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WELCOME SPEECH FROM THE CHAIRMAN

RISM 17th International Surveying Conference for Undergraduates (ISCU 2025)

بسم الله الرحمن الرحيم السلام

عليكم ورحمة الله وبركاته

Greetings to all,

It is with great pleasure that I welcome you to the 17th RISM International Surveying Conference for Undergraduates (ISCU 2025), themed *"Embracing Construction Revolution 4.0: Transforming Malaysia's Built Environment."* On behalf of the Royal Institution of Surveyors Malaysia (RISM), I also wish to express our sincere appreciation to Universiti Teknologi MARA (UiTM), Perak Campus, for graciously hosting this significant event.

As we navigate the era of the Fourth Industrial Revolution (IR4.0)—or in our context, Construction Revolution 4.0 (CR4.0)—we are witnessing transformative advancements across the global construction sector. Technologies such as Building Information Modelling (BIM), the Internet of Things (IoT), artificial intelligence (AI), robotics, big data analytics, and cloud computing are redefining the way we build, manage, and interact with our built environment. For Malaysia, embracing CR4.0 is a strategic imperative to achieve our socio-economic and environmental goals.

This conference serves as a vital platform to unite surveying undergraduates from various disciplines, fostering critical dialogue on industry challenges, enhancing professional networking, and preparing a new generation of talent for the rapidly evolving construction landscape. It is also an opportunity for employers to engage with and inspire our future professionals.

I would like to extend my heartfelt thanks to all industry speakers, paper presenters, judges, and participants for their time, contributions, and support in making ISCU 2025 a success. I also commend the organising committee for curating a meaningful and dynamic conference experience.

May the knowledge gained, connections formed, and ideas exchanged during this event inspire all participants to lead and innovate in their future endeavours.

Wishing everyone a productive and memorable conference.

Prof. Ts Sr Dr. Adi Irfan Bin Che Ani'
Chairman, Universities' Partnering Committee
RISM Session 2024/2025
May 2025

WELCOME SPEECH FROM CO-CHAIRMAN

RISM 17th International Surveying Conference for Undergraduates (ISCU 2025)

Bismillahirrahmanirrahim.

السلام عليكم ورحمة الله وبركاته and greetings to all.

It is my great pleasure to welcome everyone to the 17th International Surveyor Conference for Undergraduates (ISCU 2025), proudly hosted by Universiti Teknologi MARA (UiTM) Perak Branch in collaboration with the Royal Institution of Surveyors Malaysia (RISM). This event is a meaningful platform for students in the built environment to share ideas, showcase innovations, and build professional networks. We are honoured by your presence and enthusiastic participation, with 135 accepted papers and 78 poster presentations this year.

UiTM Perak, home to the College of Built Environment, has long been a hub for academic excellence in architecture, planning, and surveying. Our commitment remains strong in nurturing competent graduates who meet industry demands and contribute to nation-building.

While you're here, we invite you to experience the heritage and culture of Perak Tengah from the architectural richness of Rumah Kutai to the historical towns of Pasir Salak, Bota, and Kampung Gajah.

To all presenters and winners, congratulations on your achievements. Let your work today be a catalyst for future success and academic growth. We hope this conference will inspire you to explore new ideas, foster collaboration, and make lasting memories.

My deepest thanks to the Royal Institution of Surveyors Malaysia (RISM) and the organising committee for making this event a success.

We hope your experience here will be rewarding and unforgettable.

Thank you. Selamat datang dan selamat berjaya.

Associates Professor Dr. Nur Hisham Ibrahim, *PMP*
Co-Chairman, Universities' Partnering Committee
RISM Session 2024/2025
May 2025

WELCOME SPEECH FROM THE PROJECT DIRECTOR

RISM 17th International Surveying Conference for Undergraduates 2025

Alhamdulillah, all praise to Allah S.W.T. for His guidance and blessings in making the RISM 17th International Surveying Conference for Undergraduates (ISCU) 2025 a reality.

