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A PHYSICAL STUDY OF PASSIVE FIRE SAFETY REQUIREMENT AT ACADEMIC BUILDING

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Abstract:
Most fire victims are the result of mistake from others. Besides damage to their belongings and property, some occupants are burned to death for not knowing what to do in the event of fire. Passive fire protection is one of the methods used to protect buildings and people from fire. This is supported by good fire safety management to ensure that fire protection is available at all times, facilitating escape in the event of fire and preventing damage to adjacent buildings. This study presents the condition of passive fire safety requirement at Department of Quantity Surveying Block in UiTM Seri Iskandar, Perak. The methodology for conducting the study involved literature review, data collection and analysis. The process of data collection involved obtaining primary data from the surveys by observation and measure at the selected building case studies.

Keywords: Passive fire safety; Passive fire requirement; Technical Requirements and Standards;

1.0 INTRODUCTION

Over the years, fire cases in Malaysia have been increasing rapidly. Typical documents needed when performance-based on designs should include building layout drawings, fire services equipment drawings, fire safety strategy and design assumptions adopted (Tsui & Chow, 2004). Thus, it is necessary in the early stage of designing there should be a proper planning stage. For instance, the passive fire protection is basically a planning matter and must be considered at the planning stage in the building design in terms of mitigation of fire hazard and fire risk. Based on a study done by Salleh (2017), the tragedy at Pusat Tahfiz Darul Quran Ittifaqiah on September 14 about 23 lives died because the school did not meet the level of safety including safety requirement. The Department of Fire and Rescue Malaysia found that the tahfiz center failed to comply with the prescribed fire safety rules which resulted in the escape characteristics of the path failing to function.

Typically an architect normally stipulates the fire resistance period in accordance with the building codes or regulations that prevail in the country or region where the building is to be erected (Scott, 2014). On the other hand, buildings that have been constructed in accordance with the old prescriptive requirements may not have the same fire safety level as the standard enforced today, even if all fire safety items are maintained at the original design standard (Lo et al., 2008). However, such a conclusion is warranted. Thus, triggering immediate improvement action is debatable because the rigid prescriptive requirement in the fire codes does not provide a holistic picture of the fire safety level in the building (Lo et al., 2003). Besides, fire and life safety can cover a wide spectrum of subjects ranging from chemical, building material, design and construction, safety codes, standards, and the design of various safety and emergency equipment (Wayakone, 1998). Fire is a potentially life altering threat in any high-rise building and can make an even worse situation if there is no prior preparation for such an event. By conforming to the codes and requirements from the authorities, following sensible preventive actions in proper response to fire emergencies, the overall threat of fire and fire related damages can be greatly reduced. This study presents the condition of passive fire safety requirement at Department of Quantity Surveying Block in UiTM Perak Branch.

2.0 PASSIVE FIRE SAFETY REQUIREMENT

This research emphasizes the necessity in installing passive fire protection in designing and specifying in building. Passive fire protection refers to the use of construction elements within a building that is designed to prevent or delay the spread of fire or smoke to different parts of the building (Soja & Wade, 2017).

2.1 Fire Appliance Access

All building in excess of 7000 cubic meters shall abut upon a street or road or open space of not less than 12 meters width and accessible to fire brigade appliances as shown in Figure 1. In addition, the proportion of the building abutting the street, road or open space shall be in accordance with the following scale; (UBBL). By-law 140 is stipulated as proportionate with the building perimeter that must be accessible to fire appliances. This guidance has been prepared to make reference on the provisions necessary to provide adequate access for fire service appliances to and around buildings.

