



UNIVERSITI PUTRA MALAYSIA

**A SURVEY ON BUILDING SYSTEMS
IN MALAYSIA**

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**A SURVEY ON BUILDING SYSTEMS
IN MALAYSIA**

By

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**Thesis Submitted in Partial Fulfilment of Requirements for the Degree of
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**DEDICATED TO
MY
PARENTS**



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A SURVEY ON BUILDING SYSTEMS IN MALAYSIA

BY

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In recent years the term “system” has been frequently used in the “Operational Research” jargon, probably is a result of the terms “Systematic Approach” and “Systematic Analysis”. In some minds the term system represents computerization, but this word has been used in other fields as well, explaining the complexity and inter-relationship between the parts such as building system. Because of this broadness of activities and functions that the term “system” denotes, it has recently been used in the field of construction to show the variety of complex problems which are closely related within the process of building.

Malaysia is presently look at building systems as an answer to housing shortage problem. The main advantages of using building system are, speed, quality, and economics, all of which are required to meet such a large demand for housing.

The clear understand of the current status of building systems will help to set the housing programs under the Seventh Malaysia Plan (1996-2000). However, the first



step in any advance study on building systems and its technology should be initiated by knowing the status quo.

In this thesis, three case studies and questionnaire survey were conducted. The case studies have been conducted on the unconventional construction methods, which are full prefabricated; cast in-situ; and composite construction methods. The questionnaire survey was carried out on the building system companies to understand their building system usage and current status. On the basis of the study, the building systems existing in Malaysia have been classified according to the method of construction and type of production.

The study found many types of building systems implemented in Malaysia, each have its own characteristic features, advantages, and disadvantages. These systems are the formwork, precast load bearing wall panel, precast frame, sandwich panel, interlocking block, and steel systems. The quality, speed of construction, and cost saving are the main advantages of the building systems in Malaysia, while the main disadvantages are highly capital intensive, the need for heavy equipment, and the shortage of raw materials. Finally, a comparison was made between the building system construction methods and conventional construction method. This comparison is based on the Malaysian construction industry environment.

Abstrak tesis ini diserahkan kepada Senat Universiti Putra Malaysia sebagai memenuhi sebahagian daripada keperluan untuk ijazah Master Sains.

A SURVEY ON BUILDING SYSTEMS IN MALAYSIA

**OLEH
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Dalam tahun-tahun kebelakangan, definisi “Sistem” selalunya digunakan dalam bahasa kajian operasi, berkemungkinan berpunca dari perkataan “Pengenalan Sistematik” dan “Analisis Sistematik”. Pada sesetengah pihak, perkataan sistem mewakili komputersasi tetapi perkataan ini juga banyak digunakan dalam bidang-bidang lain yang menerangkan kompleksiti dan perhubungan antara bahagian seperti sistem pembinaan. Disebabkan oleh aktiviti dan fungsi yang menggunakan “sistem” begitu banyak, ianya, juga telah digunakan dalam bidang pembinaan untuk menunjukkan variasi masalah yang rumit yang berhubungkait dengan proses pembinaan.

Pada masa sekarang Malaysia sedang mengkaji sistem-sistem pembinaan yang ada bagi menyelesaikan masalah perumahan yang timbul. Kelebihan menggunakan sistem pembinaan yang baik ialah kepantasan kerja, kualiti dan penjimatan yang mana semua faktor tersebut adalah penting bagi menampung permintaan rumah yang kian meningkat.

Pemahaman yang jelas dalam status terkini sistem-sistem pembinaan akan dapat membantu perancangan program perumahan di bawah Rancangan Malaysia



Pemahaman yang jelas dalam status terkini sistem-sistem pembinaan akan dapat membantu perancangan program perumahan di bawah Rancangan Malaysia ke 7 (1996-2000). Walaubagaimanapun pemahaman tentang permasalahan yang wujud sekarang adalah penting sebelum sebarang kajian lebih lanjut dijalankan mengenai sistem-sistem pembinaan dan teknologinya.

Dalam tesis ini, kajian ilmiah dan soal selidik telah dijalankan. Kajian ilmiah telah dijalankan keatas kaedah pembinaan tidak lazim. Manakala borang kaji selidik telah diedarkan kepada syarikat-syarikat pembinaan bagi mendapatkan maklumat yang tepat tentang penggunaan sistem pembinaan dan statusnya sekarang. Pada dasarnya, sistem-sistem pembinaan yang terdapat di Malaysia telah diklasifikasikan mengikut kaedah pembinaan dan jenis pembuatan.

