Cawangan Perak

ISCU 2025

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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

ASSESSMENT OF FIRE PROTECTION SYSTEM IN PUBLIC INSTITUTIONS: A COMPREHENSIVE REVIEW

Muhammad Faries Azman[1], Nurhidayah Samsul Rijal [2*], An Nisha Nur Welliana Abd Rased [3] and Zaimah Zainal Abidin4

[1,2*,3,4] Department of Built Environment Studies and Technology, Faculty of Built Environment, Universiti Teknologi MARA Perak Branch, MALAYSIA.

Email: hidayahrijal@uitm.edu.my
*Corresponding Aurthor

ABSTRACT

Fire protection systems are essential for ensuring the safety of occupants and infrastructure in public institutions. Effective fire prevention, detection, and suppression measures help to minimize fire-related risks, property damage, and potential loss of life. The effectiveness of these systems depends on factors such as design, maintenance, and compliance with safety regulations. However, one of the major concerns in public institutions is the adequacy and reliability of fire protection systems. Many facilities face challenges such as outdated equipment, lack of proper maintenance, non-compliance with safety standards, and insufficient fire safety awareness among occupants. These issues increase the risk of fire hazards, potentially leading to catastrophic consequences. This research aims to assess the effectiveness of fire protection systems in public institutions by reviewing previous studies and case analyses. The key objective is to identify the key components of fire protection systems in public institutions. A comprehensive literature review was conducted, analysing data from academic journals, regulatory guidelines, and case studies. The findings confirmed key fire protection parameters such as active and passive protection systems. The study revealed that many public institutions have fire protection systems in place, but their effectiveness is often compromised due to poor maintenance, outdated equipment, and inadequate staff training. Non-compliance with fire safety regulations remains a significant concern. Additionally, institutions with integrated fire detection and suppression systems, regular fire drills, and well-trained personnel demonstrated better fire preparedness and response capabilities. This research provides valuable insights into fire protection systems assessment in public institutions, contributing to improve safety measures and compliance with regulations, ultimately improving occupant safety and fire resilience.

Keywords: Active and Passive, Protection System, Fire Protection System, Public Institution, Fire Safety Regulation

I. INTRODUCTION

Fire protection systems are essential for preserving public buildings, ensuring occupant safety, and maintaining property. Public institutions such as hospitals, universities, and government offices require thorough evaluations of their fire prevention systems due to their complexity and unique challenges. This introduction provides a comprehensive analysis of research on the evaluation of fire safety systems in public buildings, highlighting key findings and recommendations from various studies. Educational institutions, particularly higher education establishments, face significant fire safety challenges. Ebenehi et al. (2017) examined fire safety management in Malaysian public universities, emphasizing the impact of budgetary constraints on maintaining fire safety measures. The study underscored the importance of proactive fire safety management to prevent incidents that could lead to unplanned expenditures, risks to life, and disruptions to academic activities. It called for comprehensive fire safety management plans tailored to the unique needs of educational institutions. A well-structured fire safety management system is crucial, as demonstrated by Yusof's (2021) investigation into fire safety management in Malaysian higher education institutions. The study suggested a conceptual framework to improve fire safety measures, emphasizing organizational duties, emergency preparedness, and training. It highlighted the necessity of empirical research to support the proposed framework and ensure its applicability in practical contexts. Government offices, as public institutions, need robust fire protection systems to guarantee both operational continuity and human safety. Mohamad Rudin and Jaafar (2020) focused on improving active fire protection systems in public offices in Kelantan, Malaysia. The study recognized existing fire safety

precautions such as smoke, heat, and fire extinguishers, as well as emergency signage. However, it emphasized the importance of routine maintenance to ensure these systems function effectively in an emergency. Healthcare facilities, especially hospitals, present unique fire safety management challenges due to the complexity of operations and patient vulnerability.

Despite these efforts, the objective remains to identify the fire protection system at public institutions. The Fire and Rescue Department in Malaysia reported responding to 51,458 fire cases in 2019, with 5,439 related to building fires. Notably, between 2018 and 2019, 149 fire incidents occurred in academic institutions (Saharuddin, 2021). Despite these statistics, comprehensive research evaluating the effectiveness of fire safety measures in Malaysian public institutions is scarce. This gap underscores the need for a thorough examination to ensure the safety and preparedness of these enterprises against fire hazards.

