

ASSESSMENT OF BUILDING STRUCTURE OPENING FOR DWELLING

MARZIATULHIKMAH BINTI MASLAN

AA08021

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ABSTRAK

Struktur bukaan atau pengudaraan adalah salah satu komponen penting di dalam pembinaan rumah kos rendah. Rumah kos rendah adalah salah satu kawasan perumahan di Malaysia di mana penduduknya terdiri daripada golongan yang berpendapatan rendah. Kualiti sesebuah tempat tinggal dan kawasan kediaman merupakan satu perkara penting dalam memastikan kepuasan penduduk setempat serta merupakan satu faktor yang boleh mempengaruhi kualiti hidup setiap individu. Dalam mendapatkan kepuasan tempat tinggal yang sesuai diperolehi ia bergantung kepada struktur bukaan di dalam sesuatu bangunan. Jadi tujuan penyelidikan ini dijalankan ialah untuk mengenalpasti keberkesanan dan kepuasan penduduk terhadap pengudaraan semula jadi bagi rumah kos rendah. Penyelidikan ini dilakukan pada rumah satu tingkat dan rumah yang diubahsuai. Borang soal selidik diedarkan untuk mengenalpasti tahap kepuasan dan keselesaan penghuninya. Keberkesanan rekabentuk akan dinilai melalui jenis-jenis penduduk, jenis kawasan perumahan, pengubahsuaian yang dilakukan dan kekerapan penggunaan peralatan mekanikal. Daripada penyelidikan dan penemuan yang diperolehi, 6% penduduk tidak berpuas hati dengan system pengudaraan rumah mereka, 29% penduduk pula kurang berpuas hati dan 65% berpuas hati dengan sistem pengudaraan di rumah mereka. Beberapa cadangan untuk memperbaiki tahap pengudaraan telah dinyatakan. Secara am, terdapat 2 kaedah untuk memperbaiki aliran pengudaraan di dalam rumah iaitu secara mekanikal dan semulajadi.

ABSTRACT

Building structure opening or indoor ventilation is one of the important requirements for building especially for low-cost housing. Low cost-housing is one of the residential areas in Malaysia where its residents are from lower income groups. Residential satisfaction is an important indicator of housing quality and condition, which affects individual's quality of life. The factors which determine their satisfactions are depend on the suitability building structure opening. The purpose of this study is to investigate the residents' satisfaction and improve the building structure opening for low cost housing. A study carries out at residential area in Pahang, Kuala Lumpur, Perak and Negeri Sembilan. To identify the level of satisfaction among occupants, questionnaire forms were distributed to low cost-housing residents. The effectiveness of these designs will be assessed from the type of occupants, type of construction area, renovation and the frequency of mechanical equipment used. From the surveys and findings being carried out, it was found that 6% of the residents not comfortable with the ventilation, 29% are slightly comfortable and 65% comfortable. Several recommendations are stated to improve the level of ventilation. In general, there are two methods used to improve ventilation flow inside a building: mechanical ventilation and natural ventilation.

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Structure opening or indoor ventilation is one of the important requirements for low cost building. Indoor ventilation makes the low cost building a wonderful place to stay for residents because it creates healthy air, controls moisture within the building and maximizes energy efficiently. Proper ventilation of building depends on natural atmospheric condition, microclimate and the operating of windows or other opening in the building being ventilated, in which the occupants control the operation of the openings.

Minnesota Department of Commerce Energy Information Center (2008) identified that indoor ventilation refer to the exchange of air inside the home, in the space inhabited by human occupants. It has two essential functions that to exhaust pollutants, moisture, and odours from the inside of the building to the outside, and to bring outside fresh air to mix with the inside air. Fresh air is needed inside the home to help eliminating odours and pollutants which are harmful to human health. Fresh air also helps to eliminate excessive moisture that harms the building structure and furnishings. It is also

important to replace the air that is expelled out of the home by kitchen range fans, clothes dryers, and other exhaust equipment.

Whole-house ventilation is the process of supplying fresh air to a living space and exhausting stale air, either by natural or mechanical means in order to maintain an acceptable level of air quality. Normal human activities such as cooking, bathing, breathing, and maintaining house plants introduce indoor pollutants (including excessive levels of water vapor) into the home. Additionally, building materials and furnishings can contribute to indoor pollution through out gassing of chemicals used in their manufacture. Finally, appliances such as heaters and fireplaces can add harmful combustion byproducts to the air in the home. Pollutants can build up to levels that may negatively impact human health unless they are removed or diluted with fresh outside air.