It is with great honour and gratitude that I welcome all participants, guests, academicians, and industry professionals to this prestigious event, proudly organized under the Royal Institution of Surveyors Malaysia (RISM). This 17th edition of ISCU stands as a proud testament to our collective dedication toward academic excellence, professional collaboration, and youth empowerment in the field of surveying.

I extend my heartfelt appreciation to RISM for its unwavering support, to the hardworking ISCU 2025 Organising Committee, and to all 16 partnering universities across Malaysia for their commitment and contributions. Your efforts have shaped this conference into a dynamic platform for knowledge exchange, innovation, and professional growth.

To the academicians and practitioners present, your insights are invaluable in bridging the gap between academic theory and real-world practice. To our undergraduate participants, your passion, curiosity, and commitment are the very foundation of our future. May this conference not only deepen your academic journey but also ignite a spirit of leadership, integrity, and sustainable thinking.

Let this gathering serve as more than an academic milestone. May it foster lifelong networks, inspire transformative ideas, and chart new directions in our shared professional journey.

Wishing everyone a rewarding and inspiring conference experience.

Sr Dr. Nurul Fadzila Zahari
Project Director
RISM 17th ISCU 2025

THE CONCEPTUAL EVALUATION PARADIGM OF MALAYSIA OLD AND NEW PUBLIC HOSPITAL BUILDINGS ON PASSIVE FIRE PROTECTION SYSTEM VERSUS UBBL 1984 COMPLIANCE

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ABSTRACT

Public hospitals in Malaysia require stringent fire safety measures opt to high occupancy due to government policy against convoluted building design and layouts. Ensuring compliance with fire safety regulations, particularly passive fire protection systems, is critical for safeguarding lives and facilitating safe evacuation during emergencies. Yet, older hospital buildings often face challenges to meet the fire safety standards due to outdated designs and spatial limitations before the Uniform Building By-Laws, 1984 (UBBL 1984) mandated by the year 1984. The paper investigates the passive fire protection system vs the appraisal of UBBL 1984 between existing new and old public hospital buildings via systematic literature review. The key disparities are design criteria such as escape routes, fire compartments, emergency exits, and fire protection systems. The findings indicate that newly constructed hospitals are more likely to fully integrate passive fire safety features from the outset, ensuring better compliance with UBBL 1984. In contrast, older hospital buildings often lack essential fire safety components due to constraints in retrofitting, potentially compromising containment, disobeyed by laws and evacuation efficiency. Expectantly, this paper provides valuable insights for hospital administrators, fire safety professionals, and policymakers, to enhance fire safety requirements in existing hospital facilities.

Keywords: Passive fire protection; UBBL 1984; Public Hospital buildings; Fire safety

I. INTRODUCTION

Fire safety is vital in the design, construction, and management of hospital buildings, given that these facilities accommodate individuals with different degrees of vulnerability. Individuals with restricted movement, health issues, or reliance on relatives require a higher level of safety in the case of a fire. Hospitals serve as multifaceted environments characterized by a high density of occupants and a variety of functions, in addition to their primary role in healing. Fire safety measures are essential to guarantee the safety and well-being of all individuals within these facilities.

A fire protection system in a building is a combination of active and passive systems that detect, contain, and extinguish fires (UBBL, 1984). Passive fire protection system in a building refers to structural components designed to slow or prevent the spread of fire and smoke without any active mechanism, typically including fire-resistant walls, floors, ceilings, doors, and fire stopping materials, essentially creating compartments within a building to contain a fire and allow for safe evacuation. (Fire Services Act, 1988: UBBL, 1984). The factors that influence fire in Asian hospital buildings were categorised into technical, management and legislation factors as categorised into technical, management, and legislative factors (Salleh et al., 2021). It has been debated during risk assessment among old and new hospital buildings in three areas of fire control, exits and general safety was also conducted by Salleh et al., 2023. These explain the old hospital building built before 1984 requires solutions to overcome this egress or fire exit requirement and parameters were also conducted by Salleh et al., 2023.

