Malaysian Journal of Sustainable Environment
Special issue, June (2025), 255-270
doi: 10.24191/myse.v12i2.7081

COMPARISON OF MALAYSIA'S BUILDING REGULATIONS REGARDING MEANS OF ESCAPE ROUTES IN STUDENT HOSTELS

Adnin Syaza Jaafar*[1], Yuhainis Abdul Talib[2], Asmat Ismail[3], & Muhammad Anas Othman[4]
***Corresponding Author**
[1,2,3,4]Department of Built Environment Studies and Technology, College of Built Environment, Universiti Teknologi MARA (UiTM), 32610 Perak Branch, Perak, Malaysia

*syaza278@uitm.edu.my, anis500@uitm.edu.my, asmat926@uitm.edu.my & manas770@uitm.edu.my
Received: 23 August 2024
Accepted: 16 December 2024
Published: 30 June 2025

ABSTRACT

A student hostel is an accommodation provided by educational institutions, offering shared living spaces for students. It needs to comply with building standards and safety features. Fire incidents in a student hostel can negatively impact students' futures. Tragic instances, such as the fire at the Madrasah Darul Quran Ittifaqiyah in 2017 and a similar incident in Georgetown, Guyana, highlighted the importance of these safety measures. Due to this, the Twelfth Malaysia Plan mandates measures to address outdated and unsafe buildings, particularly student hostels. Buildings constructed based on outdated standards may not meet current requirements. Therefore, this research aims to identify the design criteria of means of escape and to evaluate the changes in Uniform Building By-Law provisions regarding means of escape. A qualitative approach is used for data collection via evaluating archival documents and expert validation. The building standards compared are the Uniform Building By-Laws 1984 as of 2015 and Uniform Building By-Laws 1984 as of 2022. The collected data is analysed using content analysis that integrates passive and active fire protection by distinguishing the means of escape requirements prescribed in both building regulations. The analysis identified seven design criteria for safe escape routes: travel distance, door, exit, staircase, emergency lighting,

communication, power system, signage, and fire-fighting requirements. This research provides valuable insights for designers and policymakers by highlighting regulatory changes such as newly added, removed, substituted, amended, and maintained prescriptive requirements. By shedding light on the motivations behind these changes, this research could impact future updates to building laws.

Keywords: *Fire, Means of escape, Safety, Student hostel, UBBL 1984*

INTRODUCTION

A student hostel is an accommodation provided by educational institutions, offering shared living spaces for students. According to Sanni-Anibire and Hassanain (2015), student hostels are critical in helping students achieve intellectual competence, develop personal character, and enhance their overall living experiences.

Furthermore, it is essential for a student hostel to comply with building standards and include safety features (Mahmoud et al., 2017; Sanni-Anibire and Hassanain, 2015; Simpeh and Adisa, 2021). Fire safety in student hostels is a critical aspect that needs to be considered. The effectiveness of fire safety in student hostels depends on the integration of structural design, management practices and occupant awareness. Kofi et al. (2016) stated that a fire incident in a student hostel can negatively impact students' futures.

Table 1 presents statistics from the Fire and Rescue Department of Malaysia (FRDM) on fire cases in residential buildings from 2010 to 2019. This table details fire incidents in various types of residential buildings, categorised as Group I and Group III under the purpose group designation in the Fifth Schedule Uniform Building By-Law 1984 (UBBL 1984). According to these statistics, the FRDM responded to an average of 69 student hostel fire cases yearly from 2010 to 2019 (Portal Rasmi Kementerian Perumahan dan Kerajaan Tempatan, 2022).

Table 1. Fire Cases for the Residential Category

No	Type of Building	Year									
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	Squatter Houses	50	69	60	106	195	159	147	127	101	116
2	Residential House	2918	2994	2172	3235	1205	1319	1263	1300	1327	1341
3	Hotels	32	40	27	49	47	46	43	40	47	40
4	Hostels	44	40	37	56	78	89	78	91	95	87

Source: (Jaafar, 2024)

A fire in a student hostel can result in significant damage, including casualties and losses for the building management. Recent incidents, such as the fire in a student hostel in Georgetown, Guyana, have highlighted these risks. As reported by the New Straits Times (2023), this incident resulted in 19 student deaths due to factors such as a faulty fire alarm system, lack of evacuation information, and locked fire doors.

