

Indoor Environment Quality and Occupants Satisfaction in Office Building

Kyoung Woo KIM, Sang Hee PARK, Seung Min LEE, Ki Hyung YU
Korea Institute of Civil Engineering and Building Technology, Republic of Korea

INTRODUCTION

- The office, where research tasks are carried out, is an important factor in improving productivity. Indoor environmental factors can be broadly classified into four categories: indoor air quality, thermal environment, lighting environment, and acoustic environment.
- A previous study : satisfaction with acoustic comfort was lower compared to other environmental indicators. (self-reported survey results from occupants and did not involve physical measurements.)
- The objective of this study : **to measure the actual physical noise levels** in the research building, in order to **investigate the reasons for low satisfaction among occupants regarding the acoustic environment** and to identify potential countermeasures.

METHODS

- test building :
 - 25 year olds
 - located parallel to a road (45m, 8 lanes).
 - 5 stories, 77m(L) × 18.5m(W).
- test items : noise level, temperature, humidity and Carbon dioxide (CO₂).
- duration : 3 weeks monitoring, 2 points.

CONCLUSION

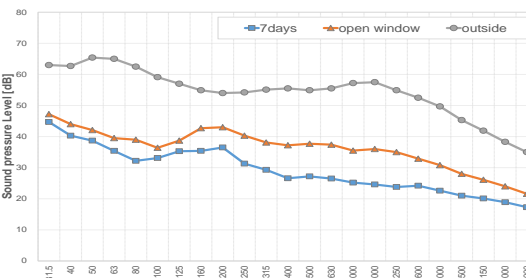
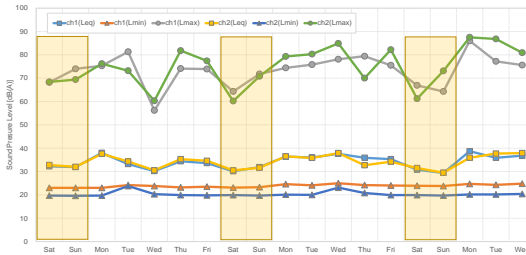
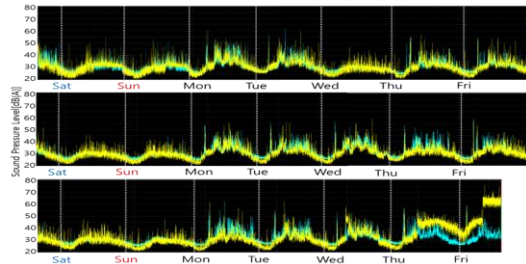
- The noise level generated indoors was not high around 40 dB(A), but there was an event where the noise level increased intermittently.
- Even if the noise level is low, the intermittent loud noise affects the person's satisfaction, measures such as separation of noise sources and installation of sound absorption materials are needed.

Acknowledgements

This work was supported by the Korea Institute of Energy Technology Evaluation and Planning (KETEP) and the Ministry of Trade, Industry & Energy (MOTIE) of the Republic of Korea (No. 20212020800120).

RESULTS

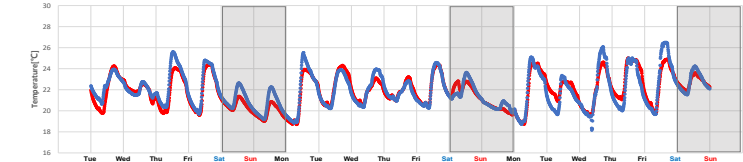
•Noise level



- Change in noise level during the measurement period.
- noise exhibits a periodic pattern with consistent variations.
- Multiple noise events occur daily, and there are slight differences in noise patterns depending on the day of the week.
- During business hours (9:00-18:00), the noise levels exhibited a pattern of initially increasing and then decreasing.
- daily (24-hour) Leq24h calculated during the measurement period.
- The daily Leq fluctuated within the range of 30-40 dB(A).
- the 24-hour Leq was below 40 dB(A), which is lower than the WHO's night-time noise guideline of 40 dB(A).

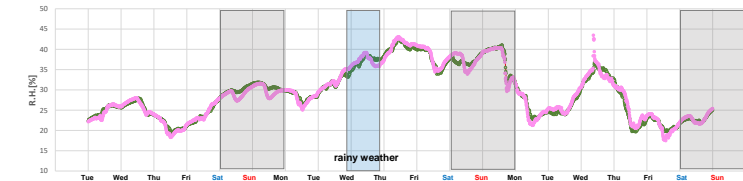
- When the window was opened, the noise level increased 9 dB(A).
- external noise level : 63.7 dB(A).
- the sound insulation performance of the window : approximately 28 dB.
- window open : occupants near the window may experience discomfort due to the increased noise.

•Temperature



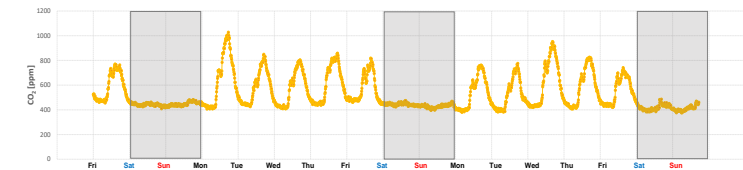
- Difference within a day sometimes reached up to 6 °C.
- The patterns of change were almost similar every day.

•Humidity



- humidity were difficult to observe periodic patterns, unlike the temperature changes.
- indoor humidity was influenced by the outdoor air.
- maximum : 43%.

•Carbon dioxide (CO₂)



- weekends : 420 ppm.
- CO₂ concentration did not exceed 1000 ppm. (guideline in Korea)