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Assessing Safety and Health Factors Influencing Performance of Malaysian Low-Cost Housing

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Abstract
The Malaysian Government through its various Malaysia Plans is committed to provide adequate, affordable, and quality low-cost housing in fulfilling nation's housing need. Therefore, the housing policy should provide the public to own affordable housing that should improve the safety and health of a building's final occupants. To achieve this aim, the information concerning the safety and health performance of buildings must always be readily available. The research first identified the critical factors through a literature review of current safety and health practices from journals, thesis and articles books in order to interpret the factors from a global perspective. The literature review identified 32 variables of factors contributing to safety and health performance of low cost housing in Malaysia. The findings of this study can form a basis that can be considered as primary elements for the development of practical assessment scheme to evaluate the safety and health of low-cost housing in Malaysia.
Keywords: *Safety and health, framework, low-cost housing, case study*

1. Introduction

The creation of the sustainable construction is one of the main priorities of construction industry in Malaysia. Therefore, there is a need for a sustainable strategy especially towards building a safer, healthier, and more sustainable built environment. Ministry of Works have set a 10 percent allocation under the Tenth Malaysia Plan for buildings and roads maintenance. The Malaysian Government has also allocated a fund of RM500 million for the repair and maintenance works of public and private low-cost housing (Government of Malaysia, 2010). Despite the Government's commitment towards building maintenance, many issues concerning the safety and health of our buildings in Malaysia have been reported. In Malaysia, unsatisfactory housing conditions and reluctance of property management to carry out safety and health inspections are evidenced by the large number of complaints and reports from residents as well as study conducted by researchers (Husin, Nawawi, Ismail, & Khalil, 2012; Fire and Rescue Department Malaysia, 2012). A study conducted by Karim (2012) pertaining to low-cost housing quality in Shah Alam, Malaysia finds that the performance of low-cost housing is influenced by various issues such as quality and materials of construction, sanitary system, facilities provided, location, maintenance, and social problems. A study by Isnin, Ramli, Hashim, and Ali (2012) indicates that the residents of low-cost terrace housing in Shah Alam, Malaysia are generally not satisfied with their housing conditions and environments. The construction activities, materials used, cleanliness, aesthetic value, safety, privacy, and amenities are among the problems and risks affecting social health and environment.

Housing condition is an important factor for health, safety, and sustainability of built environment. Moreover, direct effects of poor housing condition include structural deterioration, falling building fragments, deficiencies in fire safety provisions, slope failures, various hazards, respiratory symptoms, and mental health problems (Keall et al., 2010; Wong et al., 2006). Comprehensive ways, tools, and concept must be developed to determine performance indicators and criteria for safety and health building with the focus generally on the prevention of safety and health problems (Akasah, Abdul, and Zuraidi, 2011). More effort is necessary to boost this application especially towards the safety of buildings. It needs a comprehensive understanding of the building factors for built environment hazards and for the purpose of the initial screening to evaluate building safety and health performance. These situations are the starting point to defining the safety and health of low-cost housing concepts as a framework for theoretical and

systematic implementation in Malaysia. This preliminary study identifies the factors contributing to the safety and health performance of low-cost housing in Malaysia. These factors will help in determining the appropriate instrument to be used in the Malaysian context according to local design, construction quality, climate, environment conditions, and the use of existing buildings.

2. Low-Cost Housing In Malaysia

Low-cost housing in Malaysia demonstrates an urgent need for the low income groups, particularly in the large urban centres due to influx of migrants. Low-cost housing remains to be seen as a government effort to provide adequate and affordable housing for low-income groups and squatters. It also to ensure that Malaysians particularly the low income groups have greater access to adequate and affordable shelter and related facilities. The Ministry of Housing and Local Government via the National Housing Department plays a vital advisory role through housing strategies and programmes outlined. In this regard, various public housing projects have been implemented, which are the Public Low-Cost House Programme (PLHP) for sale/rent to buy, People's Housing Programme (PPRM) for sale, People's Housing Programme (PPRS) for rent, and Integrated Housing Programme (PPRB) (Ministry Of Housing and Local Government of Malaysia, 2009).

