

# EVALUATION OF HEALTH AND SAFETY ASPECTS IN CONDOMINIUMS

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**Yahya , M.R.\***

Department of Building Surveying, Faculty of Architecture,  
Planning and Surveying, Universiti Teknologi MARA, Malaysia

\*Corresponding author: moham643@gmail.com

## **ABSTRACT**

*At the present time, condominiums are becoming primary choice among urban high-class populace in urban area due to the facilities provided in the buildings and also comfort within their compound areas. There are numerous problems have to be tackled by the building maintenance management in order to control all activities related to the operation and maintenance in the condominium. Health and safety are the common issues based on complains from dwellers either through internal complain forms or mass media. This study aims to assess the health and safety performance of condominiums, using a basic valuation method. The valuation method based on a hierarchy of building performance indicators regarding the quality of design aspect and management aspect with five attributes such as architectural design, building services design, the surrounding environment, operation and maintenance, and facilities management (FM). Twelve condominiums were randomly selected in Klang Valley, Malaysia and assessed through site inspections, desk searches, and interviewed management corporation personnel (MC), outsourced contractors/consultants (OS), home-owners (HO) as well as (T) tenants. A performance analysis was carried out to survey and compare the overall health and safety performance of the buildings. The results had shown that there was significant similarity in health and safety condition among*

*condominiums, even though they are located at the different locality. As a conclusion, most of the classic problems of health and safety circumstances in condominiums were due to the building management system rather than building design.*

**Keywords:** *Health, Safety, Performance, Condominium*

## **1 INTRODUCTION**

The condominium should be conducive to residential living activities all the time such as be clean, structurally safe, attractive, and well lit. Its roadways and pathways, and its water supply and drainage system, must be free of all weaknesses, safe, protected, and reliable in order to provide for the continued and uninterrupted health and safety of the occupants. After the buildings have been occupied, facilities management became an issue including health and safety aspect (Linariza and Ashok, 2003). It is a living environment where the residents and their guests should be able to feel safe and comfortable as they go on with their lives.

According to Liias (1998), Jamila (1994), Malaysia Government (1999), Sapian (2003), Tiun (2006) and Eddy (2004a), the most challenging issues

in the high rise residential buildings were health and safety aspect which related to operation and maintenance activities. In addition, homeowners and tenants complained through internal complain forms or mass media and the issues were always about health and safety as well as disputes between maintenance teams and dwellers. Even so, the management gap continued to exist as referred to the on-going issues reported in mass media (Tiun, 2006). The operation and maintenance plan begins with a decision by the stockholders/stakeholders of the facility to establish a framework concerning the level of maintenance required to allow the facility to continuously serve its initial purpose in a safe and healthy environment. It deals with the direct exterior maintenance work required to preserve or restore the intended function of building services in condominium. The direct exterior maintenance work is comprised of preventive maintenance, repair, replacement, and component improvement. For the purposes of this plan, preventive maintenance is work performed on exterior components of the buildings and infrastructure to allow continued use of exterior facilities and building envelope. Repair work is restoring some building component after it has failed. Replacement refers to planned replacement of building or infrastructure components. Improvement maintenance refers to small projects to enhance the appearance and marketability of the condominium or activities to reduce the operation and maintenance cost, to include safety and health issues. To handle the issues pertaining to the management and maintenance activities, Strata Title Act 2007 (STA) was implemented in 1985, to accommodate the insufficiency of the National Land Code that was ineffective in handling the issues that arose in stratified building types (Tiun, 2006). According to STA, the FM is accountable for all the management and maintenance aspects of the building and common facilities in the building (Teo, 1993; Jamila, 1994).

## 2 RESEARCH OBJECTIVE

This study aims to evaluate the health and safety performance of condominiums, using a basic valuation method since health and safety are the most challenging aspects in condominium. Health and safety were chosen as research focus because they are the most fundamental aspects that

a dwelling should fulfill, and yet they usually cannot be easily observed and evaluated by occupants and end users.

The objective of the research will emphasize on two aspects:

- To identify the building design and maintenance management criteria and consequently the health and safety aspects in condominiums.
- To determine the relative of health and safety associated with each attribute of building design and maintenance management.
- To develop a Building Health and Hygiene Index (BHHI) and Building Safety and Conditions Index (BSCI) specifically for condominiums.