In Malaysia, one of the most tragic fires occurred at the Madrasah Darul Quran Ittifaqiyah student hostel in 2017 (Bernama, 2023). This event gained global attention as 21 students and two wardens lost their lives, trapped on the second floor due to metal grills on all windows and a blocked exit door. Although the means of escape (MoEsc) route was designed to facilitate evacuation, it proved ineffective in this instance.

Several fire incidents have also been reported at different universities in Malaysia, including one at Universiti Utara Malaysia, resulting in 90% of the hostel rooms being engulfed in flames (Zulkiffli, 2021). In another incident at Universiti Islam Antarabangsa in 2014, a fire in a dormitory storeroom caused considerable damage, though all 800 students escaped unharmed. Similarly, a fire at Kolej Universiti Islam Melaka in 2014 destroyed three hostel rooms (Bernama, 2014). While there were no casualties, both the hostel management and the occupants incurred losses.

In response to these incidents, the Twelfth Malaysia Plan 2021-2025, Economic Planning Unit (2021) mandates measures to address outdated and unsafe buildings, especially the student hostel. This aligns with Policy Enabler 1, aiming to develop future-ready talent. Students' hostels play a crucial role in nurturing such talent by providing students with an environment to develop their individuality and enrich their living

experiences. However, the high number of fire incidents in student hostels has led the government to prioritise improving the safety of these buildings.

Designing MoEsc routes in hostels is a complex process that must meet MoEsc regulations while considering the building's form, the activities within, the likelihood of fire, and the potential for fire to spread throughout the building (Abu Bakar, 2006).

Complying with current building codes and fire safety regulations is crucial when building a student hostel. Buildings constructed based on outdated standards may not meet current requirements (Lo, 1998). Therefore, this research aims to identify the design criteria of means of escape and to evaluate the changes in Uniform Building By-Law provisions regarding means of escape. This is important in ensuring the hostel meets the latest means of escape standards outlined by building regulations.

INTRODUCTION OF UNIFORM BUILDING BY LAW

The Uniform Building By-laws 1984 (UBBL 1984) is Malaysia's primary regulation for fire safety, enacted under the Street, Drainage and Building Act 1974 (Rong et al., 2014). It comprises requirements from local authorities regarding building designs, construction, and maintenance (Hisham, 2011). The Federation of Malaya's Society of Architects initiated the development of the UBBL 1984 in 1963, and after 23 years of deliberation, it was enforced on 1 January 1986 (Fong, 2017).

The UBBL 1984 was designed to consolidate various by-laws from different local authorities into a uniform set for the entire country (Fong, 2017). It provides a clear framework for building professionals, standardising regulations, and clarifying legal responsibilities for buildings (Chong, 2013). It addresses architectural, structural, health and safety, fire protection, and construction requirements.

Firefighters and local authorities consult the UBBL 1984, along with other laws for building design regulations. These include the Malaysian Standard, Life Safety Code 101 under the National Fire Protection Act (NFPA 101), and the Fire Services Act 1988 (Act 341) aimed at enhancing

the FRDM efficiency (Mat Isa & Kamaruzzaman, 2014).

The recent UBBL 1984 as of 2022, effective from January 2023, introduced new sections and schedules focusing on Fire Safety Installation Requirements, Fire Alarm System and Fire Extinguishment System regulations, and design requirements of escape routes. Along with the UBBL 1984, Malaysian Standards like MS1471, MS1182, MS1745, MS2687, and MS982 also play roles in promoting fire safety and safeguarding lives and property in Malaysia.

Fire Regulations in Uniform Building by Law

The Uniform Building By-Laws (UBBL) 1984 strongly emphasises fire safety, outlining comprehensive requirements to protect building occupants and support effective fire-fighting efforts. UBBL 1984 lays out extensive fire safety requirements across several key parts to ensure the protection of building occupants and the effective management of fire emergencies. The UBBL 1984 Amendment 2022 consists of 9 sections and 11 schedules. Part VI focuses on construction requirements, emphasising the use of fire-resistant materials and construction methods that enhance the overall safety of buildings. Part VII is explicitly dedicated to fire safety, detailing the installation of essential systems like fire alarms, extinguishing systems, and fire-resistant compartmentalisation to contain fires and prevent their spread. It also outlines the design and maintenance of escape routes, ensuring they are accessible and clear for quick evacuation.