The overall performance of houses built under the low-cost housing category was encouraging with 200,513 units completed or 86.4 percent of the Ninth Malaysia Plan's target (Economic Planning Unit, 2010). Under the Public Low-cost Housing Programme (PLHP) for the low income group, a total of 27,006 low-cost houses were constructed involving 70 projects and mainly concentrated in small towns and sub-urban areas. The Public Low-cost Housing Programme financed by the Federal Government and implemented by the State Government since 1976. For cities and larger towns, People's Housing Programme (PHP) encompasses PPRB, PPRM and PPRS were implemented for the resettlement of squatters. During Ninth Malaysian Plan, 37,241 low-cost houses under PPRB programme were completed and rented out to those eligible. Out of this total, 24,654 units were built in Wilayah Persekutuan Kuala Lumpur while 12,587 units in other major towns throughout the country. As of December 31, 2011, a total of 88 PPRS projects consisting of 76,159 units have already been implemented in which 64 projects consisting of 62,716 units have already been completed (Ministry of Housing and Local Government, 2013). While 24 projects comprise of a total of 13,443 units are in various stages of construction. The houses built under both PPRM and PPRS will use the specifications of planning and design of low-cost housing set out in the National Housing Standard for Low-cost Housing Flats (CIS2). In urban places (major cities), low-cost housing can be characterised as housing that is 5 to 18 floors with a minimum floor space of 63 m^2 and consists of 3 bedrooms, lounge, dining, kitchen area, kitchen, 2 bathrooms and toilet, and dining area (Ministry of Housing and Local Government of Malaysia, 2009). The housing prices are according to its selling price of RM42, 000 and below per unit with applicant household income of less than RM2, 500 per month.

3. Issues and Challenges of Low-Cost Housing in Malaysia

It is well known how the construction sector in Malaysia contributes an enormous influence over economic activity, employment, and growth rates. Demand on residential home especially on low-cost housing development should be proportional to the increase in population density. Assessment by the Administrative Districts, Malaysia (2010) shows that population density in Kuala Lumpur for 2010 is 7,089 per unit of land area. Therefore, programmes such as Low-Cost Public Housing Projects and Public Housing Programmes have been implemented in urban areas. But, to date, these programmes are still not able to solve the issue of insufficient low-cost housing. Since the Third Malaysia Plan, the number of completed projects has not achieved the target of low-cost housing programmes in Malaysia. During the Eight Malaysia Plan, the total number of low-cost housing was 197,649 units compared to the target of 230,000 units (Ministry of Housing and Local Government of Malaysia, 2009). The lack of housing for the low-income groups has led to the existence of squatter settlements in the major cities in the country.

During the rapid economic growth, the public and private sectors actively built low-cost houses and almost achieved the total number of unit targeted. Viewed from the end of 2011, Malaysian Investment Development Authority (2012) reported that a total of 1,422 housing projects excluding commercial buildings were approved with total investments of RM16.9 billion. Consequently, a total of RM9.4 billion were allocated for low-cost public housing during the Ninth Malaysia Plan (2006-2010) compared to RM4.2 billion in the Eight Malaysia Plan (2001-2005). This effort continued in the Tenth Malaysia Plan (2006-2010) when the Government provided large allocation for

repair and maintenance works of public and private low-cost housing (Shuid, 2010). These figures prove that the Malaysian Government is committed in providing adequate, affordable, and quality housing for all Malaysian. Furthermore, the rapid urbanisation and modernisation of Malaysia have eventually increased the demand for good quality, adequate, safe, healthy, and affordable living environment.