II. LITERATURE REVIEW

A. Introduction to Fire Protection System

Installing fire prevention systems in buildings is crucial as they are designed to detect, control, and extinguish fires, thereby protecting both people and property. These systems include both passive components, such as fire-resistant walls and doors, and active components, such as sprinklers and fire alarms. Their primary functions are to minimize fire damage, enable safe evacuation, and provide early warnings. Active fire protection systems consist of devices that detect environmental changes and alert occupants in the event of a fire. For instance, heat detectors respond to sudden temperature spikes, while smoke detectors sense airborne particles from burning materials; both trigger alarms to warn people of potential fires (Ali et al., 2023). Fire alarm systems serve as the central hub for processing signals and activating alerting devices like sirens or strobes to facilitate evacuation. Passive fire protection involves building elements designed to contain fires and prevent their spread. This includes compartmentalizing buildings with fire-resistant walls, floors, and doors that hinder fire propagation and provide safe escape routes for occupants. Integrating both active and passive fire protection measures is essential for comprehensive fire safety policies in buildings. Technological advancements have led to the development of smart fire protection systems. These systems use integrated sensors to automatically detect gas leaks, smoke, or carbon monoxide and alert building occupants and emergency services. They can also activate suppression mechanisms, such as sprinkler systems, to control or extinguish fires in their early stages (Oh et al., 2013). By employing such intelligent systems, potential damages are minimized, and fire response effectiveness is enhanced.

Fire protection systems are essential for safeguarding lives and property by detecting, controlling, and suppressing fires. Their importance is underscored by several key factors:

1. **Early Detection and Notification**: Fire alarms and detectors instantly sound an alert when smoke or heat is detected, allowing for quick escape and emergency intervention. This early warning is crucial for occupant safety (Ali et al., 2023).
2. **Containment and Suppression**: Fire sprinkler systems and other suppression techniques help minimize damage and prevent the spread of fires by controlling or extinguishing them in their early stages (Oh et al., 2013).
3. **Protection of Assets**: Fire protection systems reduce the risk of monetary losses by safeguarding valuable assets and equipment, which is important for both businesses and homes (Saharuddin, 2021).
4. **Regulatory Compliance**: In many countries, building owners and operators are legally required to install and maintain fire protection systems to ensure public safety (Connolly, 2024).
5. **Enhanced Property Value and Insurance Benefits**: Buildings with comprehensive fire protection systems often have lower insurance premiums and higher property values due to the reduced risk of fire (Belam, 2024)

B. Significance of Fire Protection System in Public Institutions

The significance of fire protection systems in public institutions is multifaceted:

1. **Protection of Occupants**: Public institutions such as courthouses, libraries, and government buildings house many people daily. Fire protection systems, including suppression mechanisms and alarms, are essential for safe evacuations and early fire detection (Kchen, 2025).
2. **Preservation of Essential Services and Assets**: These institutions store important documents, valuable assets, and critical infrastructure. Fire protection measures help prevent service interruptions and protect assets from fire damage, ensuring the continuity of public services (Kchen, 2025).
3. **Compliance with Regulatory Standards**: Public institutions must adhere to fire safety laws, such as those established by the National Fire Protection Association (NFPA). Compliance ensures occupant safety, prevents legal ramifications, and maintains public trust (Jesse, 2025).
4. **Enhanced Emergency Response**: Advanced fire protection systems facilitate quick communication with emergency personnel, ensuring a coordinated and effective response to fire emergencies (Kchen, 2025

The significance of fire protection systems in public institutions lies in their ability to protect occupants. Public institutions such as courthouses, libraries, and government buildings house many people daily. Fire protection systems, which include suppression mechanisms and alarms, are essential for safe evacuations and early fire detection (Kchen, 2025). Additionally, these systems play a crucial role in the preservation of essential services and assets. Important documents, valuable assets, and critical infrastructure are stored in these institutions. Fire protection measures help prevent service interruptions and protect assets from fire damage, ensuring the continuity of public services (Kchen, 2025). Public institutions must adhere to fire safety laws, such as those established by the National Fire Protection Association (NFPA). Compliance ensures occupant safety, prevents legal ramifications, and maintains public trust (Jesse, 2025). Furthermore, advanced fire protection systems enhance emergency response by facilitating quick communication with emergency personnel. This ensures a coordinated and effective response to fire emergencies (Kchen, 2025).