The Uniform Building By-Laws (UBBL) 1984 functions as the essential regulatory framework for fire safety in Malaysia. The regulations outline the criteria for both passive and active fire safety systems aimed at reducing fire hazards, ensuring safe evacuation, and limiting damage. Recently built hospitals typically incorporate these specifications throughout the design and construction phases, thereby achieving enhanced adherence to fire safety

regulations. Conversely, older hospitals, built under earlier regulations or with constrained resources, often face difficulties in complying with contemporary fire safety standards. The gap highlights significant concerns regarding the sufficiency of fire safety protocols in current hospital structures and the potential hazards they may present to patients, staff, and visitors. Thus, the study aims to assess passive fire protection compliance, identify design limitations in older vs new hospitals, and propose improvements for better adherence to UBBL 1984. With the growing emphasis on healthcare infrastructure in Malaysia, it is essential to assess the compliance levels and effectiveness of fire safety systems in both new and older hospital buildings.

II. LITERATURE REVIEW

2.1 Overview of Malaysia public hospital

Malaysia Ministry of Health (MOH) is the major government agency responsible for the delivery of health care in the country. Both public and private sectors are important players in Malaysia's health care delivery system are well known as the hospital. Furthermore, the government hospitals in Malaysia can be classified into several categories as described in Table 1.

Government hospital activities encompass curative, preventive, rehabilitative, promotive, and regulatory concerns (Panduan Pelan Tindakan, 2019). The MOH provides a wide range of hospital services through a sophisticated and integrated network of programmes. Medical care is delivered by the MOH through public hospitals. Whilst the public health hospitals play other rules apart from the provision of healthcare services. Public hospitals are involved in patient care, training, health research, and education. Malaysian public hospitals are classified based on their needs and organisational requirement. According to Hameed and Bibi (2014), hospitals are classified as district hospitals, district hospitals with specialist services, general hospitals, and National Referral Centres/Institutions.

2.2 Factors influence fire incident in hospital buildings

According to NFPA 101 (2013), buildings less than 8 years old are considered new, while those 8 years and older are classified as old. This classification, although simplified, provides a practical basis for evaluating variations in fire safety standards and compliance. Older hospital buildings, typically constructed before the introduction or enforcement of UBBL 1984, often exhibit legacy design features that are not aligned with modern fire safety codes. These include limited corridor widths, lack of compartmentation, and outdated emergency egress layouts. Such architectural constraints make it difficult to implement passive fire protection systems effectively. Conversely, newer hospitals are generally designed with regulatory compliance in mind, ensuring integration of fire-rated materials, accessible exits, and smoke ventilation systems from the outset—leading to better adherence to UBBL 1984 requirements.

2.3 Factors influence fire incident in hospital buildings

Lesson learned from the fire accident cases because it provides valuable lessons and experiences to prevent a similar mistake from being happened. Fire incident in Malaysia such as what happened at the ICU on the second floor of the Sultanah Aminah Hospital in Johor Bahru dated 25 October 2016 shocked the public regarding fire safety prevention of government hospital buildings. The incident took six lives, 11 people injured, and triggered evacuation activity of hundreds of others. Another example of fire accident is the one that happened in Public Sinying Hospital, Taiwan, on 23 October 2012. Thirteen persons were killed and 60 persons injured. As a result, Taiwan Government has ordered hundreds of hospitals and nursing homes across the island to conduct fire safety checks and enhance fire drills in the wake of the incident. Fire drill and evacuation route are the variables of passive fire protection (UBBL, 1984).

Multiple fire accidents reported in hospitals have identify the mistakes and problems which happened on the fire scenes. Out of 16 incidents occurred, 13 of accidents triggered by the electrical wirings and the installation of medicine equipment system which did not comply with current standards (Naziah et al., 2020). Most of the latter hospital buildings are age over than 50 years old too, which contributed to the fire incidents. Potential fire hazard sources and flammable materials can be easily found in the hospital buildings including faulty electrical circuits, poor electrical wiring and insulation, fabrics, medical equipment, volatile combustive chemicals, and others. Exemplar as emergency evacuation of patients on mechanical life support such as oxygen supply systems, the dialysis machine is very challenging as medical equipment are typically not portable and bulky was also highlighted by NYCTP (2006). Table 1 concentrates on the factors that influence fire in hospital buildings across Asian countries. A total of 16 articles focused on fire safety studies in hospital buildings.