In the context of low-cost housing construction in Malaysia, Construction Industry Development Board (CIDB) Industry has introduced Construction Industry Standard 1 (CIS 1:1998) and Construction Industry Standard 2 (CIS 2:1998) – standards that specify minimum design and planning requirements for low-cost houses in Malaysia (Sufian and Ibrahim, 2011). Both of these standards include requirement on layout, space and configuration, physical and mental health, community, infrastructures, and amenities (Husin, Nawawi, Ismail and Khalil, 2011). However, despite the enforcement of these regulatory measures, there are yet many safety and health problems faced by the low-cost occupants in Malaysia. The public housing management in Malaysia is also not excluded from problems in managing their units.

Furthermore, after these housing projects have been completed and occupied, assessment has yet to be done to analyse and describe the performance of the low-cost housing in Malaysia. To date, the current the Green Building Index (GBI) practices in Malaysia only involve rating tools to commercial buildings and single private homes excludes assessment for low-cost housing projects in urban areas, which are designed in high-rise flats (Zaid, 2010). This has lead to adopting occupant's satisfaction as an important indicator of housing quality and conditions of low-cost housing in Malaysia. The root causes leading to housing quality problem have been identified as issues related to housing layout and design, surrounding environment, maintenance, location, amenities, and building material (Omar, 2008; Karim, 2012; Zainal et al., 2012). Many studies have shown that the most problematic situations faced by low-cost housing occupants are air pollution caused by traffic or industry, road congestions and noise from heavy traffic, and lack of public parks for recreational and family activities (Zain, 2012; Zainal et al., 2012). Further evidence of the need to consider surrounding environment quality is offered by Bajunid and Ghazali (2012) . In their review, surrounding environment has a prominent role in promoting physical health and opportunities for developing social relationship as well as aesthetic needs. The surrounding environment has also been illustrated by Karim (2012) in connection with housing environment domains. He identifies at least four domains for housing environment as follows: family, social environment (neighbours and community), community facilities environment, and neighbourhood physical environment.

Maintenance can be defined as activities required to keep a facility in as built condition and therefore, continuing to have its original productive capacity (Hashim, Samikon, Nasir and Ismail, 2012). To ensure the buildings remain in good condition and to avoid the risk of accidents caused by deteriorated infrastructure, building maintenance management of public housing must be performed consistently over time to preserve the capital value of the structure (Lateef, 2010). Furthermore, Hashim et al. (2012) and Mohammed and Hassanain (2010) explore the maintenance management in low-cost housing and find that maintenance problems in facilities are heavily attributed to design limitations, lack of construction knowledge, inadequate inspection or maintenance, and material limitations. They also identify that lack of cooperation among the parties, especially the facility manager and design professionals at the design stage, may be the major contributor to problem of maintenance. Based on case studies conducted in Kuala Lumpur, Petaling Jaya, Shah Alam, and Klang in assessing the conditions of low-cost housing buildings, Zainal et al. (2012) note that many buildings face maintenance problems that need urgent attention in order to preserve them from further deterioration and decay. Inherent maintenance problems in facilities are also found to have significant relationship with respondents' physical health status. This has been highlighted by McDermott, Haslam and Gibb (2007) who identify that overcrowding and stressful earlier life can be linked to physical health status. Location characteristics are also important considerations for understanding the formation of residential satisfaction among public housing tenants. Bajunid and Ghazali (2012) indicate that there are three aspects related to location, namely the geographical location, physical and social environment. They find that the house is more valuable if it is equipped with the infrastructure within the housing environment as well as with the sense of belonging that the residents feel to their neighbourhood community. Affordable and accessible housing, transport, healthcare, education and training, leisure and recreation facilities, other public amenities, and opportunities for social interaction are the most basic requirements of living, working, and playing in urban communities that most people share (Williams, Kitchen, Randall and Muhajarine, 2007). Another factor related to housing condition is the facilities and amenities provided. A study on housing satisfaction of low-cost multistorey public housing in Selangor, Malaysia reveal that the residents are not satisfied with building services and facilities in the housing area (Hashim et al., 2012). Besides

facilities in the house, basic facilities such as public transport, educational and health facilities, markets, mailing system, community hall, playground, and parking lots are important to support the daily life of the dwellers and to enhance residents' quality of life.

