**FIRE PROTECTION PROVISIONS FOR PRE-BUILDING CODES SHOPHOUSES REPURPOSED INTO BUDGET HOTEL: A MALAYSIAN PERSPECTIVE**

Dg Badariah Ag Ali1, Farid Wajdi Akashah\*2, Raha Sulaiman3

*1,2Centre for Building Construction and Tropical Architecture, Faculty of Built Environment, University of Malaya, 50603, Kuala Lumpur, Malaysia.*

\*Corresponding author: faridakashah@um.edu.my

# Abstract

# Fire can happen at any time in any situation that could risk the life safety of people and cause destruction to a property. Many countries around the world including Malaysia, have established and enforced fire protection provisions in their building codes to control the risk of building fire. Despite that, practising such provisions can be challenging to the pre-building codes buildings as they were built before it. Those buildings need to comply the current established provisions in ensuring it is safe from any fire hazards as a way to protect the occupants. Building occupants can be very vulnerable to fire at night time especially when they are in deep sleep. In the case of hotel buildings, the guests are usually unfamiliar with the building layout which could increase their risk to the fire hazards. A good understanding of fire protection provisions for buildings that are repurposed into hotels is a key factor in making sure that such building is safe for public use. Provisions on current building codes and regulations on both active and passive fire protection systems for pre-building codes buildings repurposed into hotels in Malaysia are critically discussed in this paper.

# Keywords:

# Fire Protection System, Active System, Passive System, Hotel, Refurbished Building, Building Codes, Pre-Building Codes

***Article history:***

Submitted: 1/11/2017; Revised: 28/11/2017; Accepted: 26/01/2018; Online: 1/06/2018

# BACKGROUND OF STUDY

# Many developed countries such as United Kingdom, Japan and Australia recently has been shifting from practising prescriptive-based approach to performance-based approach in their fire safety design work (Akashah, Kayan and Ishak, 2013). Malaysia also among the countries that have been accepting the performance-based approach practices (Chee & Chen, 2005) as it provides a clear guidance to fulfil the intended fire safety objectives. Yet, it is conducted upon request by the property owner and subjected to the approval from Fire and Rescue Department of Malaysia (FRDM). The practice of fire protection in Malaysia are mainly developed based on the requirement enforced in the Street, Drainage and Building Act 1974 (Act 133), Uniform Building By-laws 1984 (Amendment 2012), Fire Services Act 1988 (Act 341) and Malaysian Standards. Despite that, the statistic of fire incidents happened in Malaysia reported to the FRDM in relation to building fire is high especially for building under the designated purposed group of ‘Other residential’ in UBBL 1984 with 2,043 cases in 2015 (Fire and Rescue Department of Malaysia, 2015).

# The fire protection systems installed in the old and existing buildings usually vary from the current requirements as the codes and standards are often being updated and changed (Hassanain, Hafeez & Sanni-Anibre, 2017). Results from that, most of the old and aged buildings in Malaysia were in unacceptable levels of compliance (Ibrahim et al., 2011) as they were built prior to the requirement stated in the building codes. As the Act 133 was established in 1974, the features of the buildings constructed before 1974 were constructed without being subjected to any fire protection measures. Enforcement of the fire protection measures for buildings in Malaysia started to take place from the year of 1974 with the inception of Act 133 via virtue of the needs of indicate fire hydrants location, installation of fire alarm and preventing from bushfire.

# Preserving of old buildings has become a trend in Malaysia (Salleh & Ahmad, 2009) especially in the area with historical significant and high tourist population such as Kuala Lumpur, Malacca and Georgetown. Owner of properties tends to change their property through adaptive-reused practice as a way to preserve the building (Ramli, Hassan, & Daeng Jamal, 2014). In this practice, the original function of a building is being changed and it will operate in different functions such as shophouses that were repurposed into hotel. It is clearly shown that the designated purposed group of the property is being changed from Group V to Group III as in the UBBL 1984. Thus, changing of building functions will result in the needs of building in fire protection measures as it would have different fire risks as for example the characteristics of occupants and fire loads.

