UNIVERSITI TEKNOLOGI MARA
College of Built Environment

Poster Book

IIIDBEEX 2023

20 JANUARY 2023

International Invention, Innovation & Design Exposition for Built Environment and Engineering 2023

College of Built Environment
UiTM Puncak Alam
20 January 2023 I Friday

Editors:
Dr Aidatul Fadzlin Bakri, Nurzafira Zainul Abidin, Sr Dr Noor Akmal Adillah Ismail, Dr Har Einur Azrin Baharuddin, Assoc. Prof. Ts Gs Dr Abdul Rauf Abdul Rasam

CONTENTS

01 Contents

02 Preface

03 Welcome remarks

04 Exhibition layout

05 Event programme

~~06 List of entries~~

07 Poster category: Academician & Professionals

08 Poster category: Postgraduate

09 Poster category: Undergraduate

10 Appreciation

SOUND PRESSURE LEVEL IN A LECTURE HALL DURING OCCUPIED AND UNOCCUPIED CONDITIONS

IIIDBEEX2023
20 JANUARY 2023
International Invention, Innovation & Design Exposition for Built Environment and Engineering 2023
UNIVERSITI TEKNOLOGI MARA | College of Built Environment (CBE)

INTRODUCTION

Good acoustic levels in lecture halls can improve students' learning performance. According to a previous study, long-term and frequent noise exposure might harm students' psychological health and impair their willingness to learn (Buchari, 2017). This is because the sound pressure level can greatly affect the learning input, understanding, and overall experience of the student when receiving information and knowledge in certain learning spaces. Excessive noise can cause impatience, difficulty to concentrate, decreased productivity, frustration, mistakes in judgement, and distraction (Petrone, 2019). The mechanics of noise transmission change throughout a large frequency range and its prediction may be assessed using several approaches depending on the frequency range (Melillo, 2019). This study aims to study ether sound pressure levels comply with the regulations.

PROBLEM STATEMENT

Poor sound pressure level affecting student learning experience.

Poor acoustic conditions in a learning environment can affect the learning experience of students. The findings of a previous study demonstrated that children with additional learning needs, such as hearing impairment or speaking English as a second language, were significantly more influenced by poor school acoustics than students who did not have additional learning needs (Roskams, 2019). According to regulations, noise levels in schools must be less than 40 decibels (dB) (Montiel, 2019).

Acoustic condition in indoor environments.

More than just aesthetics must be considered while designing a space (Siregar, 2022). The size and shape of the classroom, the location, the surface treatment which can affect the sound absorption, the construction of the ceiling, walls, and floor, the total, type, and placement of the sound source, and the strength of the sound created are all aspects to consider.

OBJECTIVES

The objective of this study are stated as below:

1. To measure the sound pressure level in a lecture hall.
2. To compare the findings obtained with other studies carried out in other lecture halls.

METHODOLOGY

A sound pressure level meter was used to measure the sound pressure levels in a lecture hall. The meter has a measuring range of 35dB-100dB, and an accuracy of ±3.5dB at 94dB sound level, 1KHz sine wave. The meter was positioned at 1.5 meter from the ground. The measurement was taken in 5 positions throughout the lecture hall, the front, rear, left, right, and centre. 5 readings have been taken on each of the 5 position to know the mean, min, and max sound level. The measurement has been taken in two conditions, occupied and unoccupied.

FINDINGS

Empty lecture hall								
Point	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Mean sound level	Min sound level	Max sound level
Point A	45.4 dB	45.6 dB	44.0 dB	43.9 dB	44.7 dB	44.72 dB	43.9 dB	45.6 dB
Point B	41.5 dB	42.2 dB	42.7 dB	41.1 dB	42.2 dB	41.94 dB	41.1 dB	42.7 dB
Point C	34.6 dB	35.7 dB	37.8 dB	33.1 dB	35.6 dB	35.36 dB	33.1 dB	37.8 dB
Point D	39.9 dB	36.6 dB	40.0 dB	40.2 dB	37.4 dB	38.82 dB	36.6 dB	40.2 dB
Point E	43.4 dB	47.0 dB	47.5 dB	46.0 dB	48.2 dB	46.42 dB	43.4 dB	48.2 dB
Mean sound level			Min sound level			Max sound level		
41.452 dB			33.1 dB			48.2 dB		

