieved without interrupting Parliament activities [1] in the Hall: from measuring drawing of the Hall, expecially Fregio, and assessment, to make paintings come under restoration, after being lowered and substitued by photographic copies at real scale (Cohordinator R. Cecchi, L. Moro and M. Agostiano; Consulting P. Gasparoli and L. Bauce).

In September 2006 an ambient monitoring started, to assess microclimatic condition: knowledge of ambient conditions, and their variations, allows to find out damage causes. Moreover, expected results will lead to a use of the room more suitable, especially, for conservation of "Fregio Sartorio" and carved wooden coating of E. Basile, to assure conservation and long lasting effects of restoration. Moreover, acquired data are necessary to plan a program for continuous control of conservation conditions of precious surfaces within the Hall.

Monitoring program includes:

1. control of air temperature and RH, by means of 31 probes distributed along the courtroom perimeter, at 6, 11.5 and 15 m from the Tribunes's floor (plus one probe outside, on a terrace in the exterior facade);
2. psychrometric maps of the Hall and Tribunes, and psychrometric vertical profile under windows, when HVAC system was both on and off;
3. measures of air speed where the outputs are and nearby, on the surfaces of the paintings;
4. maps of surface temperature (by IRT) on these areas;

Post processing data will allow to overlap graphical visualisation of collected information and measured drawings of the courtroom, in order to obtain a clear correlation between variation of ambient conditions and building characteristics.

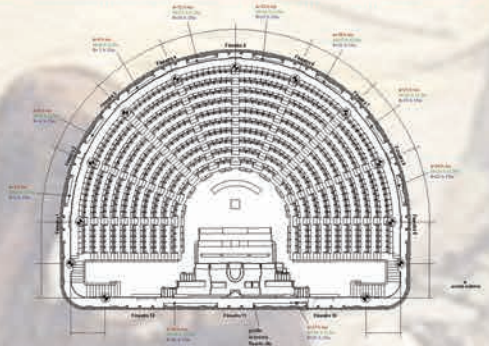


Fig 2. Hall plant, location of probes and windows.

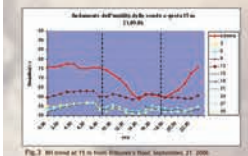


Fig.3 RH trend at 11 m from Tribune's floor, September, 21 2006

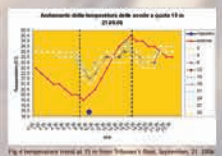
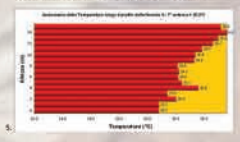


Fig.4 Temperature trend at 11 m from Tribune's floor, September, 21 2006



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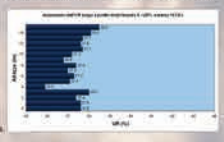

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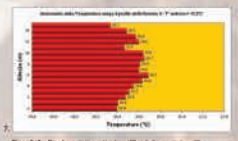

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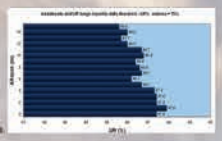

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Figg. 5÷8: Psychrometric vertical profiles below window #6

Results

After 6 months from start of measurements, microclimatic monitoring results pinpointed that main variations of microclimatic conditions are due to HVAC system, whereas trend of external ambient conditions slightly affects Temperature and Relative Humidity inside the hall:

- RH/T°C values have a small gradient (?T = 4.5°C, ?RH = 30%) during summer, fall and winter
- Daily thermal gradient of air and surfaces is below 4°C, during heating/air conditioning operation
- Air conditioning causes higher thermal gradient than heating
- Most of recorded values of RH are within the range suggested by rules in force (UNI 10829/99), except data recorded during a prolonged heating/conditioning (over 8 hours) and during direct ventilation of the Hall. In these cases, when outdoor air Temperature is low and RH very high, probes recorded RH and T°C unbalance up to 6-9 m from Tribunes's floor, and sometimes some additional effects are recorded up to 11.5 m
- Before turning HVAC on, major differences of data are recorded at 6 m from the floor. Higher variations (always within 1°C) occur while HVAC is working.
- From comparison of psychrometric vertical profiles, probes data, and IRT, resulted that higher variation are between 4 and 8 m, and they are due to air intake from HVAC. Results are similar about 2/3 of the semicircle's wall. Differences are in some parts of semicircle, where air intakes exist but are not in function and in Tribune #5, where vertical heating pipes are located inside lateral wooden columns, and their temperature generates highest temperature variations of surface and in the surrounding air, up to Hall's ceiling. High temperature of wooden surface, and consequently low RH of air, contributed to cause cracks in timber columns, especially in the sides facing the Hall.