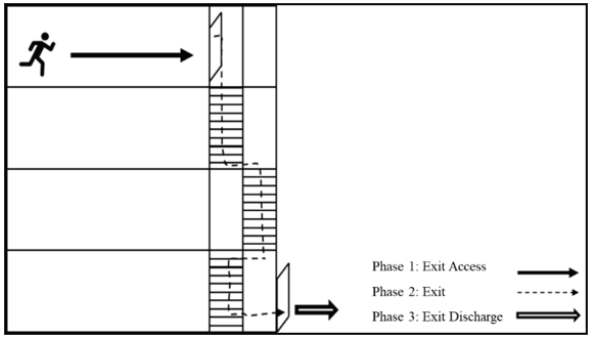
Part VIII adds further safety measures for public buildings, such as theatres and cinemas, where large crowds are present, requiring additional emergency exits and specific seating arrangements to facilitate safe evacuations. The schedules attached to UBBL 1984 provide technical specifications for fire safety elements, such as fire doors, staircases, and sprinkler systems, ensuring these components meet stringent safety standards. Together, these parts and schedules form a comprehensive framework that mandates rigorous fire safety practices, regular inspections, and strict compliance to protect lives and reduce fire-related risks in buildings. Additionally, the design requirements of the means of escape are referenced in the Fifth, Seventh, and Tenth Schedules of the UBBL 1984.

Means of Escape

Designing MoEsc routes is a complex process. It involves understanding the needs of the occupants and the purpose groups in buildings. It also requires ensuring compliance with regulatory MoEsc provisions. According to the Fifth Schedule (Uniform Building (Amendment) By-Laws, 2022), Purpose Group III – Other residential is defined as accommodation for residential purposes other than any premises found in Groups I and II. This includes a hotel, hostel, dormitory, apartment, flat, old folks' home, orphanage, or service apartment.

According to Jaafar et al. (2022), three factors ensure the effectiveness of MoEsc routes: (i) clear and unobstructed access, (ii) identified and well-lit exits, and (iii) discharge to a place of safety. Teruki, (2022) outlines six principles for standard escape routes in the Seminar on Uniform Building By-Law 1984 Amendment 2022. These include (i) sufficient number of MoEsc routes from all parts of the building, (ii) adequate width of MoEsc routes to prevent congestion, (iii) unrestricted MoEsc routes, (iv) proper fire protection for MoEsc routes, (v) adequate protection for external MoEsc routes, and (vi) recognisable and well-lit MoEsc routes.

Figure 1. Components of Means of Escape



Source:(Jaafar, 2024)

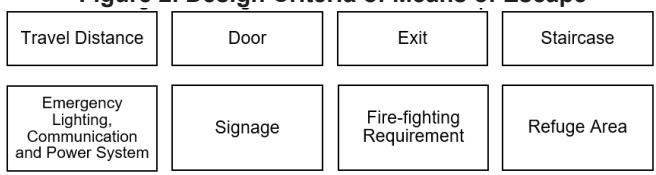
The MoEsc routes can be divided into three main components, as shown in Figure 1: exit access, exit, and exit discharge (Teruki, 2022). Exit access refers to corridors leading to the exit; the exit is typically a stairway for vertical routes, and exit discharge is a door leading to the outside and safety. Shittu et al. (2016) identified three phases of MoEsc routes:

•Phase 1: Evacuation from the room to a common corridor, protected staircase, or final exit.
•Phase 2: Evacuation via a common corridor to a protected staircase or final exit.
•Phase 3: Vertical evacuation via a protected staircase to the final exit and the designated assembly point.

A MoEsc route should be easily accessible, allowing occupants to reach a safe location (Shittu et al., 2016). It is, therefore, crucial to design MoEsc routes in accordance with building standards and regulations.