In terms of design, a low-cost house in Malaysia has to have the minimum standard specified: a built-up area of 550–660 square feet with three bedrooms, dining area, a separate bathroom and toilet, and drying area (Goh and Ahmad, 2011). Goh and Ahmad (2011) in their study on housing satisfaction of low-cost flats in Kuala Lumpur, Malaysia reveal that the residents are not satisfied with the size of the kitchen. In another study, Isnin et al. (2012) find that most low-cost houses have limited space for recreation areas and facilities such as educational and health facilities, multipurpose hall, playground, and public transport for community and recreation activities. Thus, house alteration has grown rapidly due to demand for good and comfort quality dwellings. Poorly designed and executed alteration works cause problems and increase the risk towards social health and environment. Moreover, the impact of materials installed as well as the life cycle of each component of building also need to be considered. It has been also proven that users are currently getting more conscious of safety and health issues in housing environments. A study by Isnin et al. (2012) indicates that the residents of low-cost terrace housing in Shah Alam, Malaysia are generally not satisfied with the materials used in building construction. They find that the materials for building finishing have caused problems and increased the risk towards social health and environment. Therefore, performance in building materials has become one of the attributes of building quality as well as structural performance, service performance, space functionality, amenities, architectural conditions, finishes condition, and workmanship (Isnin et al., 2012).

4. General Background of Building Safety and Health

Health and safety, which may contribute for economic productivity and prosperity, are an important aspect for the well-being of individuals and society. The Constitution of the World Health Organisation (WHO) defines health as "A state of complete physical, mental, and social well-being not merely the absence of disease" (World Health Organization, 1997). The WHO concept of health is significant for measuring building health quality involving the complete state of physical, mental, and social well-being. Furthermore, Wong et al. (2006) develop a tool to measure health performance of residential buildings and defined "Indoor Air Quality'", "Thermal Comfort", "Lighting Quality", "Space", "Water Supply", "Sanitation Handling", "Sound and Space" as components of health. In another study, the importance of building safety assessment is indicated by Yau, Ho and Chau (2008) defines safe building as "a built environment that safeguards its occupants and the general public as a whole from physical, psychological, or material harms originating from the built environment, aims to reduce injuries and deaths, and hence, encourages the positive well-being of humanity". He identifies "Structural Failures", "Falling Objects", "Fire Hazards", "Building Services Failures", and "Special Hazards" as components of safety.

For many years, a variety of building performance assessment schemes mainly focusing on the housing quality have been practised in countries such as Hong Kong, China, and Australia. Among the building performance assessment methods include Building Environmental Assessment Method (HK-BEAM), Building Safety and Conditions Index (BSCI), Building Quality Assessment (BQA), Housing Performance Evaluation Model (HPEM), Standard of House Performance Appraisal (SHPA), and Comprehensive Environmental Performance Assessment Scheme (CEPAS) (Ho et al., 2008). There are many methods to survey the condition of building, ranging from fail type certification, simple additive, and weighed additive (Lin, C.Y. and Michael, 2010). In particular, the purpose of building performance assessment is to measure housing quality using performance indicators to be considered in improving the quality of the built environment (Keall et al., 2010; Ho, Yau and Poon, 2010; Lee, Je and Byun, 2011).