Conclusions

Monitoring system has been planned to measure microclimatic variation: the results overcame expectation. In fact, location of probes and procedures for psycrometric measurements allowed to survey any slight variation, despite of medium sensivity of instruments. Localization of probes and other test, and integration of results, supplied a complete analysis of air motions and gradient inside the Hall. In this way authors collected enough information to evaluate thermo-hygrometrical unbalances (due to HVAC working plants and use of the Hall) and their diffusion and affection on microclimatic parameter also at a distance from starting point of disturbance.

The presented experience is one of the most interesting research on microclimatic conditions in huge close ambient: amount of released data are extremely valuable to evaluate thermal-hygrometrical behavior of materials conserved at controlled ambient conditions, as it would happen in an enormous laboratory.

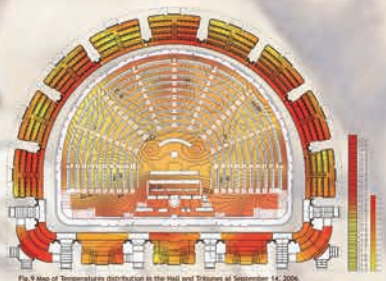


Fig.9 Map of Temperatures distribution in the Hall and Tribunes at September 14, 2006.

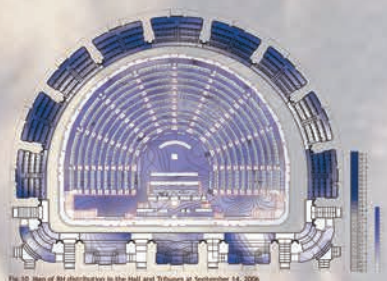


Fig.10 Map of RH distribution in the Hall and Tribunes at September 14, 2006

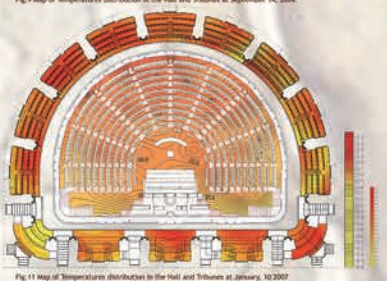


Fig.11 Map of Temperatures distribution in the Hall and Tribunes at January, 10 2007

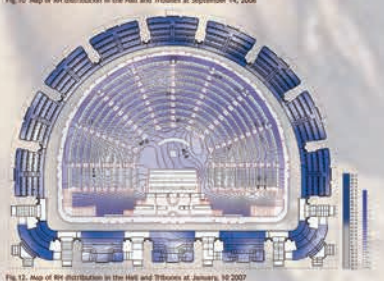
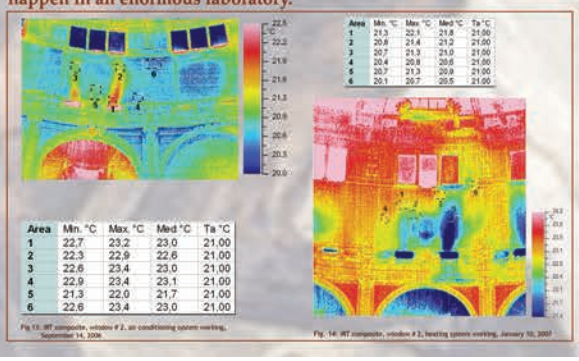


Fig.12. Map of RH distribution in the Hall and Tribunes at January, 10 2007



Area	Min. °C	Max. °C	Med °C	Ta °C
1	22,7	23,2	23,0	21,00
2	22,3	22,9	22,6	21,00
3	22,6	23,4	23,0	21,00
4	22,9	23,4	23,1	21,00
5	21,3	22,0	21,7	21,00
6	22,6	23,4	23,0	21,00

Fig.13: IRT composite, window # 2, air conditioning system working, September 14, 2006

Area	Min. °C	Max. °C	Med °C	Ta °C
1	21,3	22,1	21,8	21,00
2	20,8	21,4	21,2	21,00
3	20,7	21,3	21,0	21,00
4	20,4	20,8	20,6	21,00
5	20,7	21,3	20,9	21,00
6	20,1	20,7	20,5	21,00

Fig. 14: IRT composite, window # 2, heating system working, January 10, 2007