## 3 RESEARCH METHODOLOGY

Figure 1 illustrates a flowchart of a research based on Ho et al. (2004) simple assessment framework. There were twelve condominiums in Klang Valley, Malaysia have been randomly surveyed. Research also extended Ho et al. (2004) health assessment framework to building safety. To make the survey results more comprehensible to the public, the research has translated technical performance details into indices (e.g. a health index and a safety index) for building classification. With these indices, the public and homeowners can easily know the health and safety performance of their properties.

The research method was organized which include site inspections, desk searches and interviewed MC, OS, HO and T.

Two assessment schemes such as Building Health and Hygiene Index (BHHI) for health and Building Safety and Conditions Index (BSCI) for safety were developed which based on the theoretical assessment framework introduced by Ho et al. (2004). This assessment model is in line with the ideology of the assessment model developed by Kim et al. (2005), which was designed for existing buildings with various degrees of quality. They studied on the high rise residential buildings based on the existing policy and practice as well as the current issues in those particular buildings. There

are 25 variables for the BHHI and 18 variables for the BSCI. The weightings of the variables were assessed by two expert panels by using analytic hierarchy process (AHP) (Saaty, 1982).

The respondents' weightings of the variables were extracted from a pair wise comparison of the relative importance of all pairs of factors at the same

level as the hierarchy using the AHP computer package Expert Choice 2000. The observation of an assessor was recorded and graded based 1 to 10 scales. The result from condition survey was calculated by multiplying the assessment grade with the weightage of each attributes and subsequently the weightage of each criterion.

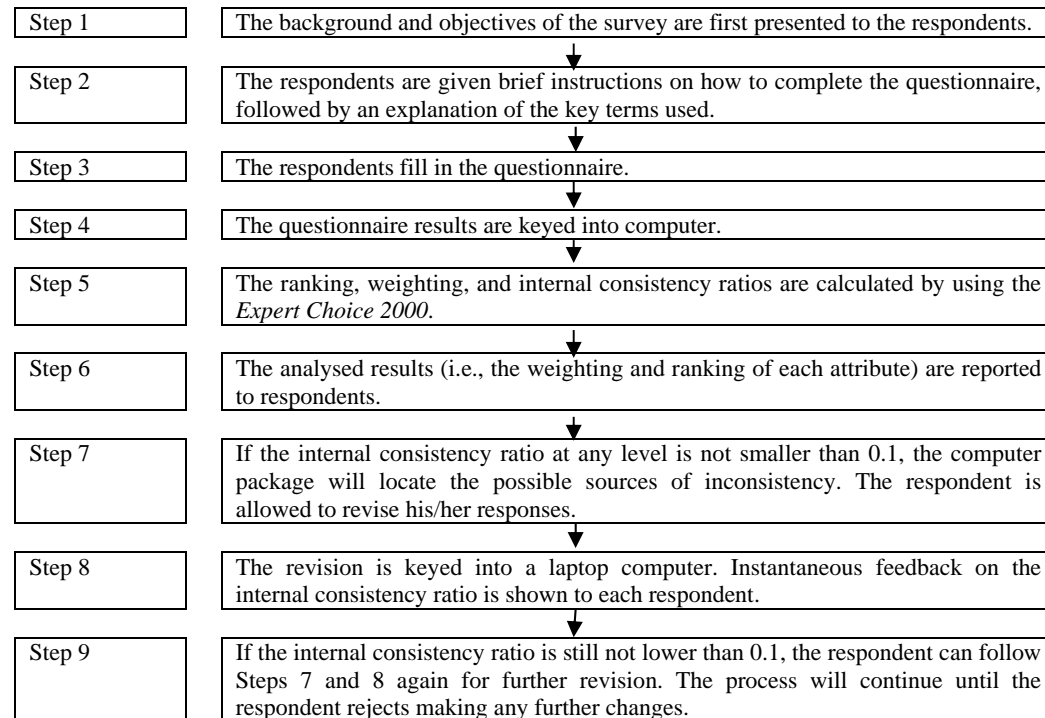


Figure 1: A flowchart showing the procedures of the data collection

### 3.1 Defining health and safety

Ho et al. (2004) pointed out some characteristics that a healthy building should have:

1. A healthy building should not be too densely populated;
2. Its window design and layout should facilitate natural ventilation and diffusion of daylight;
3. It should be isolated from noise and air pollution sources;
4. Its water supply and waste systems should be appropriately installed, maintained, and managed; and
5. Its environmental conditions should be clean and hygienic.