# Hotel buildings are listed as buildings building with high risk (Kobes et al., 2008) resulting from the number of incidents reported for hotels are high as the building caters a multi-purpose use. It is regularly being accessed by non-specific personnel which indirectly increases the possibility of fire hazards of the hotel building. The occupants of hotel building could become vulnerable in the event of fire as they usually are not familiar with the building layout (Pal & Ghosh, 2014). This situation could become worse if the fire happens during night time where the occupants are normally in deep sleep. Hence, it is a need for the hotel management to practice a correct type of fire protection system in their building as specified in the building codes.

# Provisions of fire protection system derived from established codes and regulations in Malaysia are discussed in this paper specifically for buildings repurposed into hotel accommodation. The result from the pilot study carried in looking into the perception of hotel users based on their recent experience staying at hotel building in Malaysia is presented. In the end, a conceptual framework of this research is generated according to the established fire protection provisions and the pilot result.

# LITERATURE REVIEW

# *Fire Protection Provisions in Malaysia for Hotel Buildings*

# Construction works conducted are govern by the building codes (Farlex, 2017) to assure the building is safe and sound. The practice of fire protection measures for buildings in Malaysia are mainly based on Act 133 and UBBL 1984 (MPC, 2016) and applies not only to new buildings but also to any building that undergoing refurbishment or being repurposed. On the other hand, the needs of fire certificates for buildings and fire abatement are mentioned in the Act 341. The critical periods of development of fire codes in Malaysia are illustrated in Figure 1.

#

# Figure 1: Implementation of fire codes in Malaysia (adapted from Akashah, Wan Teh & Baaki, 2016)

# *Street, Drainage and Building Act 1974 (Act 133)*

# Provisions of fire protection measures in Act 133 are regarding the needs to mark the location of fire hydrants, providing fire alarms where necessary and prevention of bushfire. These measures are based on Section 30 and Section 37 respectively. These two sections give the local authority the power to penalize anyone including owner and occupants of the premise should they failed to adhere to these provisions. It goes on to show that prevention and early warning measures are emphasized in ensuring safe built environment.

# *Uniform Building By-Laws 1984 (Amendment 2012)*

# Fire protection provisions are covered primarily written under Part VII (Fire Requirements) and Part VIII (Fire Alarms, Fire Detection, Fire Extinguishment and Fire-fighting Access) in these by-Laws and also set out in details in the schedules of the same by-Laws. In this by-Laws, buildings or premises are grouped into eight purposed groups in the Fifth Schedule as a different function of buildings have different requirements to be followed in providing fire protection system for the building. The designated purposed groups of buildings categorised as in Fifth Schedule of UBBL 1984 are listed in Table 1 below.

# Table 1: Designated purposed groups of buildings (Source: UBBL1984, 2012)

|  |  |  |
| --- | --- | --- |
| Purposed Group | Title | Description |
| I | Small residential | Private dwelling house detached or semidetached that not comprising more than a ground storey, one upper storey or a basement storey(s) except a flat or terrace house.  |
| II | Institutional | Hospitals, school or other similar establishment used for treatment care or maintenance of persons from disabilities due to illness or old ages or other physical/mental disability or under the age of 5 years. |
| III | Other residential | Any other premises used as accommodation for residential purpose other than in groups I and II. |
| IV | Office | Office or premises used for office purposes. |
| V | Shop | Shop or shop premises or premises that are not a shop but used to carrying the retail trade or business and premises where public are invited to resort for the purpose of delivering their goods for repair or other treatment.  |
| VI | Factory | All premises as defined in section 2 of the Factories and Machinery Act 1967 excluding buildings specified under purpose group VIII. |
| VII | Place of assembly | Public or private place that used for the attendance of persons for their social, recreational, educational business or other activities that are not comprised in groups I to VI. |
| VIII | Storage and general | Place used as storage, deposit or parking of goods and materials including vehicles and other premises that are not comprised in groups I to VII. |