5. Safety and Health Performance Metrics Literature

Hierarchical structure of safety and health building factors gives preliminary idea on what past researchers have discovered especially on the factors contributing to building safety and health performance. A safety and health framework should be comprehensive enough to address all relevant safety and health issues. However, in the same time, it needs to be concise enough in order to present building safety and health factors in a systematic manner. Many literatures (Al-Homoud and Khan, 2004; Reese, 2004; McDermott, Haslam and Gibb, 2007) have pointed out that building design and management plays an important role in building safety. Therefore, the implementation of safety measures should be addressed in the design and management process. The demand for safe, healthy, and comfortable living environment and requirement has increased dramatically, thus sustainable development and management must have engineering, managerial, financial, and intelligent features and capability to respond to the

rapid changing pace of technology in design and management (Lau and Lam, 2005). Therefore, sustainable building requires a holistic approach that consists of design and management to enhance the life cycle of building. According to Chohan, Tahir, Abdullah, and Tawil (2011) sustainable maintenance plays as a tool to provide information to the designer during the design and construction phases towards sustainable design. The impact of design on structure and material installed as well as the life cycle of each component of building should also be considered. The structure of building safety and health framework consists of performance criteria where most of them have common objectives to assist people and building stakeholder to make more informed decisions. There are 28 scholarly research papers selected for this study. Of those research papers, 32 safety and health factors of building performance have been found as shown in Table 1 and Table 2. The main factors are divided into five variables consisting of architecture, building services, external environment, operations and maintenance, and management approaches.

5.1 Architecture

Architecture refers to the layout configuration and disposition of a building that are added to provide greater surroundings as well as the finest design details (Bokalders and Block, 2010). They highlight that building sustainability must take broader changes in architecture, construction, and spatial planning to reduce environmental, safety, and health impacts of buildings. Therefore, the focus of architecture is not only on the aesthetic aspects; it should be in combination with a certain structural solution or style, and it must enclose space in which certain activities can take place safely, comfortably, and efficiently. Ramly, Ahmad and Ishak (2006) find that 47% of architectural defects are caused by design defects, 17% from materials, 15% from construction, 18% from misuses of facilities, 15% from poor maintenance, and 5% from vandalism. Isa, Zainal and Hashim (2011) propose also find that the majority of the defects identified are architectural works, followed by electrical works, and civil and structural defects. These suggest that defects could have been prevented if consideration is made on the architectural building elements. Furthermore, Chohan et al. (2011) point out the needs for architects to prevent these defects by using more appropriate materials and better design and layout.

5.2 Building Services

Similar to architecture, building services are required for the safe, comfortable, and environmentally friendly operation of buildings. Building services refer to the design, installation, operation, and monitoring of the mechanical and electrical systems such as electrical supply, lighting, ventilation, plumbing and sanitary, fire services, and lifts (Ho et al., 2008). Lai and Yik (2011) highlight that assessment of building services conditions is important to safeguard the safety, health, and well-being of people, and to protect the environment. A study done by Green, Kouassi, Venkatachalam, and Daniel (2011) proves that physical housing conditions such as plumbing, heating, cooling and building security contribute to mental health dysfunctions such as being depressed, feeling worried, feeling sad, feeling helpless, and feeling emotional. Thus, it can be summarised that housing could have a significant impact on safety, health, and behaviour of residents (Harker, 2007). Thus, Building Department of Hong Kong takes rigorous services to facilitate the construction and maintenance of quality and sustainable buildings. The Department also includes conducting regular review of regulations and standards to keep the building control system commensurate with the advancement in technology. It has also been found that systems of building services namely electricity, fire service, lifts and escalators, gas supply, water supply, and ventilating systems tend to be maintained in serviceable condition if they are regularly inspected according to the legal requirement (Lai and Yik, 2004)