Ho et al. (2004) was defined a safe building as one that minimizes the risk of physical injury and the death of occupants, such as evacuating them effectively should emergencies arise. Hence, a safe building should have the following characteristics:

1. a structurally sound construction design and condition;
2. properly installed and maintained electrical and gas supply systems;
3. a design that facilitates the evacuation of occupants in case of emergency; and
4. a location that is less prone to flooding or landslides.

## 4 RESULT AND DISCUSSION

### 4.1 Overall Results

Table I showed the raw data have been collected and converted into a set of performance indicators that represent the health and safety conditions of each factor. The analysis of the assessment results will contribute to the key

factors that influence the variations in the health and safety performance of the condominiums.

$$BHHI_k = \sum_{i=1}^n W_{H,i} F_{H,ik}$$

Equation 1(a)

$$BSCI_k = \sum_{i=1}^{ns} W_{S,i} F_{S,ik}$$

Equation 1(b)

The distributions of BHHI and BSCI after the application of Equation (1a) and Equation (1b) to each building, the median BHHI and BSCI scores were 45% and 52%, respectively. Specifically, the BHHI ranged from 45% to 53%, whereas the BSCI ranged from 43% to 55%. Since the indices are building-specific, the health and safety performance of every building, it can be compared to the others.

### 4.2 Performance Attribution

A variance disintegration analysis was conducted to tell the relative significance of the first level factors (design and management) in affecting the dispersion of the BHHI and BSCI. Buildings differ, at most, by 48% for the BHHI and 50% for the BSCI. By definition, the BHHI and BSCI are the weighted sums of the design index (DI) and the management index (MI), respectively. In other words:

$$BHHI_k = w_{H,D} DI_{H,k} + w_{H,M} MI_{H,k}$$

Equation 2(a)

$$BSCI_k = w_{S,D} DI_{S,k} + w_{S,M} MI_{S,k}$$

Equation 2(b)

Table 1: Building factors assessed under the BHHI and BSCI, and their relative weightings

Level 1		Level 2		Level 3	
	Weight (%)	Category	Weight (%)	Building factor	Weight (%)
<i>BHHI</i>					
Design	48.3	Architecture	18.2	Size	2.1
				Plan shape	3.0
				Master Bedroom	2.3
				Windows	3.4
				Noise reduction	3.4
				Open space	1.4
		Building Services	19.7	Water supply	4.8
				Drainage	5.8
				Refuse disposal	3.7
				Lift	2.4
		External Environment	16.2	Density	1.9
				Adjacent use	1.7
				Air quality	5.3
				Aural quality	2.6
				Visual obstruction	1.6
				Thermal comfort	2.9
Management	51.7	Operations & maintenance	26.8	Cleaning	6.1
				Pest control	5.5
				Refuse handling	4.6
				Drainage condition	5.8
				Unauthorized alteration	4.0
				Water quality	7.5
		Management approaches	19.1	Owners' duties	6.1
				Documentation	6.2
				Emergency preparedness	6.1
<i>BSCI</i>					
Design	46.2	Architecture	22.4	Height and disposition	3.6
				Means of escape	8.0
				Means of access	6.5
				Amenities	3.3
		Building services	16.6	Fire service installations	8.5
				Electrical installations	4.3
				Fuel supply	3.8
		External environment	8.2	Proximity to special hazards	6.5
				Proximity to fire station	1.7
Management	53.8	Operations & maintenance	33.2	Structural condition	8.3
				Building services condition	5.6
				Exit routes condition	8.4
				Fire compartment	4.0

		Illegal appendages	6.9
	Management approaches	Owners' duties	4.2
		Documentation	3.8
		Emergency preparedness	8.7
		Financial arrangement	3.9