Fire safety plan implementation in hospital buildings is generally low from the systematically reviewed literature across Asia. Findings from most reviewed literature perceived that safety rules and violation of building codes are among the hit factors contribute to fire incident in Asian hospital buildings. Follows by the application of combustible and flammable materials, electricity, lack of fire safety installation and negligence of staffers.

Thus, these major dual factors indicate that most of these healthcare building contravene by-laws and safety rules enumerate in passive fire protection. It has been agreed notably on evacuation and emergency route as reported by Salleh *et al*. (2023) were the most problem found in old hospital building vice-versus the new hospital building that have been built after UBBL 1984 mandated.

In Malaysia, Fire and Rescue Department of Malaysia (FRDM) as cited in Ghani and Aripin (2018) reported that between 2010 and 2016, approximately 209 fire cases have occurred in hospitals and clinics in Malaysia. The fire outbreak on 25th October 2016 at the Intensive Care Unit (ICU) Ward in Sultanah Aminah Hospital, Johor Bharu, Malaysia was one of the recent and disastrous cases. Although the report is yet to be officially released, there is an unconfirmed finding that a lack of natural smoke ventilation design may have caused the high casualties.

The absence of vent in the hospital buildings for hazardous smoke to move out should there be fire out-break is always a challenge because majority of the windows are fixed glass walls for natural lighting. It is suggested a fire engineering approach to arrive at adequate natural smoke venting design for hospital buildings. Also, Ong and Suleiman (2015) identified mistakes associated with global fire accidents in hospital buildings constructed between 1918 and 2013. Inadequate automatic fire protection installations, lacking law enforcement, weak planning, inadequate maintenance and management in fire safety, combustible material among others. In the Malaysia context, four public hospitals heve been investigated and found that documentation issues, use of combustible and flammable materials, lack of fire safety installations, locked doors and windows due to security reasons and lack of training of hospital staff are the factors contributing to fire in Malaysian hospital buildings. Some of these findings agree with this paper findings that cut across Asia's hospital buildings, for example, Rafi, Wasiuddin, and Siddiqui (2012) found that carelessness of the stakeholders using the facility, violation of building codes by the relevant authorities and users, unawareness of safety measures, and inadequate training of staff were the major causes of fire incidents in Pakistan's hospital buildings. Whilst in Indonesia, Sunindijo, Lestari, and Wijaya] (2013) evaluated hospital readiness and resiliency in a disaster scenario such as fire out-break. Ten hospitals in West Java and five hospitals in Yogyakarta were engaged in the study. Public hospital facilities are important infrastructure that should always remain safe and operational even in a crisis. The hospital safety index (HIS) with 151 items was adopted as a tool for measurement in line with World Health Organisation (2015). The authors found that the HIS level of the hospitals investigated would not be able to function during and after fire out-break. This indicates these healthcare facilities are potentially at risk.