5.3 External Environment

Safety and health measures should be emphasized to protect occupiers from external environment which can introduce additional hazards within the home. The term environmental hazard refers to all the potential threats facing human society by events that originate in, and are transmitted through, the environment (Smith and Petley, 2008). They identified the major categories of environmental hazard are natural hazards (floods and landslide), technological hazards (hazardous materials, Industrial failures, unsafe public buildings and facilities) and context hazards (environmental degradation and air pollution). The study of Hamsa, Masao, Shuhei and Yosuke (2010) highlights the several inadequacies of living environment houses at Taman Melati residential area in Kuala Lumpur. The study addressed the problems of physical environmental parameters such as noise level, air pollution, and level and traffic volume. Zainal, Kaur, Ahmad, and Khalili (2012), highlighted that quality of surrounding environment was measured by air quality and peaceful environments. They found that surrounding environment have significant

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5.6 Operation and Maintenance (O&M)

Facilities operations and maintenance encompass all broad spectrum of services required to assure that the built environment will perform the functions for which a facility is designed and constructed (Sapp, 2009). They suggest that O&M includes preventive and predictive (planned) maintenance and corrective (repair) maintenance. Preventive maintenance (PM) consists of a series of time-based maintenance requirements that provide a basis for planning, scheduling, and executing scheduled (planned vs. corrective) maintenance. On the other hand, corrective maintenance is a repair necessary to return the equipment to properly functioning condition or service, and may be both planned and unplanned. The study conducted by Isa et al. (2011) finds that there is rapid increase in the cost of maintenance work in various countries including Hong Kong, Singapore, the United Kingdom, and Malaysia. The Malaysian Government has also increased the budget maintenance for schools and health clinics, housing projects, water tank projects, flood mitigation plans, and provision of sports facilities, from RM2.5 billion for 2012 to RM6 billion for 2011 (Government of Malaysia, 2013). Thus, Isa et al. (2011) propose building best maintenance criteria in order for future sustainable building maintenance management works as follows: 1) clear maintenance policy; 2) systematic maintenance programmers and priority; 3) producing accurate building assessment and condition; and 4) updated information and data integration system.

Moreover, in connection to the O&M, Lai and Yik (2004) suggest that maintenance practitioners should continuously update their knowledge and be abreast with any amendments in regulatory controls. They identify that damages could arise due to negligence from legal responsibilities and liabilities. To ensure compliance with relevant acts, maintenance work shall be referred by a competent person, a competent worker, a competent examiner, a registered specialist engineer, and a registered specialist contractor. The integration of design on facilities operation and

maintenance is also pronounced by Mohammed and Hassanain (2010) as the communications between facility manager and design professionals is important to ensure a successful project outcome.

5.7 Management Approaches

Besides design quality, the quality of management approaches in buildings is also important for the health and safety of residents. According to Lai and Yik (2011) who evaluate the quality of facilities management services in residential buildings in Hong Kong, the quality of the facilities depends on the quality of their operation and management. They analyse five aspects of facilities management services including security, cleaning, repair and maintenance, landscape and leisure, and general management. Furthermore, the empirical investigation performed by Bottani, Monica and Vignali (2009) defines that the implementation of safety management systems encompasses company's attitude to defining safety and security goals and communicating these goals to employees, updating risk data and performing risk analysis, identifying risks and defining corrective actions, and developing employees training programmes.