Kajian ini mendapati terdapat banyak jenis sistem pembinaan yang digunakan di Malaysia, yang mana tiap satunya mempunyai kelebihan dan keburukannya sendiri. Akhir sekali, sebuah perbandingan dilakukan antara sistem pembinaan dengan kaedah tradisional. Perbandingan ini dibuat berdasarkan persekitaran sektor pembinaan di Malaysia.

CHAPTER I

INTRODUCTION

Malaysia's housing policy is geared towards meeting the objective of ensuring access to adequate and decent shelter to all its citizen particularly the low income groups. The national housing policy will effectively contribute towards the provision of physical shelter as a basic social need towards improving and enhancing the quality of life through the erection of decent and viable human settlements. In implementing this policy the quantitative and qualitative aspects of housing development are taken into account (Yahya, 1997).

While the problem of housing grows more acute, Malaysia is struggling to meet its own housing needs and is doing so through an increasingly advanced technology. The conventional construction method, due to the slow pace of construction and higher cost, is not able to meet the demand (Agus, 1997).

Malaysia is presently taking a long hard look at building systems as an answer to housing shortage problem. It has been suggested that there are a number of appropriate industrialized building systems which are useful for wide range of specific uses and situation, but none of them is applicable to all construction sites. They are dependent upon and influenced by many other aspects of the housing

situation such as land use, density, volume, environmental conditions, user needs, continuity of demand, and labour.

The clear understanding of the current status of building systems will help to set the housing programmes under the Seventh Malaysia Plan (1996-2000). However, the first step in any advance study on building systems and its technology should be initiated by knowing the status quo.

Historical Background

During the First Malaya Plan (1956-1960) a small provision of about RM 10 million was made in the development estimates for low cost housing followed by the provision of some RM 40 million in the Second Malaya Plan (1961-1965). During these periods housing was placed under the Ministry of Interior. In 1964, following the General Elections in April, a new Ministry of Local Government and Housing was established, which could be interpreted as an indication of the government's interest in pushing forward a more vigorous programme of public housing development. Some scattered housing projects were built in certain big towns in Malaysia. The response from the people who applied for such house was beyond expectation. In one case there were over 8,000 applicants for only a hundred units of such low cost house in Penang (Chew, 1986). This jolted the Ministry to take a look at the housing situation in the country. For the First Malaysia Plan (1966-1970), the Government voted RM150 million for low cost housing, almost of three to four times the provision in the previous development plan. The result was that about 22,500 low cost housing units were built during this

period with several thousand units under construction, as against about 7,500 units during the previous plan (Chua, 1980).

But the funds provided by the government for housing in all these years fell short of demand, although the actual extent of demand was not known. Judging by the rate of population increase and the backlog of housing, it was estimated that something like 32,000 low cost dwelling should be built annually throughout West Malaysia. The lack of data also prompted the Ministry to press for a housing census in conjunction with the population census in 1970. The housing census data is now available and is being analysed. Absolute figures indicate that there are 1.4 million dwellings for population of approximately 9 million. The average household size is 6.6 and the ratio of households to living quarters is 1:08 (Jagatheesan,1979).

For the Third Malaysia Plan (1976-1980) the project housing needs were 500,000 units of various categories of houses. However by the beginning of the Fourth Malaysia Plan (1981-1985) the housing needs shot up to 923,300 units.

The Fifth Malaysia plan (1986-1990) envisaged a total of 701,500 units of which 71 per cent is low cost houses (Chew, 1986). During the Sixth Malaysia Plan (1991-1995), the public and private sectors constructed a total of 667,745 houses. The public sector's contribution constituted 104,524 units (15.7 per cent), while that of private sector was 563,221 units (84.3 per cent). By price breakdown, 260,797 units or 40.9 per cent constituted low cost units, 288,877 units and 188,071 units were medium and high cost respectively (Ministry of Housing and

Local Government Malaysia, 1997). Table 1 shows Malaysia plans from (1976-1995) for low cost housing project.

Table 1: Malaysia Plans From (1976-1995) for Low Cost Housing

Malaysia Plan	Number of projects completed	Number of units constructed
3 rd Malaysia Plan (1976-1980)	21	5,153
4 th Malaysia plan (1981-1985)	143	21,556
5 th Malaysia plan (1986-1990)	72	13,992
6 th Malaysia plan (1991-1995)	28	6,042

Source: Ministry of Housing and Local Government Malaysia, 1997.

There is an increasing recognition by government in this region particularly, of the importance of housing for the large masses of low-income people. The Malaysian Government has always been concerned with ensuring that all Malaysians have access to adequate housing. This social obligation becomes especially vital when the home ownership is realised, not just mere shelter seeking, is the desire of every Malaysian (Salleh and Meng, 1997).

