

NEW METHOD FOR THE ASSESSMENT OF COMFORT AND PRODUCTIVITY IN THE OFFICE: A CASE STUDY

Paola M. Leardini,

MArch. Ph.D.

Lecturer

The University of Auckland, School of Architecture and Planning, Auckland, New Zealand

In the present-day society, people spend 90% of the time in enclosed spaces, 30-40% in offices. Due to building regulations and requirements for labelling policies, the modern office building is seen like an “efficient machine”, and the energy consumption is becoming a central issue in the current architectural debate. However, also occupants’ perception of indoor environmental quality (IEQ) should be verified. Therefore, new strategies for long-term building monitoring are required, focusing on human requirements and responses.

The present study describes a methodology (RPM = Remote Performance Measurement) to evaluate IEQ (measured and perceived) and its effects on comfort and performance in intervention studies in real buildings. The procedure comprises measurements of environmental parameters and completion by occupants of on-line questionnaires. Performance is assessed by a new method that uses simulated office tasks. Questionnaires and tasks are administered via a standard web browser Internet.

Main objective of the research is the implementation and the validation of the method in field experiments. Thus, it has been applied during the summer 2004, in a case-control intervention study in a real office building, situated in northern Italy. Measurements were carried out and questionnaires and performance tasks were completed prior to and after controlled modifications of specific HVAC system parameters, which affected thermal environment and IAQ.

Physical measurements of comfort indexes in the monitored building indicate indoor thermal conditions within comfort limits (ISO 7730-94). Nevertheless people’s complaints point out local problems of thermal discomfort. Evidences of a negative effect of raising the room temperature set-point on the performance of an addition task were found, confirming results of previous studies, that have shown how indoor environment factors, also affect occupants’ symptoms and performance.

Occupants’ feed-back, problems and possible improvements of the methodology are discussed. Furthermore, results of comparisons with contemporaneous and subsequent researches are presented.

References:

Federspiel CC., Fisk WJ., Price PN., Liu G., Faulkner D., Dibartolomeo DL., Sullivan DP. and Lahiff M. 2004. “Worker performance and ventilation in a call center: analyses of work performance data for registered nurses”, *Indoor Air*, 14(8), 41-50.

Levenshtein VI. 1966 “Binary codes capable of correcting deletions, insertions and reversals” *Sov. Phys. Dokl.*, 6, 707-710.

Milton DK., Glencross PM. and Walters MD. 2000. “Risk of sick leave associated with outdoor air supply rate, humidification and occupant complaints”, *Indoor Air* 10, 212-222.

Niemelä R., Hannula M., Rautio S., Reijula K. and Railio J. 2002. “The effect of air temperature on labor productivity in call centers: a case study”, *Energy & Buildings*, 34, 759–764.

Sundell J., Lindvall T. and Stenberg B. 1994. “Associations between type of ventilation and airflow rates in office buildings and the risk of SBS symptoms among occupants”, *Environment International*, 20(2) 239-251.

Tham KW. 2004 "Effects of temperature and outdoor air supply rate on the performance of call center operators in the tropics", *Indoor Air*, 4(s7), 119-125.

Toftum J., Langkilde G. and Fanger PO. 2004. "New indoor environment chambers and field experiment offices for research on human comfort, health and productivity", *Energy and Buildings*, 36(9), 899-903.

Wargocki P., Wyon DP., Baik YK., Clausen G. and Fanger PO. 1999. "Perceived air quality, Sick Building Syndrome (SBS) symptoms and productivity in an office with two different pollution loads", *Indoor Air*, 9, 165-179.

Wargocki P., Wyon DP., Sundell J., Clausen G. and Fanger PO. 2000. "The effects of outdoor air supply rate in an office on perceived air quality, Sick Building Syndrome (SBS) symptoms and productivity", *Indoor Air*, 10(4), 222-236.

Witterseh T., Wyon DP. and Clausen G. 2004. "The effects of moderate heat stress and open-plan office noise distraction on SBS symptoms and on the performance of office work", *Indoor Air*, 14(s8), 30-40.

Zagreus L., Huizenga C., Arens E. and Lehrer D. 2004. "Listening to the occupants: a Web-based indoor environmental quality survey", *Indoor Air*, 14(s8), 65-74.

Authors

1) Presenter and attendee at the conference

Leardini, Paola M.

MArch., PhD

“New method for the assessment of comfort and productivity in the office: a case study”.

The University of Auckland, National Institute of Creative Arts and Industries, School of Architecture and Planning

Architecture Building, 26 Symonds Street, Auckland

Private Bag 92019, Auckland, New Zealand

Telephone: +64 9 373 7599

Facsimile: +64 9 373 7694

Email: p.lear dini@auckland.ac.nz

Full Mailing Address until JULY 2007:

Via Montemartini, 13

I – 27100 Pavia, Italy

Phone: +39 335 6837134

Fax: +39 0382 35588

Email: paola.lear dini@polimi.it

2) Co-author

Toftum, Jørn

Associate Professor, Ph.D.

“New method for the assessment of comfort and productivity in the office: a case study”.

International Centre for Indoor Environment and Energy, Technical University of Denmark

Building 402

DK-2800 Lyngby, Denmark

Phone: +45 45 25 40 28

Fax: +45 45 93 21 66

Email: jt@mek.dtu.dk