1. INTRODUCTION

This research work was summarised to be presented at the International Conference PESA - Passive and Low Energy Architecture, which in June 2006, promoted its main theme: a challenge for energy efficiency and urban planning. The objectives of the research is to study and multidisciplinary approach which integrates technical and architectural aspects, social implications and economic data. The content presented here is based on a one-year research project which compiled on-site measurements and interviews with full-time students. Rodrigo's thermal comfort indices: PMV - Predicted Mean Vote, and the correlated PPD - Predicted Percentage of Dissatisfied were applied from which the results were compared against the occupant's opinions about the building thermal performance. The interpretation is to note that even in excellent environmental conditions, there is still a number of people dissatisfied (fig. 2).

2. LOCAL ENVIRONMENTAL CONDITIONS

Following the climatic zones of Ghion adopted for Brazilian cities, São Paulo has a climate, with average mean temperatures varying from 18°C to 23°C and humidity. In fact, 20% of the time of the coast zone in during summer, when the temperature is related to natural ventilation (especially due to humidity), what to the other 80%, which turn in winter, the strategy is passive solar heat.

3. ARCHITECTURE: THE ICONIC BUILDING

3.1 Architectural Concept

The FAUUSP building was designed by the architect João Viana Arantes and it is opened in 1969. While the upper part of the buildings is a concrete box, the lower part is seen as a glass box. Regarding the interior environmental conditions, the main entrance is a great open space that reveals the internal “square” (fig. 3).

3.2 Environmental Strategies

The lower levels of the building have south-west and north-east orientations, therefore, a significant area of the studios (fig. 4) are exposed to solar radiation during summer while the upper levels get direct sun during mornings in summer, implying on windows and the concrete walls in south case and on the highly translucent roof.

4. ENVIRONMENTAL ASSESSMENT

Two spaces were selected for this environmental assessment: a studio and the lecture hall at the middle of the row of arts. The choice was based on the upper part of the structure, with its multi-functional characteristics, indoor exposure and occupation patterns.

4.1 Thermal data analysis

The measurements were taken in two periods of the year: from the 30th March to the 1st of April, which was still the hot season in São Paulo and from 21st of June to 2nd of July, which was the beginning of winter. The climatic variables measured were air and globe temperatures, relative humidity and air velocity. All measurements were taken at 1.1m high (according to ISO 7730/98).

4.2 Measurements

The measurements were applied during the measurements, the questions were applied and the responses (fig. 10), pointed out (surprisingly enough) that the occupants

4.3 Questionnaire

The questionnaires were applied during measurements, the questionnaire were prepared based on the literature, from which the PMV and the PPD results were considered through comfort indices: PMV and the PPD.

5. LEARNING AND QUESTIONS FROM THE ENVIRONMENTAL STUDIES

5.1 Thermal data analysis

Hot days, comparing the results from the two spaces, the measurements during the hot week showed a temperature variation of 8°C, while the relative humidity varied from 78.1% to 48.8 °F (fig. 6).

5.2 Comparative analysis

The comparative analysis between the results of Fanger's model comparing, the application of the measurements against the questionnaires' responses (fig. 10), pointed out surprisingly enough that the results were comparable against the PMV/PPD based on measurements. It is possible that these results are related to the situation of the occupants, the design and environmental aspects of the building which have other effects on the occupants sense of comfort rather than purely environmental, such as absence of windows and lack of subjective privacy and visual communication with the outside of the upper floor.

5.3 Conclusions

The unusual architectural features of the building proved to be more comfort than unnoticed. The results of a degree of dissatisfaction of the occupants in hot days of cloudy sky, which would otherwise be considered as extraordinary, the differences between the results of Fanger's index applying the measurements against the opinions of occupants, might be due to the environmental performance of such "special" and unusual buildings can not be understood only by means of building physics. It requires a multi-disciplinary approach, combining technical and subjective perception. Hence, the building of FAUUSP - a unique piece of the story of Brazilian modernism, brings lessons and questions about buildings environmental performance.

5.4 Final considerations

The Fanger's methodology is often criticized for generating human responses that are not entirely accurate. The results of a degree of dissatisfaction of the occupants in hot days of cloudy sky, which would otherwise be considered as extraordinary, the differences between the results of Fanger's index applying the measurements against the opinions of occupants, might be due to the environmental performance of such "special" and unusual buildings can not be understood only by means of building physics. It requires a multi-disciplinary approach, combining technical and subjective perception. Hence, the building of FAUUSP - a unique piece of the story of Brazilian modernism, brings lessons and questions about buildings environmental performance.

ACKNOWLEDGMENTS

Many thanks to FAUUSP and CNPq, for the support given to the two undergraduate researchers from which this project was based on. Both researchers were developed by students from FAUUSP and supervised by the PhD and Master students. The authors would like to thank all the persons who have contributed in any way to this work.

REFERENCES


Rodrigo de Castro Dantas Cavalcante, Patrícia Mara Sanches and Joana Carla Soares Gonçalves

1Laboratório de Contorno Ambiental e Eficiência Energética, Departamento de Tecnologia da Arquitetura, Faculdade de Arquitetura e Urbanismo, Universidade de São Paulo, USP, Rua do Lago, 876, Cidade Universitária, São Paulo - SP Brasil 05508-080

2pocarch@usp.br, pathyta@uol.com.br, rodrigo_cdc@yahoo.com.br