A good flow of air movement can provide comfortable natural ventilation and thermal conditions and healthy environment besides reducing the requirement for mechanical ventilation. Careful design of the internal spaces and openings allows airflows driven by the buoyancy of warmer air to draw cooler fresh air into building. Removing the need for ventilation equipments can save money and space and also reduces health risks associated with highly serviced 'sick building syndrome'. (P S Burge, 2004)

Aim

The aim of the study is to investigate the residents' satisfaction and improve the building structure opening for low cost housing.

1.2 Problem Statement

Low cost housing design plan creates problem to the internal structure and low cost houses and flats are built to accommodate those who have low and medium income with prices as low as around RM 25, 000 to RM42, 000. In other words, qualities of these houses sometimes do not meet the standard. The building structure opening (indoor ventilation) is very poor because there is not even have proper windows and some do not even have any openings for air. About the spaces, the low cost houses always have a small space. (Ministry Of Housing and Local Government, 2008)

1.3 Objective of Study

The objectives of this study are:

1. To analyze the number and opening sizes of windows, doors and roofs in low cost housing.
2. To investigate the residents' satisfaction.
3. To get feedback from residents' on their evaluate house ventilation.

1.4 Scope of Study

Location

The study will be conducted in the low cost housing in Perak, Pahang, Kuala Lumpur and Negeri Sembilan.

Scope of Work

The study focus on the design of structure openings (indoor ventilation) and residents' satisfaction on ventilation of low-cost housing.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In construction, engineering and real estate development the word building may refer to the any man-made structure used or intended for supporting or sheltering any use or continuous occupancy or an act of construction. Buildings comes in a different shapes and functions, and have been adapted throughout history for various factors, from building materials available, to weather conditions, to land prices, ground conditions, specific uses and aesthetic reasons. A building as a shelter represents a physical division of the human habitat (a place of comfort and safety). Residential buildings are called houses or homes, through buildings containing large numbers of separate dwelling units are often called apartment buildings, blocks to differentiate them from the more 'individual' house.

2.2 Building Structure Opening

Structure opening or indoor ventilation is very important for occupant's weather for low cost or high cost building to providing healthy air, controlling moisture within the building and maximizing energy efficiency. Structure opening or ventilation depends on environment condition, microclimate and the operating of windows or other opening in the building being ventilated.

Poor indoor structure opening at home can have an adverse impact on occupant health and comfort, especially for those that have greater sensitivity, such as children, the elderly and those with respiratory problems such as asthma. Inadequate ventilation can also increase the chance of moisture problems if humidity is not expelled from within, or if humid air from outside is drawn in without adequate conditioning.

In building or room where the inside air pressure is too low the building can become depressurized, causing combustion equipment (like furnaces and water heaters) to back draft dangerous gases (such as carbon monoxide) into the building rather than out through the chimney. Under-pressurized building can also contribute to indoor air quality problems by encouraging the growth of molds and mildews in areas with poor air circulation, leading to health problems, including allergies and upper respiratory infections.

In building where the inside air pressure is too high, there is the possibility that moisture could be driven into the walls and attic and cause damage to insulation and the building structure. Overly pressurized homes can also lead to wasted energy for heating and cooling losses.

There are 2 types of ventilations, natural ventilation and mechanical ventilation. Natural ventilation was replaces indoor air with fresh outdoor air without using mechanical power. Hence, natural ventilation can save the energy consumed by the heating, ventilating, and air-conditioning systems in a building if it provides acceptable indoor air quality and thermal comfort levels. While a mechanical ventilation system can be combined with all sorts of heating and cooling systems. Often the heating, cooling and ventilation of a building are combined in the air-conditioning system.

2.3 Resident Satisfaction

Residential satisfaction, defined as the feeling of contentment when one has or achieves what one needs or desires in a house, is an important indicator and planner, architects, developers, and policymakers use it in a number of ways. It has been use as a key predictor of an individual's perceptions of general "quality of life", an indicator of incipient residential mobility and hence has altered housing demands and affected neighbourhood change. (Djebuarni & Al-Abed, 2000)

Residential and neighbourhood satisfaction is an important indicator of housing quality and condition, which affects individuals' quality of life. (abdul Ghani Salleh, 2008) Most residential satisfaction studies have integrated both objective and subjective attributes for the assessment of residential satisfaction. Francescato, Weidemann, and Anderson (1987) contend that satisfaction depends on three elements – the design which includes its space organization, layout and facilities provided, the management practices (in public housing), and the surrounding social aspects.

According to Varady and Carrozza (2000), tenant satisfaction encompasses four distinct types of satisfaction (1) satisfaction with the dwelling unit; (2) satisfaction with the services provided, including repair service; (3) satisfaction with the whole package received for the rent paid – dwelling and service; and (4) satisfaction with the neighbourhood or area.