Effective MoEsc routes require both passive and active fire safety measures. As Shittu et al. (2016) point out, combining MoEsc routes with fire detection and alarm systems is crucial for enabling occupants to evacuate and seek immediate assistance. In addition, (Abass et al., 2022) also acknowledge that passive fire safety alone is often inadequate, necessitating active system integration. MoEsc routes should be continuous and integrated with building elements, allowing users to reach safety during a fire. Ensuring occupants can reach a safe place outside the building within a specified distance is crucial. MoEsc routes should be considered at the design stage and incorporated into the building's architecture. Figure 2 presents eight design requirements related to MoEsc routes.

Figure 2. Design Criteria of Means of Escape



Source: (Jaafar, 2024)

Student Hostel

Student hostels are facilities provided by educational institutions. They create an attractive learning environment, foster student unity, and support the development of a vibrant student culture (Hassanain, 2008; Simpeh & Akinlolu, 2021). The significance of student hostels cannot be overstated. Student hostels are expected to provide an attractive environment that promotes learning, unity, and the development of a vibrant student

culture. In addition, student hostels are crucial for helping students achieve intellectual competence and cultivating their personal character, ultimately enhancing their overall living experiences (Sanni-Anibire & Hassanain, 2015), also added that student hostels provide students with spaces for studying, sleeping, relaxing, and dressing.

Apart from these features, student hostels must adhere to building standards. Subramaniam (2004) acknowledges student hostels are low fire risk buildings under Group III, classified as "other residential" in the Fifth Schedule UBBL 1984. However, recent studies by Mahmoud et al., (2017); Sanni-Anibire & Hassanain (2015); Simpeh & Adisa (2020); Simpeh & Akinlolu (2021) have shown that student hostels are high-risk living accommodations where fires can quickly become uncontrollable. When fire incidents happen in a student hostel, it could jeopardise student's futures and leave lifelong scars.

METHODOLOGY

A qualitative approach is used for data collection, which involves evaluating archival documents and seeking expert validation. Creswell & Creswell, (2018) acknowledge that archive documents are advantageous as they can be accessed anytime at the researchers' convenience. Data were collected from local building standards and regulations, specifically the UBBL 1984 in Malaysia, which governs fire safety. Additionally, the versions of Uniform Building By-Laws 1984 as of 2015 and Uniform Building By-Laws 1984 as of 2022 were also utilised to fulfil the objectives of this paper.

The data was analysed using content analysis, integrating passive and active fire protection by distinguishing the escape requirements prescribed in local and international building regulations. Muthiah et al. (2020) explain that the prescribed requirements must be coded or themed into manageable categories based on previous literature related to escape design criteria. Hence, all prescriptive requirements were grouped into seven main design criteria: travel distance, door, exit, staircase, emergency lighting, communication, power system, signage, and fire-fighting requirements.

Several interviews were conducted with stakeholders from the federal government and professionals to validate the data. All data are presented in table form for easy reference and access, and a cross-case analysis was conducted to compare the escape requirements based on building regulations. The table format is adapted from Abdul Samad, (2021); Hagiwara & Tanaka, (1994); Hung & Chow, (2001).

FINDINGS AND DISCUSSION

The contents of the Uniform Building By-Laws 1984 as at 2015 and the Uniform Building By-Laws 1984 as at 2022 were analysed and grouped into seven design criteria: travel distance, door, exit, staircase, emergency lighting, communication and power system, signage, and fire-fighting requirements (refer to Appendix A for detailed comparison).

There are 72 prescriptive requirements regarding MoEsc included in the UBBL 1984. Based on the findings presented in Appendix 1, five types of measures are identified: (i) inserted prescriptive requirement, (ii) deleted prescriptive requirements, (iii) substituted prescriptive requirements, (iv) amended prescriptive requirements, and (v) maintained prescriptive requirements. These measures incorporated the latest improvements, innovative designs, and new architectural technologies into the updated regulatory requirements (Teruki, 2022). Furthermore, this ensures that the building's regulations are up to date.

The first measure involves inserting prescriptive requirements into the Uniform Building By-Laws 1984 as of 2022. This measure covers 11 prescriptive requirements. As stated in the UBBL 84' - 174A, one of these requirements pertains to the final exit. The Uniform Building By-Laws 1984 as of 2022 also introduces a new requirement related to exit access. Specifically, the exits must provide direct access to (i) the final exit, (ii) the protected corridor leading to the final exit, (iii) the exit staircase leading to the final exit, and (iv) the discharge point to the place of safety. This requirement ensures that occupants have access to unobstructed MoEsc routes to reach a place of assembly in the event of a fire.