# Although hotel buildings fall under group III in the by-Laws, some of the hotel business in Malaysia are operating in shophouses premises that is in group V. In this situation, the requirements of fire protection system that need to be followed are based on the highest risk encountered in the building. Both of the provisions on active and passive systems such as fire staircases, fire alarm and detection systems, fire extinguishers, fire doors, compartmentation and emergency routes and signs are explained in details under this by-Laws. As in the Ninth Schedule of the by-Laws, it is mentioned that the fitting used for the purposed of fire compartmentation in the building must be made of from non-combustible materials and having a suitable resistance period as required.

# *Fire Services Act 1988 (Act 341)*

# Act 341 is established to explain the responsibilities of the FRDM in ensuring the effectiveness and efficiency of the department towards fire protection practice in Malaysia. Other than that, this act also describing the needs of fire protection system to be installed in a property. According to the Act 341, all premises that are completely being constructed and used by the public need to have fire certificate and renewed annually except for premises operating as religious worships places or single private dwelling. Fire certificate for the premises will be issued by the FRDM based on the satisfactory proof in providing required fire protection measures for the premise to protect the life safety of the occupants. Upon receiving the fire certificate, premises will be randomly inspected by the FRDM to ensure the consistency of the building management in providing the required fire protection facilities. If it to be found that the risk of fire in the building is serious or could lead to immediate fire danger, FRDM will issue a notice to the building owner to cease any activity conducted or restricting on the usage of the premise. Despite that, the owner or occupier of the premises has their right to make an appeal by submitting a letter within the specified period upon receiving the notice if they did not agree with the decision, condition or refusal of any order.

# *Malaysian Standards*

# Malaysian standards are derived from any adjustment or application of international standards to the local context. Standards that are being set in Malaysia are practical (Malaysian Plastics Manufacturers Association, 2017) as it is frequently reviewed to meet the new development. Besides, there are no impossible goals being set out as for the Malaysian standards. The enforcement of standards is voluntary to be practised (Department of Standards Malaysia, 2006) except for the compulsory standards as mentioned in any regulations, laws or others. As for example, the standards related to the process of issuing fire certificate are considered mandatory standards by the FRDM. Table 2 below represents the mandatory standards that need to be fulfilled in the process of obtaining Fire Certificate.

# Table 2: Summary of mandatory standards for issuance of Fire Certificate (Source: Fire and Rescue Department of Malaysia (FRDM), n.d.)

|  |  |  |
| --- | --- | --- |
| Fire Safety Fitting | MS | Title |
| Fire door | MS 1073: PART 2:1996 | Specification for fire resistant door sets Part 2: Methods for determination of the fire resistance – General principles |
| MS 1073:PART 3:1996, including AMD.1:2003 | Specification for fire resistance door sets: Part 3: Methods for determination of the fire resistance – Type of door sets |
| Fire dampers | MS 555: PART 1: 2003 | Fire dampers: Part 1: Specification |
| MS 555:PART 2:2003 | Fire dampers: Part 2: Installation (2nd revision) |
| Bricks | MS 76:1972  | Specification for bricks and blocks of fired brick earth, clay or shale Part 2: Metric units |
| ‘KELUAR’ sign | MS 983:2004  | ‘KELUAR’ signs (internally illuminated) - Specifications |
| Emergency light | MS 619: Part 2-22:2005  | Luminaires: Part 2-22: Particular requirements – Luminaires for emergency lighting (1st revision) |
| Smoke detector/ heat detector/ manual fire alarm/ fire alarm panel/ alarm bell | MS 1745:Part 15:2006 | Fire detection and fire alarm systems: Part 15: Multisensor fire detectors |
| MS 1745: Part 5:2005  | Fire detection and fire alarm systems: Part 5: Heat detectors – Point detectors |
| Hose reel | MS 1447:Part 1:2006  | Fixed firefighting systems – Hose system: Part 1: Hose reels with semi-rigid hose |
| MS 1488:2006 | Firefighting hoses – Semi-rigid hoses for fixed systems |
| Smoke extraction system | MS 1780:2005  | Smoke control system using natural (displacement) or powered (extraction) ventilation |
| Fire suppression system  | MS 1746:Part 1:2008 | Gaseous fire-extinguishing systems – Physical properties and system design – Part 1: General requirement (1st revision) (ISO 14520-1:2006, MOD) |
| MS 1746:Part 8:2008  | Gaseous fire-extinguishing systems – Physical properties and system design – Part 8: HFC 125 extinguishant (1st revision) (ISO 14520-8:2006, IDT) |
| MS 1746:Part 9:2008  | Gaseous fire-extinguishing systems – Physical properties and system design – Part 9: HFC 227EA extinguishant (1st revision) (ISO 14520-8:2006, IDT) |
| Fire extinguisher | MS 1539:Part 1:2002, including COR. 1:2004  | Specification for portable fire extinguishers: Part 1: Construction and testing methodology |
| MS 1539:Part 3:2003  | Specification for portable fire extinguishers – Part 3: Selection and installation – Code of practice (1st revision) |

