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Research article

OSH-Based School Building Safety Risk Evaluation through Workplace Environmental Measurements at MAN Islam Cendekiawan

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ABSTRACT

Background: Inadequate management of workplace environmental conditions and building safety aspects may increase potential risks to students, teachers, and school staff. The implementation of Occupational Safety and Health (OSH) principles in school facilities is essential to identify hazards, prevent accidents, and improve safety management. This study aimed to evaluate school building safety based on OSH principles through workplace environmental measurements and assessment of safety conditions at MAN Islam Cendekiawa.

Methods: This study used a descriptive quantitative design with an observational approach. Data were collected through direct measurements of workplace environmental parameters, including lighting intensity using a lux meter, temperature and humidity using a thermo-hygrometer, and noise levels using a sound level meter. Observations were also conducted to assess physical building conditions, ventilation systems, building maintenance, and safety facilities. The collected data were analyzed descriptively by comparing the measurement results with applicable Occupational Safety and Health (OSH) standards.

Results: The results showed that workplace environmental conditions at MAN Islam Cendekiawa were generally adequate to support educational activities. Lighting intensity, temperature, humidity, and noise levels were within acceptable limits based on OSH requirements. However, several aspects, including ventilation optimization, routine building maintenance, and improvement of safety facilities, require further attention to minimize potential hazards and enhance school safety management

Conclusion: The evaluation of school building safety through workplace environmental measurements provides an effective preventive approach for identifying potential hazards and improving OSH implementation in educational facilities. Continuous monitoring, improvement of infrastructure, and strengthening of safety management systems are recommended to create a safer and healthier learning environment. This study contributes to the development of OSH practices in schools and supports efforts to protect the health and safety of students, teachers, and school personnel.

INTRODUCTION

School buildings are essential facilities that support educational activities and serve as working environments for teachers, educational staff, and learning spaces for students. A safe, healthy, and comfortable school environment is an important factor in maintaining the quality of educational

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processes and protecting the health and safety of school occupants. However, several educational facilities still experience challenges related to workplace environmental conditions and building safety aspects, including inadequate lighting, inappropriate temperature and humidity conditions, excessive noise exposure, and physical building conditions that require continuous monitoring and improvement. These factors may affect occupant comfort, concentration, productivity, and overall safety. The World Health Organization (WHO) emphasizes that healthy and safe workplace environments are important components in supporting individual well-being and preventing health risks associated with environmental exposure (WHO, 2025).

The implementation of Occupational Safety and Health (OSH) principles in educational facilities has become increasingly important as part of efforts to establish safe and sustainable learning environments. According to the International Labour Organization (ILO), a safe and healthy working environment is a fundamental principle that requires effective hazard identification and risk control measures (ILO, 2021). In Indonesia, the implementation of OSH management systems is regulated through Government Regulation Number 50 of 2012 and supported by the Regulation of the Minister of Manpower Number 5 of 2018 concerning workplace environmental safety and health requirements. These regulations highlight the importance of monitoring workplace environmental factors, including physical environmental conditions, to prevent occupational health and safety risks.

Previous studies have demonstrated that environmental measurements are essential for identifying workplace hazards and determining appropriate risk control strategies. Suma'mur (2014) stated that occupational hygiene measurements are an important step in evaluating workplace conditions, while Tarwaka (2019) explained that proper workplace environmental management can improve comfort and reduce the risk of health problems. Furthermore, studies on indoor environmental quality in educational buildings have shown that factors such as lighting, thermal conditions, ventilation, and noise significantly influence occupant comfort and learning performance (Zhang et al., 2022; Yusuf & Susanto, 2020).

Although previous research has evaluated workplace environmental conditions and OSH implementation, comprehensive assessments that integrate environmental measurements with physical building safety evaluations in school facilities remain limited. Therefore, this study provides scientific value by combining workplace environmental measurements and building condition assessments to obtain a more comprehensive evaluation of school safety risks.

This study aimed to evaluate school building safety based on Occupational Safety and Health (OSH) principles through workplace environmental measurements and assessment of building safety conditions at MAN Islam Cendekiawa. The findings are expected to provide evidence-based recommendations for improving school safety management and developing safer, healthier, and sustainable educational environments.

METHODS

This study employed a descriptive quantitative design with an observational approach to evaluate school building safety based on Occupational Safety and Health (OSH) principles through workplace environmental measurements at MAN Islam Cendekiawa. The observational approach was selected because it allows the assessment of actual workplace conditions through direct measurement and field observation of environmental factors and safety aspects (Suma'mur, 2014). The research samples were selected using purposive sampling from several active areas of the school, including classrooms, teachers' rooms, laboratories, and administrative rooms.

Data were collected through direct measurements of workplace environmental parameters, including lighting intensity using a **lux meter**, temperature and humidity using a **thermo-hygrometer**, and noise levels using a **sound level meter**. Building safety conditions were assessed using an OSH-based observation checklist covering physical building conditions, ventilation systems, maintenance conditions, and safety facilities. The assessment of workplace environmental conditions was conducted based on occupational safety and health requirements, particularly the Regulation of the Minister of Manpower of the Republic of Indonesia Number 5 of 2018 concerning Occupational Safety and Health in the Workplace Environment (Ministry of Manpower of the Republic of Indonesia, 2018).

The research process consisted of preparation, data collection, analysis, and evaluation stages. Environmental measurements and building observations were performed in selected school areas to identify potential hazards and evaluate safety conditions. The collected data were analyzed descriptively

by comparing measurement results and observation findings with applicable OSH standards. This approach is consistent with OSH management principles that emphasize hazard identification, risk assessment, and preventive control measures (International Labour Organization, 2021; Government of the Republic of Indonesia, 2012).