Table 1.0 Factors that influence fire incidents in Asian hospital building

	Authors/countries	Main design/ Methodology	Factors that influence fire in Asian hospital building						
			SR	SC	E	NS	S	TS	BC
1.	Salleh et al. (2023)-Malaysia	MM	√			√			√
2.	Salleh et al. (2020)-Malaysia	QL	√			√	√		√
3.	Ong & Suleiman (2015a) - Malaysia	QL	√	√					√
4.	Samsuddin et al. (2018) - Malaysia	QN	√						
5.	Olanrewaju et al. (2018) - Malaysia	QL	√				√		
6.	Ghani & Aripin (2018) - Malaysia	QL	√	√					√
7.	Martiana & Wahyudiono (2018) - Indonesia	QN	√		√				
8.	Jiang et al. (2014) – China	QN	√						
9.	Chowdhury (2014) – India	QN		√					
10.	Pal & Ghosh (2014) – India	CS	√	√	√	√			√
11.	Mulyasari et al. (2013) - Japan	QN	√						
12.	Shohet & Lavy (2017) - Israel	QN	√						
13.	Rafi et al. (2012) - Pakistan	QL	√						√
14.	Nankongnab et al. (2018) - Thailand	QN	√						
15.	Sarsangi et al. (2014) – Iran	CS	√						√
16.	Alzaben et al. (2016) – Saudi Arabia	QN	√					√	
	Total		**15**	**4**	**2**	**3**	**2**	**3**	**7**

QN=Quantitative; **QL**= Qualitative; **MM**=Mixed methods; **CS**=Case study; **SR**=Disregard for safety rules; **SC**=Use of combustible and flammable materials; **E** = Electricity; **NS** = Lack of fire safety installation; **S** = Negligence of staffers; **TS** = Low standard of contractor's work ;**BC** = Violation of building codes

2.4 Fire prevention systems in public hospital building

FRDM defined fire prevention and control systems as a protection in the aspects of fire prevention, control and extinguishment for a certain area based on the availability of risks in that area. Fire prevention system in the building is very essential to ensure fire could be prevented from the early stage and control the fire from spreading to the other parts of the building. It could also describe, as a temporary defense system against fire while waiting

for the fire brigade to arrive. The system is differing from one building to another, depending on the type, size, and function of the building. Installation of the fire prevention systems device must comply with the requirements by the fire brigade and most importantly, by the UBBL 1984.

According to Chow (2001), Fire prevention systems must be designed according to the specification by the UBBL 1984 and needs. Fire prevention systems can be divided into active fire control and passive fire control. Engineers need to implement both active and passive fire prevention systems when designing an effective fire protection system in a building was a study conducted by Spitzenberger (2016). The active fire prevention systems are required to manage and mitigate the fire process while passive fire prevention prevents escalation.

2.4.1 Passive fire prevention systems

Passive fire prevention systems are a method to control the threat of fire by not using any mechanical devices. It is a system which combined with the building design itself, such as the exit routes, exit, emergency doors, fire-rated doors, and staircases. In the event of a fire, passive fire prevention systems can control the fire from spreading to the other parts of the building and protect the building occupant to leave the building safely. Spitzenberger (2016) concluded the main function of passive fire prevention system is to contain fires or slow their spread to limit damage to the facility and give occupants more time to escape and evacuate to a safer area.

The system is an effective barrier to prevent escalation which does not require energized initiation or any motion to activate it. However, the limitation for these systems does not prevent the fire from spreading, do not provide cooling, requires more space, and maintenance. The passive fire prevention systems include materials that are designed to limit temperatures and prevent excessive heat absorption within process plant equipment, structures, and vessels such as fire-rated walls, fire-rated doors, insulation, drainage sumps, compartmentalization, and others (UBBL, 1984). However, the challenges for the systems are determining how much additional fire resistance is required beyond the active fire prevention system even though the need for personnel in a fire area can be minimised with the presence of a passive fire prevention system.

2.5 Fire safety rules and regulation for hospital building in UBBL 1984

Regulatory framework and fire requirements provision in the Uniform Building By-Law 1984 in Malaysia. Definition of terms and references used in the Uniform Building By-Laws 1984 can be found in Table 2.0 Local authorities are a government agency. One of it function is to check all applications for a new building to be built in their territory. Any application for a new building will be approved if it has fulfilled all requirements by the by-law. The consideration to approve any building plans submitted to the local authority will only be given after the local authority has received a written recommendation by internal and external technical departments.