C. Criteria of Fire Protection System

The first requirement for a fire protection system is fire safety engineering design. Purkiss and Li (2013) emphasize the importance of constructing buildings that can withstand the effects of fire. Their study examines various design methodologies, including prescriptive and performance-based approaches, and discusses the behavior of natural fires, the thermal properties of materials at elevated temperatures, and calculation techniques for ensuring fire resistance in structural elements. Hariri's (2007) analysis of the fire protection design at Kuala Lumpur Central Station highlights the integration of emergency response facilities, fire safety measures specifically tailored for large-scale transportation hubs, and strategies to enhance fire safety in high-occupancy buildings. The study underscores the importance of incorporating fire protection elements during the planning and construction phases of complex facilities. According to Iieta., (2023) outlines key design elements that support fire protection in administrative buildings. Architectural design features include site layout with sufficient access routes (at least 6 meters wide) for firefighting vehicles, window openings designed for easy firefighter entry while minimizing flame transfer between floors, the separation of spaces into horizontal and vertical fire zones to contain fire spread, and adequate ventilation in stairwells and elevators to prevent toxic fume accumulation. Non-architectural design features encompass the use of automatic fire extinguishing systems (sprinklers) and manual firefighting tools (portable extinguishers and fire hoses) for effective fire suppression. Additionally, the integration of fire alarm systems with air conditioning systems to prevent smoke circulation, and the implementation of both automatic (smoke, flame, heat, or gas detectors) and manual (glass break keys) fire alarm systems, are crucial. These factors enhance firefighting efforts, ensure safe evacuation, and reduce fire damage.

D. Definition of Public Institutions

Public institutions are organizations established and operated by governmental entities to serve the public interest and provide essential services to society. They are characterized by formal and informal rules that organize social, political, and economic relations, offering relative certainty and predictability for everyday interactions (Joshi et al., 2015). These organizations typically receive a significant portion of their funding from the government, and their leadership is guided by a legal mission (Costake, 2009). Essentially, public institutions are organizations infused with value beyond the technical requirements of their tasks, serving societal ambitions by combining reliable performance with high levels of legitimacy (Boin & Christensen, 2008).

E. Role of Public Institutions in Users' Well-Being

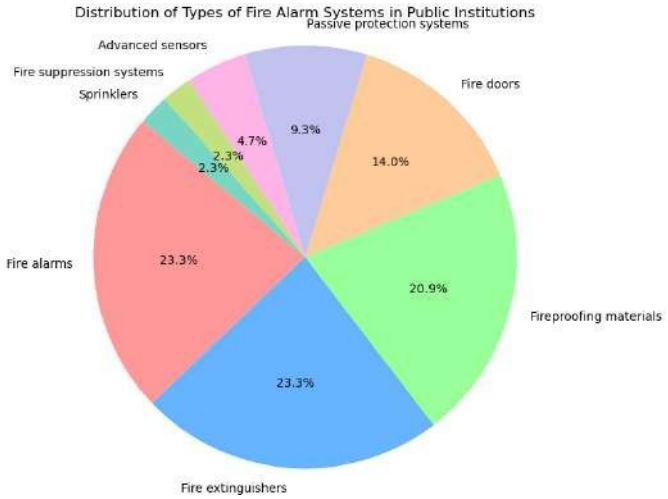
Public institutions play a significant role in enhancing individuals' well-being through various means. One key aspect is the provision of easily accessible community services. For instance, public libraries serve as welcoming spaces that offer resources supporting social interaction, digital literacy, and mental and physical health, all of which contribute to overall well-being (Karki et al., 2024). Moreover, the quality of governance has a substantial impact on national well-being. Research indicates that citizens who experience good governance—characterized by honesty, equity, reliability, and responsiveness—report higher life satisfaction. This connection underscores the importance of strong public institutions in promoting societal welfare (Helliwell et al., 2014). Additionally, the adoption of digital government initiatives has been linked to improved citizen well-being. By leveraging digital technologies to enhance service delivery, increase transparency, and build trust, governments can boost civic engagement and overall life satisfaction (Welby, 2019). Trust in public institutions also mediates the relationship between individual mental health and government support. Studies show that people's mental health improves when they perceive public institutions as trustworthy, highlighting the crucial role of institutional trust in fostering personal well-being (Poma et al., 2023). In summary, public institutions contribute to users' well-being by providing essential services, ensuring good governance, embracing digital innovations, and building trust within the community.

F. Types of Fire Protection Systems at Public Institutions

To protect people and property, public institutions must have fire protection systems. The matrix table below review more detailed overview of the fire protection measures in public institutions