The second measure involves deleting prescriptive requirements from the Uniform Building By-Laws 1984 as of 2022. This measure affects eight prescriptive requirements. One of the deleted prescriptive requirements in

the Uniform Building By-Laws 1984 as of 2022 is the requirement on storey exits, as specified in the UBBL 84' – 167 (1). In the Uniform Building By-Laws 1984 as of 2015, it was mandated that a building must have at least two-storey exits, positioned no closer than 4.5m. These storey exits should also be arranged within the maximum travel distance outlined in the Seventh Schedule of the UBBL 1984. This requirement is crucial to ensure occupants have sufficient exits and can reach them reasonably during a fire. However, the Uniform Building By-Laws 1984 as of 2022 removes this requirement. While this removal allows more flexibility in building design, designers must calculate the egress capacity to ensure that the MoEsc complies with the requirements.

The third measure involves substituting prescriptive requirements in the Uniform Building By-Laws 1984 as of 2022. This measure includes fifteen prescriptive requirements. One of the prescriptive requirements substituted in the Uniform Building By-Laws 1984 as of 2022 is the requirement on maximum travel distance, as mandated in UBBL 84' – 165 (3) and the Seventh Schedule of UBBL 84'. In the Uniform Building By-Laws 1984 as of 2015, the maximum travel distance was set at 15m from any point in the room to ensure that individuals could reach a point of safety within 15m or less. However, the Uniform Building By-Laws 1984 as of 2022 sets a more stringent requirement, reducing the maximum travel distance to 9m from any point in the room. This change ensures that individuals can reach a point of safety within a shorter distance. Both Amendments specify maximum travel distances under the Seventh Schedule of UBBL 1984.

The fourth measure involves amending prescriptive requirements in the Uniform Building By-Laws 1984 as of 2022. This measure includes six prescriptive requirements. One of the amended prescriptive requirements in the Uniform Building By-Laws 1984 as of 2022 is regarding ventilation and a lighted staircase, as specified in the UBBL 84' – 111. The Uniform Building By-Laws 1984 as of 2015 already required adequately lighted and ventilated staircases. However, the Uniform Building By-Laws 1984 as of 2022 further specify that staircases should be appropriately lighted with an average illuminance level of at least 100 lux. The Uniform Building By-Laws 1984 as of 2022 also addresses the necessary level of illuminance for staircases, which is now set to be less than 100 lux. Adequate illuminance

is crucial for occupants to have clear vision, especially during evacuations during a fire (Degala, 2017; Jaafar et al., 2022; Jaafar & Abdul Talib, 2017).

The fifth measure involves maintaining prescriptive requirements from the Uniform Building By-Laws 1984 as of 2015. This measure includes 32 prescriptive requirements. One maintained requirement pertains to exit routes, as specified in the UBBL 84' – 169. The exit route requirements in the Uniform Building By-Laws 1984 as of 2015 and the Uniform Building By-Laws 1984 as of 2022 remain unchanged. They emphasise that the width of an exit route should not decrease along its path of travel. This requirement ensures that exit routes maintain a consistent width throughout the MoEsc routes, preventing potential bottlenecks or obstructions that could hinder safe evacuation for occupants in the event of a fire (Sanni-Anibire & Hassanain, 2015; Zhang et al., 2019).

CONCLUSION

This study is relevant to student hostel management, architects, and the broader built environment field. It acknowledges the importance of integrating passive and active fire protection measures to ensure safe evacuation routes. This area has been overlooked in current research, particularly in the context of student hostels.

This paper compares the evolution of MoEsc requirements between the Uniform Building By-Laws 1984 as of 2015 and the Uniform Building By-Laws 1984 as of 2022. The Uniform Building By-Laws 1984 contents were analysed and grouped into seven design criteria: travel distance, door, exit, staircase, emergency lighting, communication and power system, signage, and fire-fighting requirements. Five types of measures are identified based on 72 prescriptive requirements related to MoEsc: (i) inserted prescriptive requirement, (ii) deleted prescriptive requirements, (iii) substituted prescriptive requirements, (iv) amended prescriptive requirements, and (v) maintained prescriptive requirements.