2.4 Housing Price, the Design and Planning Standard of Low-cost in Malaysia

Low-cost housing development in Malaysia is undertaken by both the public and private sectors. Low-cost housing is defined according to its selling price of RM25000 per unit or less and it is aimed at target group of households with monthly incomes not exceeding RM750 (RM1 is approximately equivalent to US\$0.30). However, these limits have been revised recently by the government. The government's commitment towards low-cost housing started during the First Malaysia Plan (1966–1970) while the private sector's involvement was in the Second Malaysia Plan (1971–1975) when the government realized the need and importance of the role of the private sector in ensuring an adequate supply of low-cost housing for the country (Ghani & Lee, 1997).

The main objective of the Public Low-Cost Housing Programme (PLCH) is to improve the quality of life, eradicate poverty among the low-income group and to resettle the urban squatters. (Percetakan Nasional Malaysia Berhad, Kuala Lumpur. 2008)

The housing price categories in Malaysia based on the Ministry of Housing and Local Government definition. In order to improve the quality of low-cost houses and simultaneously meet private developer's argument for a review of the selling prices of these units the government has introduced in 2002 the new pricing guideline for this type of houses. With the new selling prices of low-cost houses, it is to be expected that the design specifications be revised too. The new design specifications are summarized in Table 2.1.

Table 2.1 Low-Cost Houses: New Design Specifications

Elements	Terrace Houses	Flats
Floor Space	48-60 m ²	45-56 m ²
Bedroom		
-minimum number	3	3
-minimum area of habitable room		
(i) First room	11.7 m ²	11.7 m ²
(ii) Second room	9.9 m ²	9.9 m ²
(iii) Third room	7.2 m ²	7.2 m ²
Kitchen-minimum area	4.5 m ²	4.5 m ²
Living and dining rooms	Provided as one combined space or separately with adequate area according to internal layout.	Provided as one combined space or separately with adequate area according to internal layout.
Bathroom and toilet	Provided separately with minimum area of 1.8 m ² each.	Provided separately with minimum area of 1.8 m ² each.
Storage space and porch	Adequate provision for resident's comfort.	Adequate provision for resident's convenience and comfort.
Drying area (*) Launderette facilities		Adequate provision for each unit.

Note: (*) Must be provided according to the '**Guidelines for the provision of launderette facilities in multi-storey buildings**'

Prepared by Local Government Department, Ministry of Housing and Local Government.

Source: Ministry Of Housing and Local Government, 2002

2.5 The Concept of Low-cost Housing

Basically, low cost housing is defined according to its selling price of RM 25,000.00 to RM 42,000.00 per unit. Below are the following guidelines laid down by The Ministry of Housing and Local Government for this category of housing:-

- 2.5.1 The target group consists of households with monthly incomes not more than RM750.00
- 2.5.2 The type of house includes terrace, flats or detached houses.
- 2.5.3 The minimum design standard specifies a built up area of 560-600 square feet, 3 bedrooms, a living room, a kitchen and a bathroom.

Low cost houses are built in order to ensure that Malaysians particularly of the low income group have greater access to adequate and affordable home and related facilities thus gradually reducing poverty.

2.6 The Purpose of Structure Opening (Ventilation)

Ventilation is important for the comfort of the occupants and to ensure a healthier living environment. Below are the factors for the purpose of ventilation in a building: -

- 2.6.1. To fulfill health needs which are to maintain air quality in a building to a minimum level which is to replace used air with fresh, clean air.
- 2.6.2. To create thermal comfort by encouraging evaporation of moisture and increasing heat loss and lessen the discomfort caused by moist and sticky skin.
- 2.6.3. To cool the building structure whenever the temperature inside a building is higher than the temperature outside the building.
- 2.6.4. To cool the body by encouraging evaporation of moisture from the skin and increasing heat loss from the skin by forced convection

For tropical climate, which is hot and humid, natural ventilation is the best approach that can be provided at a lower cost compared mechanical ventilation. A majority of residential buildings in Malaysia were constructed based on the natural ventilation system (Smith Peter R. and Tamakloe Patrick K., 1963).

2.7 Effects of Structure Opening

The Environmental Protection Agency indicates that indoor air pollutants in office buildings, public areas and homes may be two to five times and sometimes as much as 100 times, higher than outdoor levels. This is a special concern since most people spend 90 percent of their time indoors.

Poor indoor ventilation at building can have an adverse impact on occupant health and comfort, especially for those have greater sensitivity, such as children, the elderly and those with respiratory problems such as asthma. Inadequate ventilation can also increase the chance of moisture problems if humidity is not expelled from within, or if humid air from outside is drawn in without adequate conditioning. (EPA)