# RESEARCH METHODOLOGY

# A survey has been conducted to review the opinion of hotel users on the fire protection system practised in the hotel building that they have stayed recently in Malaysia. Results from the survey show that all respondents preferred to stay in a hotel that provides adequate protection in fire aspects regardless of the star ratings or characteristics of the hotel. Besides, 14.3% of the respondents did not feel safe in staying at the hotel building in their recent experience and if there is a real fire situation happen, 28.6% of the respondents also feel unsafe to stay at the hotel. From the survey, the result shows that all of the respondents preferred to have both active and passive fire protection system to be applied inside the hotel building as a way to prevent from any unwanted situation in a fire event. Although the results represented in this paper were based on the respondent’s recent experience in staying at any hotel buildings in Malaysia, the result clearly reflect the needs of both active and passive fire protection systems in a hotel building as a mean of protection measures against fire.

# RESULTS AND DISCUSSION

# Provisions of fire protection system in Malaysia have been established in detail with the introduction of UBBL 1984. Buildings have been classified based on their functions into the designated purpose groups and having different requirements to be followed for every group. The requirements of groups vary as they are operated in different functions with different occupants’ characteristics and a number of loads imposed to the buildings. Besides, UBBL 1984 also have described the minimum requirement that needs to be followed by the stakeholder in adopting both passive and active protection system in their premises. As a matter of fact, adopting the fire protection system according to the requirements stated in the building codes can be quite difficult for buildings that were built before the existence of the provisions. However, the buildings still need to comply with the requirements enforced by the authority.

# The framework of this research is illustrated in Figure 2 below where the provisions of fire protection system highlighted in the codes and regulations are the essential inputs to adopt fire protection system in a building. Requirements of both active and passive fire protection system for hotel buildings need to be reviewed based on the established provisions to adapt the system into the pre-building codes buildings. Thus, it goes on to show that both systems are necessary to protect the safety of building occupants and the property itself.

#

# Figure 2: Conceptual framework of the study

# CONCLUSIONS

# Safe and resilient built environment could be achieved with the help of practising building fire codes as intended for a building. Implementing the specific provisions as enforced in the codes to the minimum requirements could improve the building safety against fire hazards. A reasonable safety standard can be obtained by strict operation in following the codes while managing the premises by the building stakeholders. By adopting the required fire protection system in the building according to the designated group could increase the safety level of the premises and indirectly reducing the building fire hazards. However, it can be quite challenging to adopt fire protection features in pre-building codes buildings. Therefore, it is highly recommended to look into the challenges faced by the stakeholders of the pre-building codes buildings in adopting the fire protection system as required in the current established codes and regulations.

# ACKNOWLEDGEMENTS

# Authors would like to express their gratitude and thanks to the Ministry of Higher Education for the grant FP046-2014B and parties involved in this study especially the Research and Planning Unit and the Fire and Rescue Department of Malaysia (FRDM) for the cooperation.