The application for a new building needs to be made by the developer or by the developer's representative which is normally a registered architect. The number of internal technical department depends on the size of the local authority. For example the Kuala Lumpur Municipal Council has 12 internal technical departments i.e. Economy Planning and development department, Town Planning Department, Building Department, Mechanical Engineering Department, Architect Department, etc. Meanwhile, the Penang Municipal Council only has five internal technical departments i.e. Building Department, Engineering Department, Town Planning and Development Department, Licensing Department, and Urban Services Department. Among the internal technical departments, Building Department is the one who is responsible for controlling, implementation and enforcement to ensure that all buildings in their area are safe for occupy.

There are a number of external technical departments that the local authority will have to refer for the technical comments before any building plans can be approved that which is inclusive of Fire Services and Rescue Department (FRDM). FRDM is responsible to comment on the design and specifications of escape routes, emergency exits, party wall, and/or fire doors, fire barrier, compartment floors etc. Reference for regulatory requirement regarding the fire safety aspects in the building is The Uniform Building By-Law 1984 which uses by both departments i.e. Building Department, and Fire Services and Rescue Department for statutory satisfaction.

Apart of Uniform Building By-Laws and other arbitrations which apply to all buildings, another act governs at private healthcare facilities to ensure the safety of patients. The Private Healthcare Facilities and Services Act 1998 Act 586 enforced in 2006, mandated the healthcare facility. Alternatively, few international codes and guides that published by a non-profit organisation such as National Fire Protection Association (NFPA), Historic Scotland, and Fire Protection Association, which are useful for reference (Hamiruddin and Ghafar, 2007).

Table 2.0 UBBL 1984 criteria or passive fire preventive system

No.	Tittle	Reference	Criteria
1	Storey Exits	UBBL 84'-167 (1)	-At least two storey exit located no closer than 5 meters and not exceed the travel distance
		UBBL 84'-172 (1)	-Storey exit and access to such exits shall not be obscured by any decorations, furnishings or other equipment
2	KELUAR Signage	UBBL 84'-172(3)	-All exit sign legible letters > 150 millimeters high and 18 millimeters wide. The lettering shall be in red against a black background.
		UBBL 84'-172(1)	-Readily visible sign and shall not obscured by decorations, furnishings or etc
		UBBL 84'-172(4)	-Illuminated continuously during periods of occupancy
		UBBL 84'-172(2)	-A sign reading "KELUAR" with an arrow indicating direction shall be placed in every location where the direction of travel to reach the nearest exit is not immediately apparent.
3	Exit Door	UBBL 84'-173(1)	-Shall be openable from the inside without the use of key or any special knowledge
		UBBL 84'-173(2)	-Shall close automatically when released
		UBBL 84'-186(1)	-Shall open only in the direction of exit
4.	Travel Distance	UBBL 84'-165, UBBL 84'-166(2)	-Travel distance to all exits must not more than 45m.
		UBBL 84'-188(1)	-Travel distance for place of assembly from any point to reach an exit not exceed 45m.
		UBBL 84'-165	-Compliance of the travel distance to the maximum distance calculated in accordance with provision in the Seventh Schedule
5	Fire-fighting staircase	UBBL 84'-168 (1), UBBL 84'-229(1)	-Availability of mean of egress via at least 2 separate staircases.
		UBBL 84'-168(2)	-Compliance of the width of staircase to the width calculated in accordance with provision in the Seventh Schedule.
		UBBL 84'-197(1)	-Availability of protected lobby to serve staircase.
		UBBL 84'-198(1)	--Determination whether the enclosed staircase come with ventilation at each floor or landing level by either permanent openings or openable windows to the open air having a free area of not less than 1m²/floor.
		UBBL 84'-201(1)	-Determination whether the enclosed staircase below ground level equipped with suitable means to prevent the ingress of smoke.
		UBBL 84'-229(4)	-Determination whether the staircase provided has direct access to fire-fighting lobby.
		UBBL 84'-177(1)	-Computation of number of staircase and staircase width.
6	Place of assembly	UBBL 84'-178	-Determination whether the exit for place of assembly is located, separated or protected to avoid any undue danger to the occupants of the place of assembly from fire originating in the other occupancy smoke therefrom. Identification of the classification of places of assembly. UBBL179, UBBL183
		UBBL 84'-179, UBBL 84'-183	-Identification of the classification of places of assembly.