Ethical considerations were applied by obtaining permission from the school authorities before conducting the research. The study focused on workplace environmental and building safety assessments, and all collected data were used solely for scientific purposes.

RESULTS

The assessment of school building safety based on Occupational Safety and Health (OSH) principles was conducted through workplace environmental measurements and physical building condition evaluations at MAN Islam Cendekiawa. The results provide an overview of environmental quality and structural safety conditions that may affect the comfort, health, and safety of school occupants.

Table 1. Workplace Environmental Measurement Results at MAN Islam Cendekiawa

Measurement Location	Lighting (Lux)	Temperature (°C)	Humidity (%)	Noise Level (dB)	Description
Classroom 1	285	27.5	65	48	Comfortable environmental condition
Classroom 2	310	27.8	63	50	Supports learning activities
Teachers' Room	325	26.9	60	45	Supports work activities
Laboratory	295	27.2	62	52	Slightly higher noise due to activities
Administration Room	340	26.7	59	46	Relatively good environmental condition

The measurement results indicate that lighting intensity ranged from 285 to 340 lux, temperature from 26.7°C to 27.8°C, humidity from 59% to 65%, and noise levels from 45 to 52 dB. Overall, these values suggest that the indoor environmental conditions are within acceptable comfort ranges for educational activities.

Table 2. Evaluation of School Building Conditions Based on OSH Principles

Component	Observation Result	Risk Level	Recommendation
Floor condition	Good condition	Low	Routine maintenance
Walls and ceiling	Moisture detected in some areas	Moderate	Repair moisture sources
Stairs and access routes	Functional	Low	Add safety signage
Ventilation system	Needs improvement	Moderate	Improve air circulation
Safety facilities	Available but not optimal	Moderate	Improve evacuation system

The building condition assessment shows that most structural components are in good condition, although several areas such as ventilation systems, moisture in walls, and safety facility optimization still require improvement.

DISCUSSION

The results of this study indicate that the environmental conditions at MAN Islam Cendekiawa generally support educational activities. The lighting levels (285–340 lux) are adequate for reading and learning activities, consistent with occupational lighting standards that emphasize visual comfort and the prevention of eye strain in indoor workplaces (Suma'mur, 2014; OSHA, 2023). Appropriate lighting is essential to maintain learning effectiveness and reduce visual fatigue among students and teachers.

Similarly, temperature (26.7–27.8°C) and humidity (59–65%) remain within relatively stable ranges, indicating acceptable thermal comfort conditions. According to Tarwaka (2019), thermal comfort is strongly influenced by temperature, humidity, and air movement, which directly affect productivity and concentration in occupational settings. However, conditions approaching the upper comfort limit may still require improved ventilation to maintain long-term comfort stability.

Noise levels ranging from 45 to 52 dB indicate that the school environment is relatively quiet and suitable for learning activities. However, slightly higher noise in the laboratory reflects increased activity intensity, which is expected in practical learning environments. WHO (2018) recommends that indoor educational environments should maintain noise levels below 55 dB to avoid learning disruption, meaning that the observed conditions are still within acceptable limits.

The building condition evaluation reveals that although structural safety is generally adequate, several risk factors still exist, particularly moisture in walls, suboptimal ventilation, and incomplete optimization of safety facilities. Moisture problems may lead to structural deterioration and mold growth, which can affect occupant health if not properly managed (OSHA, 2023). Therefore, preventive maintenance and engineering controls are necessary to reduce long-term safety risks.

These findings are consistent with Suma'mur (2014), who emphasized that workplace environmental measurement is a fundamental step in hazard identification and risk control. In addition, Tarwaka (2019) stated that proper workplace environmental management improves comfort, safety, and productivity, while poor conditions may increase occupational health risks.

Compared to previous studies, this research provides a more integrated approach by combining environmental measurements and building safety evaluation in a school setting. This aligns with the concept of OSH-based school safety management, which emphasizes both environmental and structural risk control in creating safe learning environments (ILO, 2019).

Overall, the findings show that although the school environment is generally safe and supportive of learning activities, continuous improvement is required, especially in ventilation systems, moisture control, and safety facility management.

CONCLUSION

This study aimed to evaluate school building safety based on Occupational Safety and Health (OSH) principles through workplace environmental measurements at MAN Islam Cendekiawa. The findings show that, in general, the school environment is in a condition that supports educational activities, with adequate lighting, stable temperature and humidity, and controlled noise levels across the observed areas.

However, the evaluation also identified several aspects that require improvement, particularly related to building maintenance, ventilation systems, and the optimization of safety facilities. These issues indicate that although the current environmental conditions are relatively safe, there are still potential risks that need to be addressed to ensure long-term safety and comfort for school occupants.

Based on OSH principles, this study confirms that regular environmental monitoring and building condition assessment are essential for early hazard identification and risk control in educational facilities. Therefore, the implementation of systematic OSH-based school safety management is strongly recommended to maintain a safe, healthy, and comfortable learning environment.

For practical implications, schools are encouraged to improve ventilation systems, conduct routine maintenance of building structures, and enhance safety infrastructure such as evacuation routes and emergency signage. For future research, it is recommended to expand the assessment scope by including additional variables such as fire protection systems, disaster preparedness, and school safety culture in order to obtain a more comprehensive evaluation of school building safety.

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CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this study. All data collection, analysis, and interpretation were conducted objectively without any financial, personal, or institutional influences that could affect the results or conclusions of the research. translatekan

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