Under the Seventh Malaysia Plan (1996-2000), the Government has drawn up a housing programme involving the planned construction of some 800,000 units of houses by both the public and private sectors. These houses are categorised in Table 2.

Table 2: Categorised of Housing

house cost level	cost of one unit	No. of units	percentage of the total No. of unit
i- low cost house	costing not more then RM 25,000	235,000 units	29.3 per cent
ii- low-medium cost house	costing between RM 25,000 to RM 60,000	350,000 units	43.75 per cent
iii- medium cost house	costing more than RM 60,000 but not exceeding RM 100,00	85,000 units	16.25 per cent
iv- high cost house	costing RM 100,000 and above	85,000 units	10.63 per cent

Source: Ministry of Housing and Local Government Malaysia, 1997.

The housing programmes under the Seventh Plan particularly emphasise the construction of more low medium cost houses. The private sector will play an increasingly important role in meeting the housing needs of the population. During the plan period, the private sector is expected to construct about 570,000 units or 71.3 per cent of the total. Of the total to be constructed by the private sector, 24.6 per cent will be low cost houses and 42.1 per cent low medium cost houses (Ministry of Housing and Local Government Malaysia, 1997).

Waleed et al. (1997) stated that to achieve this target using the present conventional Building System (reinforced concrete frames and brick as in-fill) will require an excessive number of workers, since on average only one house is completed per year per worker (on house/ year/ worker). The rising cost of labour (unskilled foreign workers) is an important factor in increasing the total cost of the house (the labour cost has increased to 30 per cent of the construction cost

compared to 10 per cent a few years ago). Moreover, the required quality can not be achieved due to poor quality control at the site. In order to overcome the present problems, the mass production of housing under high quality control is required.

The concept of mass production of quality building is termed “Industrialised Building System”. By using new building systems and factory produced building components and by pioneering “conveyor belt” mass production technique at the building site, it may be possible for each building worker to construct up to 10 houses per year (Waleed et al., 1997).

Industrialised System means that to build on site with elements or components produced by series in plants. These components are such as floors, walls, columns, beams, and roofs. They are then assembled and erected on the site properly joined to form the final units. However, it is accepted that the Industrialised System is the only way to bridge the gap between demand and supply (Rollet, 1986).

For the building industry, industrialisation involves the rationalisation of the whole process of building, which includes the process of design, the forms of construction used, and the methods of building adopted in order to achieve an integration of design, supply of materials, fabrication and assembly so that building work is carried out more quickly, with less labour on site, and if possible, at less cost (Friedman and Cammalleri, 1993).

Mullens (1995) reported that the leading idea of industrialisation of building was to transfer the major share of production activities from site to a factory, where various methods and techniques of mass manufacturing can be used, and an increase of productivity can be ensured. For this, standardisation of building components was necessary. This was the background of industrialisation in the sixties and seventies. Industrialisation equalled to the use of prefabricated components and their manufacturing techniques.

In the eighties, the leading ideas were productivity increase, on the one hand, and flexibility of system buildings, providing for easy customisation and powerful architectural expression, on the other hand. Requirements with increasing importance were also the service life assessment, energy, operability, maintainability, recyclability and the total quality. Information technology, automation and robotics emerged as powerful means for realisation of these requirements. Now, in the nineties the leading idea is process improvement and redesign. It is understood that it is not enough to convert construction to seem like manufacturing or to introduce advanced technology. Rather the goal is to have processes that generate maximum value to their customers and contain minimum amount of waste (Mullens, 1995).

Objective

The aim of this research is to survey the current status of the building systems exist in Malaysia, and to find out the practice use of the existing building system technology. In addition to that, secondary objectives may be achieved by this research are such as:

- i- Providing a new building systems classification;
- ii- Since there are no list or registry for the building system companies, the approach was to get a list of these companies in Malaysia; and
- iii- Providing information regarding current status of the building systems.

The above objectives will be achieved through the following:

- i- Provide a detailed explanation for each type of the building systems;
- ii- Survey by using questionnaire; and
- iii- present and discuss case studies for some available systems constructed in Malaysia.

The method of approach adopted in this study is shown in Figure 1.

Justification

Available literature indicates that considerable research efforts have been directed towards the ‘hardware elements’ of the building systems technology, as will be shown in the literature review in Chapter II. However, the hardware elements are concerned with the structure itself. Nonetheless, to date, the ‘software elements’ of the building systems, which concerned with the data and information