2.6 Malaysia Old and New Public Hospital Buildings on Passive Fire Protection System with UBBL 1984 compliance

Research done by Salleh *et al*., (2023) indicate that the old building contributed the highest violation to the minimum requirements of evacuation, fire containment and general safety. Fire extinguishment recorded the highest numbers of zones that complied with by laws. Fire exit/egress revealed as the greatest score among average value differences between the required and obtained fire safety scores in the three areas exits. Elements that are computed in these items contribute to the score exit access, exit route, emergency response program, manual fire alarm and corridor partitions/walls.

A fundamental knowledge of fire containment and extinguishment is necessary to make reasonable judgements about action priorities and viable egress routes (NFPA 101, 2013). The newest constructed among all the case studies, older buildings had a lower fire safety compared to the new ones. Meanwhile, the total average difference

between the desired and obtained results in the three areas of general safety, fire control and exit routes in all surveyed buildings fulfilled by the newest hospital was also conducted by Salleh *et al*., (2023)

III. METHODOLOGY

A. Types Of Data Collection

The first stage involves reviewing literature, government regulations, and past fire safety audits to identify gaps in compliance, especially in older hospitals. There are around 25 documents, including regulations like UBBL 1984, the Fire Services Act 1988, government fire audit reports, and academic articles. These documents were chosen because they are closely related to fire safety in healthcare buildings. Many older facilities struggle with outdated infrastructure and limited space for fire safety upgrades.

The second stage consists of fire system audits and observations in selected hospitals. fire safety audits were carried out at three public hospitals located in Pulau Pinang, which are Penang General Hospital, Balik Pulau Hospital, and Seberang Jaya Hospital. These hospitals were chosen because they represent different building ages and designs. A checklist based on guidelines from the Fire and Rescue Department of Malaysia (FRDM) and CPBS101 was use. This assessment evaluates passive fire protection systems, including fire-resistant walls, compartmentation, and emergency exits. Newly built hospitals are expected to comply with UBBL 1984, while older hospitals may face design-related challenges.

The third stage focused on getting direct input from people involved in hospital fire safety. Semi-structured interviews were done with hospital managers, fire safety officers, and construction professionals. The questions focused on issues like retrofitting difficulties, budget limitations, and staff preparedness. The responses were grouped into themes to better understand common challenges and possible improvements.These discussions provide insights into compliance challenges and practical difficulties in implementing fire safety measures, especially in older buildings.

The study aims to assess fire safety compliance, identify design limitations in older hospitals, and propose improvements for better adherence to UBBL 1984. By combining document analysis, audits, and interviews, this research offers a comprehensive understanding of fire safety issues in Malaysian hospitals and suggests ways to enhance safety for patients, staff, and visitors.The undertaking of this research was done in three phases in line with the objectives of the study and the intended investigation of the levels of compliance to fire safety in Malaysian hospitals operating under UBBL 1984. Various activities and methods were used for each stage to solve the study questions systematically.

B. Research Process

The research framework (Figure 1.0) focuses on the interplay between three core elements: hospital fire safety actions, stakeholder practices, and fire risk management. These elements collectively inform the development of a fire safety management plan tailored to the unique needs of Malaysian public hospitals. The framework emphasizes variables such as compliance levels, the effectiveness of passive fire safety systems, and the impact of design limitations in older buildings. By addressing these variables, the study systematically evaluates gaps in compliance and opportunities for improvement.

