HOME OFFICE ILLUMINATION: THE UNDISCOVERED COUNTRY

Ceren Sarikaya[a], Ulrich Pont[b,*], Ardeshir Mahdavi[b]

[a]Graduate Student of Building Science and Technology, TU Wien, Vienna, Austria
[b]E259.3 (Dept. of Building Physics and Building Ecology)

INTRODUCTION

Sufficient and satisfactory illumination levels are considered to be of utmost importance for health, well-being, and productivity of occupants of buildings. As such, the consideration of illumination aspects in the framework of building planning and interior design is playing a key role in contemporary work of architects. Moreover, there are a number of international standards as well as national laws and guidelines in most countries that define minimum thresholds for illumination, glare avoidance and daylight penetration of spaces (e.g. [1]). Building planning needs to consider these regulations. Thus, most planning processes for larger office facilities encompass a consultant for lighting aspects. This is not necessarily true for other planning tasks, as fewer regulations exist for other building usages, especially residential use. In the case of small scale home offices situated within residential units, regularly the occupants, who often are non-specialists in lighting design, design their workplaces themselves. Little is known about the in-fact lighting conditions in such home-office places, especially those that could be named “micro offices”. Thus, the present contribution literally sheds light upon this topic by presenting the results of recent efforts pertaining to investigate into a set of small scale home offices in Izmir, Turkey.

METHODOLOGY

Case study home offices: All together 9 different home offices that encompass 10 work places (1 in each residential unit, except one encompassing two work spaces) were examined (named A-J). The involved professions that can be found in the offices can be considered as diverse and include lawyers, journalism free-lance IT professionals as well as architects and industrial designers. Figure 1 illustrates some floor plans of the examined offices. In each of the spaces the task area of the specific work place was identified, and in further evaluation steps clearly distinct from other areas of the corresponding space (living, sleeping, kitchen, etc.).

Figure 1: Some of the small scale floor plans (not scaled, orientation arrows pointing in north direction)

Deployed evaluation methods: For the purposes of this study, we deployed both measurements and numeric simulation tools. The used simulation environment was the well-known simulation tool Dialux [2]. The measured Key Performance Indicators included illumination inside and outside of the residential units. In particular, the outside illuminance was measured during daytimes parallel to the illumination levels on the work planes, but also of the remaining apartment, to be able to derive

daylight factors. Furthermore, night-time measurements were conducted to assess the artificial lighting in the workspaces / residential units.

RESULTS & DISCUSSION

Figure 2 illustrates the results of the artificial light assessment via simulation and field measurement (these happened in the evenings and encompassed 56 to 104 measurement positon per workplace). In all of the offices average and median illumination levels were below the two threshold values (500 lux respectively 300 lux) named in typical standards for workplaces [1] in both simulation and measurements. Generally speaking, the average deviation between simulation results and field measurements was quite small (around 1%). In some cases very well lit evaluation points could be found, which indicates that per se luminaries might offer sufficient lighting levels, but are positioned in an unfortunate way. Some of the other results indicate that the general availability of artificial lighting seems sparse and could and should be subjected to improvement. Regarding the daylight availability, some of the offices offered quite large average daylight factor values on the workplaces, while others did not feature satisfactory daylight availability (daylight factor values between 0.24 to 9.93). Generally speaking, the quality of the indoor illumination in all of the examined micro offices can be considered as dissatisfactory, especially if compared to large scale offices, which regularly have been subjected to light planning.

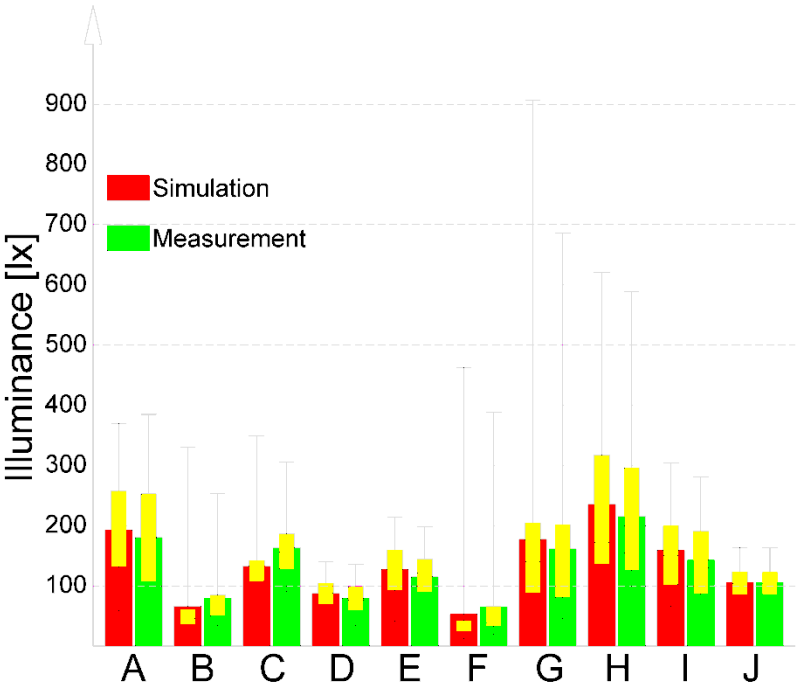

Figure 2: Illumination levels in workplaces A-J. red: simulation; green: field measurement.

CONCLUSION AND FUTURE RESEARCH

The next step in this research effort is an optimisation effort. For the examined offices, low-cost improvements should be checked upon via the simulation models. More general, future research efforts should encompass a larger sample of home offices from different regions of the world and different job disciplines, the derivation of a “checklist” for home offices to generate good lighting conditions, and – a bit farfetched – the development of an mobile phone app that can support the setup of home offices based on some basic planning parameters, such as location, orientation of transparent building components, and available luminaries. Such an app could utilize existing simulation tools and corresponding knowledge, but offer valuable planning support to home office planning without a designated consultant specialized upon lighting.

REFERENCES

[1] European Standard Series EN 12464 - Light and lighting - Lighting of work places. (different issueing dates).

[2] Software Dialux (www.dial.de)