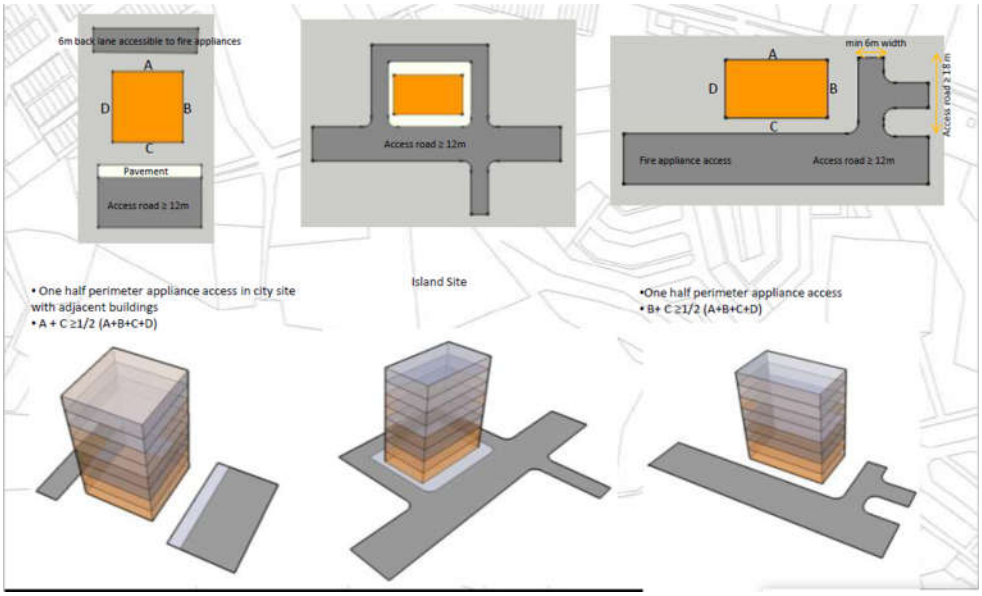


Figure 1: Site and space planning

2.2 Compartment

The spaces in the building are divided into smaller compartments for fire safety management reasons as to limit the spread of fire, restrict the movement of smoke, optimize evacuation routes during fire and an accommodate different activities (Purpose Group). This is done to enable each compartment has its own fire protection systems.

In addition, fire doors of the appropriate Fire Resistance Period (FRP) shall be provided; openings in compartment and separating walls, such as in hotel guest rooms, AHU rooms. Openings in protecting structures, such as protected staircases, protected lobbies, fire fighting access lobbies. Openings in partitions enclosing a protected corridor or lobby.

2.3 Means of Escape (MOE)

Every building should be designed such that the occupants can escape easily when fire breaks out. They must be able to reach a place of safety without being overcome by the heat or the smoke, and therefore the time needed to escape has to be shorter than the time the fire will take to spread (Hassanain & Ashwal, 2005).

When designing escape routes or assessing their efficiency the following requirements should be considered (Hassanain & Ashwal, 2005). All escape routes should be free from obstructions. All final

exits should be unlocked when the building is in use. In addition, doors on escape routes should be opened in the direction of travel. A plan should be posted on each floor to illustrate escape routes and exits.

2.4 Ventilation to Staircase Enclosure

In buildings not exceeding 18 metre, staircase enclosure may be unventilated provided that access to them at all levels through ventilated lobbies & staircase enclosures are permanently ventilated at the top with minimum 5% of the area of enclosure.
Figure 2 below shows at every level it has ventilated lobbies, which are required to provide permanent ventilation 5% at top area of enclosure. This stipulates the building height should be less than 18m.