The analysis provides invaluable insights for policymakers, architects, and engineers involved in building design and fire safety by delineating regulatory changes, such as newly added, removed, substituted, amended,

and maintained prescriptive requirements. By shedding light on the motivations behind these changes, this research could impact future updates to building laws. Furthermore, the study's findings have the potential to shape policy and regulatory changes in building safety, particularly those related to evacuation routes, as policymakers and regulatory bodies can utilise these results and recommendations to bolster existing regulations. The primary goal is to underscore the importance of the findings to stimulate positive changes in the broader context of building safety regulations.

In addition to its practical implications, this research holds the potential to enhance building safety regulations, particularly those related to evacuation routes, thereby ensuring the safety and welfare of occupants in various building environments, specifically student hostels. The findings could serve as a guide to minimise the potential for accidents and casualties during emergencies, particularly fires, by implementing effective evacuation requirements for student hostels. As this paper only distinguishes the evolution of escape requirements between the Uniform Building By-Laws 1984 as of 2015 and the Uniform Building By-Laws 1984 as of 2022, further study is needed to distinguish the global perspective on MoEsc regulation for student hostels.

ACKNOWLEDGMENT

The Fire and Rescue Department of Malaysia supported this research by providing complete access to fire statistics and insights into MoEsc regulations.

FUNDING

There is no funding received for this research.

AUTHOR CONTRIBUTION

The authors contributed by researching and analysing data, writing the content, reviewing and revising the manuscript.

CONFLICT OF INTEREST

The authors affirmed that there is no conflict of interest to disclose regarding the publication of this paper.

REFERENCES

Abdul Samad, M. H. (2021, May). *Fire Safety Regulations: A Comparative Study of Malaysia and England and Wales.* Building Engineer. https://www.buildingengineer.org.uk/intelligence/fire-safety-regulations-comparative-study-malaysia-and-england-and-wales.

Abu Bakar, H. (Ed.). (2006). *Guide to Fire Protection in Malaysia* (2nd ed.). The Institution of Fire Engineers (UK) Malaysia Branch (FEM).

Bernama. (2014, 13 October). *Tiga bilik asrama Kolej Universiti Islam Melaka terbakar*. BHarian. https://www.bharian.com.my/taxonomy/term/11/2014/10/ 11335/tiga-bilik-asrama-kolej-universiti-islam-melaka-terbakar.

BERNAMA. (2023, August 15). *Databank disasters & calamities:* Fire – hostels. https://www.bernama.com/

Chong, L. S. (2013). *Uniform Building By-Laws 1984* (Amendments) 2012. PAM Professional Practice Forum 2013, 1–3.

Creswell, J. W., & Creswell, J. D. (2018). *Research Design. Qualitative, Quantitative, and Mixed Methods Approaches* (Fifth Edition). SAGE Publications.

Degala, V. K. Y. (2017). *Minimising the Emergency Evacuation Time Of A Building* (Issue May) [Master of Science]. The University of Akron.

Economic Planning Unit. (2021). *Twelfth Malaysia Plan, 2021-2025*. Economic Planning Unit, Prime Minister's Department Malaysia. https://www.epu.gov.my.

Fong, T. Y. (2017). *History of the Development of the Uniform Building By-Laws 1984.* The Ingenieur, 51–56.

Hagiwara, I., & Tanaka, T. (1994). International Comparison of Fire Safety Provisions for Means of Escape. *Fire Safety Science, 4,* 633–644. http://www.iafss.org/publications/fss/4/633.

Hisham, B. (2011). *An overview of the Uniform Building By-Laws, 1984 & the Amendments 2007.* http://badrulhishamarchitect.blogspot.com/2011/03/overview-of-uniform-building-by-laws_963.html.

Hung, W. Y., & Chow, W. K. (2001). Review On Fire Regulations For New High-Rise Commercial Buildings In Hong Kong And A Brief Comparison With Those In Overseas. *International Journal of Engineering Performance-Based Fire Codes, 3*(1), 25–51.

Jaafar, A. S. (2024). *Enhancing Fire Safety Regulations for Malaysian Student Hostels; Effective Means of Escape.* Universiti Teknologi MARA Cawangan Perak.