Table 1: Building safety and health performance measures

Dimension	Category	Building Factors / Attributes	Keall et al. (2010)	Wong et al. (2006)	Yau et al. (2008)	McDermott et al. (2007)	Lee et al. (2011)	Al-Homoud & Khan(2004)	Lai & Yik (2004)	Wang et al. (2005)	Chohan et al.(20111)	Bluyssen (2010)	Deng, Xu, & Zeng(2008)	Bottani et al. (2009)	Kim et al. (2005)	Husin et al. (2011)
Scope Of Assessment	Design	Architecture														
		Means Of Escape	1	1	1	1		1								
		Means of Access	1	1	1	1		1								
		Structural and Finishes Integrity					1			1	1				1	1
		Building Material					1			1	1				1	1
		Amenities	1	1	1		1									
		Space Functionality	1	1											1	
		Fire Resistant Construction	1	1	1	1		1		1						1
		Building Services														
		Electricity Supply	1	1	1			1		1	1				1	1
		Lighting	1			1	1	1				1			1	
		Ventilation	1				1				1	1			1	
		Air-conditioning														
		Plumbing	1	1			1	1		1					1	1
		Sanitary Services	1	1			1	1		1					1	
		Fire Services		1	1	1		1								1
		Lifts		1												1
		External Environment														
		Emergency Services		1	1		1									
		External Hazards					1								1	
		Location	1									1				
		Air Quality	1	1			1					1			1	
		Peaceful Environment	1				1					1				
		Aesthetics		1											1	
	Management	Technical-Operation & Maintenance														
		Building Peripherals		1	1											
		Structural and Finishes Integrity		1	1		1			1						
		Building Services Conditions	1	1	1		1	1	1	1						
		Transformation Of Building							1							
		Fire Compartment Integrity	1	1	1		1	1		1						
		Administration- Management Approaches														
		Emergency Evacuation Plan		1	1			1					1	1		
		Documentation & Evaluation		1	1		1		1	1			1	1		
		Safety Education											1	1		
		Security Management		1	1		1		1				1	1	1	
		Occupant Safety Management											1	1		
		Waste and Cleaning Services	1				1		1							

Table 2 (continue): Building safety and health performance measures

Dimension	Category	Building Factors / Attributes	Hashim et al. (2012)	Isnin et al. (2012)	Aziz & Ahmad(2012a)	Karim (2012)	Zainal et al. (2012)	Latif et al. (2012)	Aziz & Ahmad (2012b)	Husin et al. (2012)	Bajunid & Ghazali (2012)	Omar (2008)	Ali et al. (2012)	Mustafa et al. (20111)	Salfarina et al. (2010)	Sani et al. (2012)
Scope of Assessment	Design	Architecture														
		Means Of Escape								1		1	1			
		Means of Access								1		1	1			
		Structural and Finishes Integrity				1	1			1			1			
		Building Material														
		Amenities	1		1	1	1	1	1	1	1	1			1	
		Space Functionality	1	1	1	1	1	1	1	1	1	1			1	1
		Fire Resistant Construction								1						
		Building Services														
		Electricity Supply								1			1			
		Lighting	1			1	1		1				1			1
		Ventilation	1				1		1				1			1
		Air-conditioning											1			1
		Plumbing	1			1				1			1			1
		Sanitary Services	1			1				1			1			1
		Fire Services								1		1	1			
		Lifts Services				1				1			1			
		External Environment														
		Emergency Services	1													
		External Hazards		1												1
		Location														
		Air Quality	1	1	1	1	1		1							1
		Peaceful Environment	1	1	1	1	1	1	1		1	1			1	1
		Aesthetics	1	1	1		1	1	1		1	1				1
	Management	Technical-Operation & Maintenance														
		Building Peripherals	1													
		Structural and Finishes Integrity				1	1						1			
		Building Services Conditions	1			1		1		1			1	1	1	1
		Alteration Of Building	1	1												
		Fire Compartment Integrity								1						
		Administration- Management Approaches														
		Emergency Evacuation Plan														
		Documentation & Evaluation											1		1	
		Safety Education											1			
		Security Management	1					1						1		
		Occupant Safety Management				1	1	1				1		1		
		Cleanliness/Hygience	1	1		1		1						1		1

6. Conclusion

Building safety and health literature was intensively reviewed and analysed in this paper in order to address building safety and health variables for theory and implementation. Finally for the conclusion, the building safety and health performance measures of low cost housing will be used by researcher, contractor, building owners, maintenance and management services providers. A quantitative evaluation methodology based on the proposed framework is under development by the writers. The methodology will be able to predict and understand the role and formation of individual variable and their relationships among each other. For further study, the development of safety and health model can be used as an assessment framework, process and benchmarking tool for building performance evaluation in terms of safety and health.

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