**References**

Akashah, F., Kayan, B., & Ishak, N. (2013). Quantitative Risk Assessment for Performance-Based Building Fire Regulation. *The 3rd International Building Control Conference*. Kuala Lumpur.

Akashah, F.W., Wan Teh, W.S.N. & Baaki, T.K. (2016). Fire Risk Assessment of Historic Buildings in Malacca World Heritage Site. The Malaysian Surveyor The Malaysian Surveyor, 51(4).

An, Z. Y., & Liu, B. (2013). Chinese Historic Buildings Fire Safety and Countermeasure. *Procedia Engineering*, 234-237.

Chee, S. T., & Chen, T. L. (2005). Critical Review of The Objectives of Fire Engineering - Performance Based Approach. *Buletin Ingenieur*, 21-24.

Department of Standards Malaysia. (2006). Malaysian Standards. Retrieved from Malaysian Standards: MS-ISO-IEC-GUIDE-67\_04\_prev-pdf.pdf

Dieken, D. (2007). Power Engineering - Five Common Fire Protection Problems. Retrieved 16 March, 2017, from http://www.power-eng.com/articles/print/volume-111/issue-3/features/five-common-fire-protection-problems.html

Fire and Rescue Department of Malaysia (FRDM). (n.d.). Piawaian yang Dirujuk Bagi Pengeluaran Sijil Perakuan Bahan. Retrieved from <http://www.bomba.gov.my/resources/index/user_1/UploadFile/Orang%20Awam/Perkhidmatan/piawaian_yang_dirujuk_bagi_pengeluaran_sijil_perakuan_bahan>

Fire and Rescue Department of Malaysia. (2015). *2015 Annual Report.* Kuala Lumpur: Fire and Rescue Department of Malaysia.

Hassanain, M., Hafeez, M., & Sanni-Anibire, M. (2017). A ranking system for fire safety performance of student housing facilities. *Safety Science,* 116-127.

Malaysian Plastics Manufacturers Association. (2017). *What are Standards?* Retrieved from MPMA: http://www.mpma.org.my/Pages/MALAYSIANSTANDARDS.aspx

Meacham, B. (2014). Fire safety engineering at a crossroad. *Case Studies in Fire Safety*, 8-12.

MPC. (April, 2016). *Malaysia Productivity Corporation (MPC) Official Website.* Retrieved 10 March, 2017, from http://www.mpc.gov.my/wp-content/uploads/2016/04/Chapter-4.pdf

Ramli, Z., Hassan, Z., & Daeng Jamal, D. (2014). Adaptive reuse of several historical buildings in Kuala Lumpur as museums. *7th International Seminar on Ecology, Human Habitat and Environmental Change in the Malay World* (pp. 231-241). Riau: UR PRESS PEKANBARU.

Salleh, N. (2011). Fire Safety in Heritage Buildings: Life vs Property Safety. In A. Soomro, *Heritage Study of Muslim World* (pp. 61-72). Selangor: IIUM Press.

Salleh, N. (2012). Fire Safety and Protection Measures in Heritage Buildings with Special Consideration of Museum Buildings in Malaysia. *1st International Conference on Innovation and Technology for Sustainable Built Environment 2012* (pp. 379-385). Perak: Universiti Teknologi MARA.

UBBL 1984. (2016). Fifth Schedule. In M. Government, Uniform Building By-Laws 1984. International Law Book Services.

You, F., Zhu, S.-B., & Han, X.-F. (2011). Analysis and Flame Retarding Design of Combustibles in Nanjing Typical Historical Buildings. The 5th Conference on Performance-based Fire and Fire Protection Engineering. 11, pp. 625-633. *Procedia Engineering*.

Zhou, B., Zhou, X.-m., & Chao, M.-y. (2012). Fire protection of historic buildings: A case study of Group living Yard in Tianjin. *Journal of Cultural Heritage* (13), 389-396.