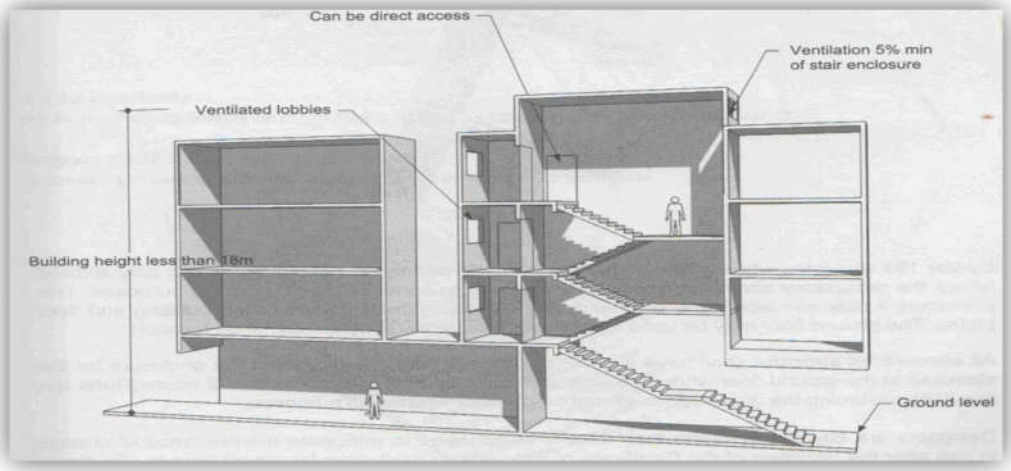


Figure 2: Ventilation to staircase enclosure

3.0 METHODOLOGY

The research study focusses on issue and problem in relation to the condition of passive fire safety requirement. The aim of this study was to determine the condition of passive fire safety requirement. Based on the passive fire safety guideline, an inspection survey and interview were conducted with the facility manager department and head of station, Fire and Rescue Department. The data obtained from the literature and data collection from the main site where the building condition were analyzed. The data were summarized. Later recommendation and conclusion toward the condition of passive fire safety requirement were made to ensure whether it complies with standards of UBBL or not.

4.0 PHYSICAL STUDY OF THE ACADEMIC BUILDING

As previously defined in the scope of the study, this study focuses on Department of Quantity Surveying Block and it is categorized as an education building where these buildings are used mainly as a study sessions for students at UiTM Perak Branch. From the inspection and investigation of the main site it is found that the building has:

4.1 Fire Appliance Access

The Department of Quantity Surveying Block has excessed of 7000 cubic meters include street or road or open space and is accessible to fire brigade appliances. The proportion of the building abutting the street, road or open space shall be in accordance with the following scale; (UBBL). For three fourth of perimeter appliance access as shown in Figure 3 below is above 112000 (cubic meter). The building volume

calculation is added which include the length of front part of building, left part of building and rear part of building.

Figure 3: Fire appliance access at Department of Quantity Surveying

4.2 Compartment

The building is categorized as education purpose and there is no limit of dimensions and compartment volume. In addition, fire doors of the appropriate Fire Resistance Period (FRP) are provided at staircases, protected lobbies, fire fighting access corridor and lobby as shown in the figure 4 below.

Figure 4: (a) Single Fire door (b) Double leaf door of fire door

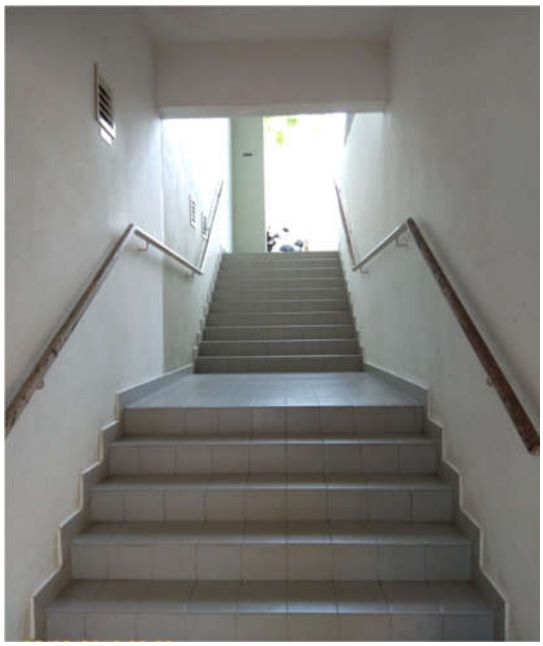
4.3 Means of Escape (MOE)

The adequate escape road at Department Quantity Surveying provides an easy access to assembly point because it covers half of the building. When in a situation of fire, the distance should not be more than 15. The assembly point cannot be too far to ensure fast access to safety in escape routes. The signs which mark emergency routes and 'exit' or 'keluar' is provided clearly, as can be seen in the figure below.

Figure 5: (a) Assembly point area at the rear of the building. b) Signage 'exit

4.4 Ventilation to Staircase Enclosure

The staircase condition at Department of Quantity Survey is open staircase as shown in Figure 6. This provides natural ventilation, which is sufficient. Thus, opening such window is not required. In buildings not exceeding three storeys above ground, staircase enclosures may be unventilated provided there are access to them at all levels through ventilated lobbies.