Jaafar, A. S., & Abdul Talib, Y. (2017). Means of Escape Assessment Procedure for Hospital's Building in Malaysia. *The International Journal of Engineering and Science, 06*(06), 32–36. https://doi.org/10.9790/1813-0606023236.

Jaafar, A. S., Abdul Talib, Y., Ismail, A., & Othman, M. A. (2022). Fire Safety for Residential College in Higher Education: A Literature Review. *E-Proceedings v-GOGREEN2021.*

Kofi, A., Joshua, A., Peter, A., & Emmanuel, B. B. (2016). Challenges to fire safety management in multi-storey students' hostels. *International Journal of Flexible Manufacturing Systems, 4*(1), 53–61.

Lo, S. M. (1998). A building safety inspection system for fire safety issues in. *Structural Survey, 16*(4), 209–217.

Mahmoud, A. S., Sanni-Anibire, M. O., & Hassanain, M. A. (2017). Performance-based fire safety evacuation of an auditorium facility using a theoretical calculation method. *International Journal of Building Pathology and Adaptation, 35*(2), 124–138. https://doi.org/10.1108/IJBPA-11-2016-0027.

Mat Isa, B., & Kamaruzzaman, S. N. (2014). *Fire Safety Audit of Buildings*.

University of Malaya Press.

Muthiah, P., Naidu, R. S., Badzis, M., Mat Nayan, N. F., Abdul Rahim, R., & Abdul Aziz, N. H. (2020). *Qualitative Research Data Collection and Data Analysis Techniques* (2nd ed.). UUM Press.

New Straits Times. (2023, 23 May). *Fire that killed 19 in Guyana school dorm may have been set "maliciously."* New Straits Times. https://www.nst.com.my/world/world/2023/05/912279/fire-killed-19-guyana-school-dorm-may-have-been-set-maliciously.

Portal Rasmi Kementerian Perumahan dan Kerajaan Tempatan. (2022). *Koleksi Buku Laporan Tahunan Kpkt Dari Tahun 2006 Sehingga 2019*. https://www.kpkt.gov.my/index.php/pages/view/162.

Rong, T. Y., Akashah, F., & Mahyuddin, N. (2014). Agent-Based Fire Evacuation Model as a Tool for Fire Safety Design Assessment in *Malaysia. International Journal of Property Sciences, 4*(1), 1–13.

Sanni-Anibire, M. O., & Hassanain, M. A. (2015). An integrated fire safety assessment of a student housing facility. *Structural Survey, 33*(4–5), 354–371. https://doi.org/10.1108/SS-03-2015-0017.

Shittu, A. A., Idiake, J. E., Oweyobi, L. O., Tsado, A. J., Bilyaminu, B., & Mac-Barango, D. O. (2016). Viability Of Fire Escape Routes In The Student Hostels At Selected Katsina State Tertiary Institutions. *Proceedings of the School of Environmental Technology International Conference (SETIC 2016)*, 657–671. http://repository.futminna.edu.ng:8080/jspui/handle/123456789/2208.

Simpeh, F., & Adisa, S. (2021). Evaluation of on-campus student housing facilities security and safety performance. *Facilities, 39*(7–8), 470–487. https://doi.org/10.1108/F-04-2020-0051.

Teruki, E. G. (2022). Overview Amendment UBBL 2021 . *In Seminar on Uniform Building By-Law 1984* (Amendment 2021).

Uniform Building (Amendment) By-Laws. (2015). *Uniform Building By-Law 1984* (Legal Research Board, Ed.). International Law Book Services.

Uniform Building (Amendment) By-Laws. (2022). *Uniform Building By-Law 1984* (Legal Research Board, Ed.). International Law Book Services.

Zhang, L., Wu, X., Liu, M., Liu, W., & Ashuri, B. (2019). Discovering worst fire scenarios in subway stations: A simulation approach. *Automation in Construction, 99* (November 2018), 183–196. https://doi.org/10.1016/j.autcon.2018.12.007.

Zulkiffli, Z. (2021). *Tingkat tiga asrama pelajar UUM terbakar.* HMetro. https://www.hmetro.com.my/mutakhir/2021/07/732813/tingkat-tiga-asrama-pelajar-uum-terbakar