Table 1: Measured sound pressure levels at 5 different points in empty lecture hall

Lecture hall with occupants								
Point	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Mean sound level	Min sound level	Max sound level
Point A	76.5 dB	79.3 dB	80.2 dB	78.4 dB	82.3 dB	79.34 dB	76.5 dB	82.3 dB
Point B	83.0 dB	85.3 dB	80.1 dB	87.3 dB	79.4 dB	83.02 dB	79.4 dB	87.3 dB
Point C	81.0 dB	71.4 dB	73.5 dB	76.8 dB	77.3 dB	76.00 dB	71.4 dB	81.0 dB
Point D	83.0 dB	79.3 dB	80.1 dB	78.6 dB	84.7 dB	81.14 dB	78.6 dB	84.7 dB
Point E	69.1 dB	72.4 dB	68.2 dB	74.3 dB	70.1 dB	70.82 dB	68.2 dB	74.3 dB
Mean sound level			Min sound level			Max sound level		
78.064 dB			68.2 dB			87.3 dB		

Table 2: Measured sound pressure levels at 5 different points in occupied lecture hall

Table 1 shows the readings in decibels of the sound pressure level in an unoccupied lecture hall. The maximum allowed background noise in a lecture hall is between 30-35 dB (DIN 18041). Besides, it is preferable to have the decibel readings when to be between 65-75 dB (Eggenschwiler, 2005) when hearing lessons. As shown in Table 2, the mean reading of the classroom with occupants is 78.1 dB, while the highest recorded reading was 87.3 dB. By comparing the mean values for both states, a difference of 36.6 dB was found. It should be noted that only selected spots in the lecture hall were selected for sound pressure level measurements, and the acoustic perceptions of the occupants are not included in this study.

NOVELTY

As lecture halls are essential educational facilities in higher educational institutes, there is a need to ensure that the acoustic conditions are acceptable for the users. This study highlights the sound pressure levels for both occupied and unoccupied states in a lecture hall, and the findings can be referred to for improvement in acoustic performance.

CONCLUSION

The average sound pressure level when unoccupied is 45.452 dB and the occupied average reading is 78.064 dB which is above the range 65-75 dB. Based on the findings obtained, the sound pressure levels at certain locations need further assessment. In future work, more measuring points for sound pressure level measurements will be identified the acoustic perception of the occupants will be gathered to make the findings more inclusive.

COMMERCIALIZATION

The findings of this study can be used as references in future studies on the sound pressure levels in a lecture hall during occupied and unoccupied states.

REFERENCE

Buchari, & Matondang. N. (2017). The impact of noise level on students' learning performance at state elementary school in Medan. AIP Conference Proceedings, 1855(June 2017).

Montiel, I., Mayoral, A. M., Pedreño, J. N., & Maiques, S. (2019). Acoustic comfort in learning spaces: Moving towards sustainable development goals. *Sustainability (Switzerland.*

Siregar, I. (2022). Cyber Library Auditorium Acoustic Evaluation in Acoustic Phonetic Perspective. *Budapest International Research and Critics Institute.*

Roskams, M., Haynes, B., Lee, P. J., & Park, S. H. (2019). Acoustic comfort in open-plan offices: the role of employee characteristics. Journal of Corporate Real Estate, 21(3), 254–270.

DIN 18041:2004-05, 'Hörsamkeit von kleinen und mittleren Räumen. (Acoustical quality in small to medium-sized rooms.)', Beuth Verlag GmbH.

Eggenschwiler, K. (2005). Lecture halls - Room acoustics and sound reinforcement. *Forum Acusticum Budapest 2005: 4th European Congress on Acustics*, 2059–2064.

Barron, M. 2009. Auditorium Acoustics and Architectural Design. New York: Spon Press.

Petrone, G., Melillo, G., Laudiero, A., & De Rosa, S. (2019). A Statistical Energy Analysis (SEA) model of a fuselage section for the prediction of the internal Sound Pressure Level (SPL) at cruise flight conditions. Aerospace Science and Technology, 88, 340–349.

PREPARED BY:
MUHAMMAD FARIS ASHMAN BIN ISAHAK
IR. DR. KWONG QI JIE