Figure 2 summarized the results in Venn diagrams. 67% of variations in BHHI are merely attributable to management factors, suggesting that management factors dominate design factors in differentiate healthy buildings from the relatively less healthy ones. Only 4% of variations due to their co-movements were very low and insignificant. In BSCI, pure design factors contributed 21% to the total variation, while pure management factors contributed 52%. Similar to its health counterpart, pure management factors are more influential than pure design factors in affecting the variations in safety performance. In other words, most of the variations in building health and safety conditions were attributed to be difference in building management rather than building design. So, FM should improve health and safety performance by enhancing management. However, as opposed to the BHHI's results, the co-movement of design and management factors occupies quite a significant share, being responsible for 27% of the variations in the BSCI. A probable rationale for such a strong co-movement is that design and management factors are determined by some ordinary factors, especially building age. There is growing evidence in the FM literature regarding the positive impact of health and safety building and its environments on building occupants' satisfaction, retention, and improved FM performance. The establishment of health and safety environment in the building requires strong FM leadership at all levels of the organization, but especially at the point of care or unit level where most front line staff work and building occupant care is delivered. This finding presents the evident regarding the importance of health and safety building and the significant role of FM leaders in the building and sustaining these health and safety environments.

It pointed out some characteristics that support the development of healthful and safety practice/work environments in FM should have:

- i. A collaborative practice culture
- ii. A communication rich culture
- iii. A culture of accountability
- iv. The presence of adequate numbers of qualified staffs
- v. The presence of expert, competent, credible, visible leadership
- vi. Shared decision making at all levels
- vii. The encouragement of professional practice & continued growth/development

A failure to take steps to build cultures of engagement can lead building occupants to feel that they are not supported in their building.

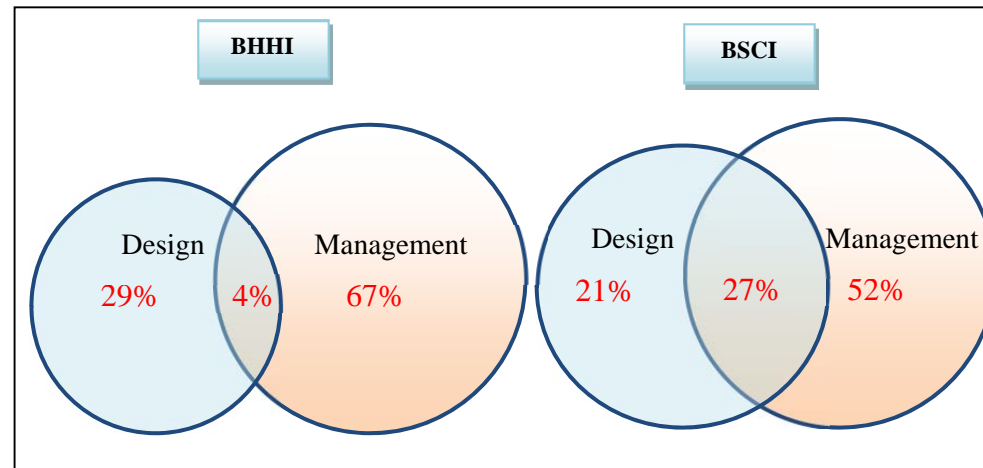


Figure 2: Contributions of design and management factors to variations in the BHHI and BSCI

## 5 CONCLUDING REMARKS

The results had shown that there was significant similarity in health and safety condition among condominiums, even though they are located at the different locality. The result provides the important indicator which is can improve life quality of the building occupants.

To encourage more sustainable residential buildings at the community level, the assessment results can be summarized into two simple and comprehensible performance indicators for public consumption, namely the BHHI and the BSCI. By circulation these performance indices, the public would be better informed of the health and safety risks of different buildings so that management corporation can make more responsible and accountable on health and safety assessments in the future. The stakeholders can use these results to know whether a building outperforms or underperforms.

Homebuyers as well as building management also can use the data to ascertain the performance of building before they make their decisions.

As a conclusion, most of the classic problems of health and safety circumstances in condominiums were due to the building management system rather than building design.

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