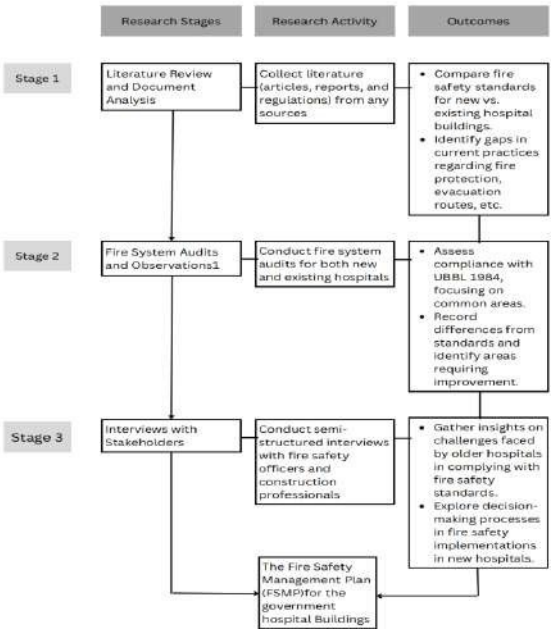

Figure 1.0 Research Theoretical Framework

IV. FINDINGS

The findings from this study highlight significant differences in passive fire protection compliance between newer and older public hospitals in Malaysia. Based on audit observations and interview feedback, it is clear that newly constructed hospitals demonstrate higher levels of adherence to the Uniform Building By-Laws (UBBL) 1984. These buildings are designed with fire safety in mind from the early planning stages, which allows them to incorporate essential passive fire protection features more effectively. This includes clearly marked and unobstructed exit routes, fire-rated doors, fire-resistant materials, and proper compartmentation between different zones of the hospital. These features collectively create a safer environment for patients, staff, and visitors, and improve overall evacuation efficiency during emergencies.

In contrast, older hospitals face multiple challenges in meeting current fire safety standards. Many of these facilities were built before the introduction of UBBL 1984 and were not originally designed with modern fire safety requirements in mind. As a result, they often lack critical passive fire protection components such as adequate smoke compartments, compliant emergency exits, and structurally protected escape paths. During site audits, several issues were frequently observed in these buildings, including narrow corridors that could restrict movement during an evacuation, outdated or damaged fire doors, and insufficient or poorly maintained signage. Some escape routes were either blocked or lacked clear directional indicators, further compounding the risks during a potential fire event.

Insights from semi-structured interviews with fire safety officers, hospital administrators, and building maintenance professionals further supported these findings. Participants consistently pointed out that retrofitting passive fire safety systems in older buildings is both technically challenging and financially demanding. The limited space available in older hospital layouts restricts the installation of additional fire compartments or protected staircases. Moreover, modifying structural components in operating hospitals often requires shutting down critical areas, which raises practical and operational concerns. Budget limitations also play a major role, as fire safety upgrades frequently compete with other infrastructure or healthcare priorities for funding. In some cases, hospital staff lacked adequate training or awareness of current fire safety procedures, contributing to inconsistent implementation and oversight.

CONCLUSION

This study explored the differences in passive fire protection compliance between older and newly constructed public hospitals in Malaysia, with a focus on adherence to the Uniform Building By-Laws (UBBL) 1984. Through document analysis, fire safety audits, and interviews with key stakeholders, it became evident that newer hospitals are generally more compliant due to their ability to incorporate fire safety elements during the design stage. These hospitals benefit from built-in features such as fire-rated materials, proper compartmentation, and clear evacuation paths that align with modern regulatory standards.

On the other hand, older hospital buildings face several challenges in meeting fire safety requirements. Their outdated architectural designs, limited space for upgrades, and high renovation costs make it difficult to implement passive fire protection systems effectively. Audit findings and interview responses both pointed to blocked exits, narrow corridors, and a lack of structural fire safety measures as common problems. Additionally, staff in older facilities often have limited awareness of fire safety protocols, further impacting compliance.

The study highlights the urgent need for targeted improvements in older healthcare facilities. Phased retrofitting, prioritization of fire safety in renovation budgets, regular audits, and enhanced staff training should be pursued to bridge the compliance gap. Ensuring consistent fire safety standards across both old and new hospitals is essential to protecting lives, reducing fire-related damage, and upholding the safety responsibilities of public healthcare institutions.

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