Study	Focus	Key Findings	Recommendations	Types of Fire Alarm Systems
Ebenehi et al. (2017)	Fire safety management in Malaysian public universities	Budgetary constraints impact fire safety measures; proactive management is crucial	Comprehensive fire safety management plans tailored to educational institutions	Fire alarms, fire extinguishers, fireproofing materials
Yusof (2021)	Fire safety management in Malaysian higher education institutions	Conceptual framework for improving fire safety measures; need for empirical research	Emphasize organizational duties, emergency preparedness, and training	Fire alarms, fire extinguishers, fireproofing materials
Mohamad Rudin & Jaafar (2020)	Active fire protection systems in public offices in Kelantan, Malaysia	Existing precautions include smoke, heat, fire extinguishers, and emergency signage	Routine maintenance to ensure system functionality in emergencies	Fire alarms, fire extinguishers, fireproofing materials, fire doors
Salim et al. (2021)	Fire safety management in Malaysian public healthcare buildings	Issues include poor maintenance, inadequate water pressure, lack of communication systems, lax regulations	Strengthen emergency response teams, improve occupational health and safety systems, create viable structure	Fire alarms, fire extinguishers, fireproofing materials, fire doors, passive protection systems
Salleh et al. (2020)	Fire safety management in public hospital buildings across Asia	Technical, management, and legislative factors affect fire safety	Comprehensive fire safety management plans, regular training, modernization of safety equipment	Fire alarms, fire extinguishers, fireproofing materials, fire doors, passive protection systems
Ali et al. (2023)	Active fire protection systems	Heat & smoke detectors trigger alarms for early warning	Integration of fire alarm systems with air conditioning to prevent smoke circulation	Fire alarms, advanced sensors, fire extinguishers
Oh et al. (2013)	Smart fire protection systems	Integrated sensors detect gas leaks, smoke, carbon monoxide; activate suppression mechanisms	Employ intelligent systems to minimize potential damages and enhance fire response effectiveness	Fire alarms, advanced sensors, fire suppression systems, sprinklers
Kchen (2025)	Fire protection in public institutions	Importance of suppression mechanisms and alarms for safe evacuations and early detection	Incorporate fire protection elements during planning and construction phases	Fire alarms, fire extinguishers, fireproofing materials, fire doors, passive protection systems
Jesse (2025)	Regulatory compliance in public institutions	Adherence to NFPA fire safety laws ensures occupant safety and maintains public trust	Ensure compliance to prevent legal ramifications and preserve public confidence	Fire alarms, fire extinguishers, fireproofing materials, fire doors
Belam (2024)	Property value and insurance benefits of fire protection	Comprehensive systems lead to lower insurance premiums and higher property	Implement comprehensive fire protection systems to reduce fire risks	Fire alarms, fire extinguishers, fireproofing materials, fire doors

The pie chart represents the various types of fire alarm systems discussed in the studies on fire protection systems in public institutions. Each segment of the pie chart corresponds to a specific type of fire alarm system, and the size of each segment indicates its prevalence and importance based on the number of studies that mentioned it.



The pie chart visually demonstrates that fire alarms, fire extinguishers, and fireproofing materials are the most frequently mentioned fire protection systems in the studies, reflecting their fundamental role in ensuring fire safety in public institutions. Other systems, such as fire doors, passive protection systems, advanced sensors, fire suppression systems, and sprinklers, also play important roles in creating a comprehensive fire protection strategy. By understanding the distribution and importance of these systems, public institutions can prioritize their fire safety measures to enhance occupant safety and protect property.

CONCLUSION

Fire protection systems are indispensable for safeguarding public institutions, ensuring occupant safety, and preserving property. The objective of this research was to identify the fire protection systems in public institutions and to highlight their critical importance in safeguarding lives and property. Fire protection systems are indispensable for ensuring occupant safety and preserving property in public institutions such as hospitals, universities, and government offices. The research underscores the necessity of comprehensive fire safety management plans tailored to the unique needs of these institutions. Effective fire safety management involves both active and passive protection measures, including fire alarms, sprinklers, fire-resistant materials, and advanced sensors. Studies have shown that proactive fire safety management can prevent incidents that lead to unplanned expenditures, risks to life, and disruptions to essential services. The integration of fire protection elements during the planning and construction phases, along with regular maintenance and training, is crucial for the effectiveness of these systems. Additionally, compliance with regulatory standards and the adoption of smart fire protection technologies further enhance the safety and resilience of public institutions. The finding shows effective fire safety management involves both active and passive protection measures, such as fire alarms, sprinklers, fire-resistant materials, and advanced sensors. Studies have shown that proactive fire safety management can prevent incidents that lead to unplanned expenditures, risks to life, and disruptions to essential services. The integration of fire protection elements during the planning and construction phases, along with regular maintenance and training, is crucial for the effectiveness of these systems. Additionally, compliance with regulatory standards and the adoption of smart fire protection technologies further enhance the safety and resilience of public institutions. Overall, the research underscores the necessity of robust fire protection systems in public institutions to ensure the well-being of occupants, protect valuable assets, and maintain the continuity of public services. By addressing the identified challenges and implementing the recommended measures, public institutions can significantly reduce fire-related risks and enhance their preparedness for fire emergencies.

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In the name of Allah, the Most Benevolent and Merciful, glory be to Allah, the Lord of the world, and peace be upon His Messenger. I want to thank Him most of all for providing me with the mental toughness and persistence I required to complete the task. We are grateful to Allah SWT for giving us the strength to complete the work,

both mentally and physically. Completing this activity requires more than just effort. If you're determined and have a lot of energy, you can finish the paper on time.

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