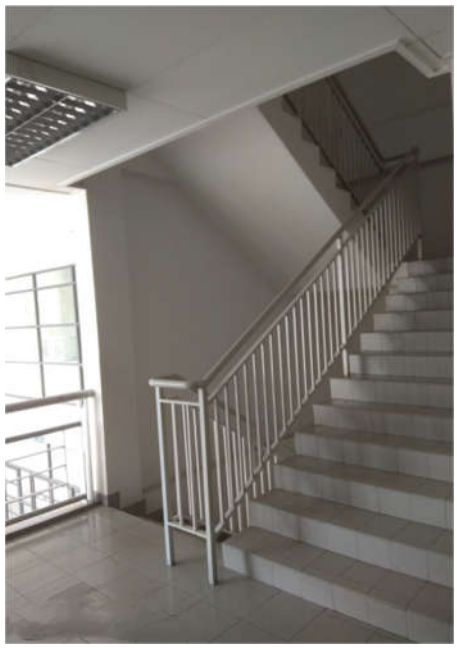


Figure 6: (a) Stairs to the front and rear of the building. (b) Staircase connection at the every level

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5.0 DISCUSSION

The overall case study at Department of Quantity Surveying about fire legislation and requirement is acceptable because four main components of passive fire safety and element are met and comply with the requirement. The condition of fire appliance access at Department of Quantity Surveying has open space and two-way street with three fourth of perimeter around the building. In addition, the fire doors of the appropriate Fire Resistance Period (FRP) are complied with and are provided at staircases, protected lobbies, fire-fighting access corridor and lobby. Furthermore, the exit signage and assembly point signage

are provided in case of means of escape requirement. The requirement of ventilation to staircase enclosure is comply with where it has open staircase and have a sufficient natural ventilation.

Table 1: UBBL Clause and Site Observation Result (Case Study).

ASPECT OF PASSIVE FIRE SAFETY	UBBL 1984	SITE OBSERVATION	COMMENT
Fire Appliance Access	By-law 140 is stipulates the proportion of the building perimeter that must be accessible to fire appliances.	The three fourth of perimeter appliance access (accessible at main road and back lane) at the building is sufficient.	Based on calculation of building 112000(cubic meter) is enough to comply on one sixth perimeter (accessible at main road only). By-law 140 is complying with the requirement.
Compartment	By-law 136 stipulates dimensions of building and compartment. There are five types of purpose group whereas institutional, other residential, shop, factory, store and general. By-law 162: Fire doors of the appropriate Fire Resistance Period (FRP) shall be provided.	The Department Quantity Surveying as institutional building of purpose group is no limit for area and volume compartment. Fire door resistance is provided at case study.	Therefore, the compartment wall and floor is no limit to design spaces as class and rooms selection. By-law 136 and 162 are complied with the requirements.
Means of Escape (MOE)	By-law 174 stipulates arrangement of storey exit shall give direct access to a final exit, a protected staircase leading to a final exit or an external route leading to a final exit. By-law 172 stipulates every exit shall be installed with emergency exit sign (KELUAR sign).	Every exit storey of buildings have accessible staircase where is lead to a final exit and assembly point at back lane. The signs of 'exit' are clear enough and provided.	Thereby, means of escape aspect is comply with the requirement.
Ventilation to Staircase Enclosure	By-law 174 stipulates all staircase enclosures shall be ventilated by having a minimum opening size of 1 square meter.	The situation of staircase at case study is an open space and opening such window is not required if not made even at top level staircase. The natural ventilation is sufficient on staircase condition.	Although window is not made at staircase area but the open staircase has sufficient ventilation, it is comply with the requirement.

6.0 CONCLUSION AND RECOMMENDATION

The study about education building at Department of Quantity Surveying was conducted successfully. To study the condition of passive fire safety requirement at Department of academic building in UiTM Perak Branch, observation and measure method were employed. It can be deduced that the aspect of fire safety requirement of the case study is needed to be more advanced in fire requirement design, the provision of suppression system and fulfill all the requirements.

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