

**THE APPLICATION OF INDUSTRIALISED BUILDING SYSTEM IN RESIDENTIAL
PROJECT**

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ABSTRACT

Industrialised Building System (IBS) is an alternative of construction that can change many aspects in building construction. The Industrialised Building System (IBS) is a construction system that is built using pre-fabricated components and is systematically done using machine, formworks and other forms of mechanical equipment. Before this, the construction industry in Malaysia had faced so many problems related to the increasing of using foreign workers, waste of building materials, uncontrolled quality of building materials, unsafe construction site and delay of construction period. This study is done in order to identify the number of Industrialised Building System (IBS) used in residential project, to analyze the types of Industrialised Building System (IBS) used in residential project, and to analyze the method to expand the use of Industrialised Building System (IBS) in residential project. The study is done by distributing the questionnaire by postage delivery and conducting an interview. Through detailed reading and distributed questionnaire, the number of Industrialised Building System used in residential project is identified. To conclude, the Industrialised Building System is still not widely used in the residential project. Most of the housing companies are using precast-concrete framing, panel and box system in residential project. Based on the results obtained, to reduce the Industrialised Building System (IBS) component price rate is the most preferable solution to this matter.

ABSTRAK

Sistem Binaan Berindustri adalah satu alternatif baru yang dapat mengubah banyak aspek dalam pembinaan bangunan. Sistem Binaan Berindustri adalah satu sistem pembinaan yang dibina menggunakan barang pasang siap yang secara sistematiknya dilakukan dengan menggunakan mesin, kotak acuan dan peralatan mekanikal. Sebelum ini, Malaysia telah menghadapi pelbagai masalah seperti peningkatan bilangan pekerja asing, pembaziran bahan binaan, tempat pembinaan yang tidak selamat dan penangguhan masa pembinaan. Kajian ini dijalankan untuk mengenalpasti bilangan Sistem Binaan Berindustri yang digunakan dalam projek perumahan, menganalisis jenis-jenis Sistem Binaan Berindustri yang digunakan dalam projek perumahan dan menganalisis cara-cara yang sesuai untuk meluaskan penggunaan Sistem Binaan Berindustri dalam projek perumahan. Kajian ini dijalankan dengan mengedarkan borang kaji selidik melalui penghantaran pos dan mengadakan temubual. Melalui pembacaan yang teliti dan edaran borang kaji selidik, bilangan Sistem Binaan Berindustri yang digunakan dalam projek perumahan dapat dikenal pasti. Kesimpulannya, Sistem Binaan Berindustri masih tidak digunakan lagi secara meluas. Kebanyakan syarikat perumahan menggunakan Sistem Kekotak, Panel dan Kerangka Konkrit Pratuang dalam projek perumahan. Berdasarkan keputusan yang diperolehi, mengurangkan kadar harga komponen Sistem Binaan Berindustri adalah cara yang paling sesuai untuk penyelesaian kepada masalah ini.

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CHAPTER 1

INTRODUCTION

1.1 Background Study

Industrialised Building System is an advancement of the new construction technology for the time being. It is an alternative of construction that can change many aspects in building construction. The industrialized building system is a construction system that is built using pre-fabricated components and is systematically done using machine, formworks and other forms of mechanical equipment (Rahman & Omar, 2006). The components are manufactured offsite and once completed will be delivered to construction sites for assembly and erection (Rahman & Omar, 2006). It is also can be interpreted as a system which component is manufactured in factory and then installed on site based on the size and dimension of the component required. Furthermore, a system in which concrete components prefabricated at site or in factory are assembly to form the structure with minimum in situ construction (Triksa, 1999).

Industrialised Building System is not new in Malaysia. It had begun in early 1960s when Ministry of Housing and Local Government of Malaysia visited several European countries and evaluate their housing development program (Thanoon et al, 2003). In 1964, after the visit the government had launched two (2) projects which are pilot project to increase the delivery time and Light Rail Transit (LRT) station. In order to build the project incriminate seven (7) blocks of 17-storey flats, approximately 22.7 acres of land along Jalan Pekeliling was reserved. The project was using the Danish System of large panels in a pre-fabricated system.

A year later, the government launched another project that is a six (6) block of 17-storey flats and three (3) blocks of 18-storey flats at Jalan Rifle Range. The project was awarded to Hochtief Chee Seng using French Estoit System (Din, 1984).

Currently, the Industrialised Building System (IBS) in Malaysia has gradually widely used as a modern method of construction. As an example, the Industrialised Building System (IBS) has been applied in several projects such as Kuala Lumpur International Airport (KLIA), government quarters in Putrajaya, KL Sentral, Light Rail Transit (LRT) and Bukit Jalil Sport Complex. Besides, Industrialised Building System (IBS) Centre which is located at Jalan Chan Sow Lin, Cheras, Kuala Lumpur was established to help on the evolvement of the system. The implementation of Industrialised Building System (IBS) in this country will help to reduce the entrance of foreign labor and to expedite the progress of the construction.

There are five (5) common types of Industrialised Building System (IBS) which are generally used in construction. There are Pre-cast Concrete Framing, Panel and Box Systems, Steel Formwork System, Steel Framing

System, Prefabricated Timber Framing System, and Block Work System. The steel formwork system does not require heavy machinery or high technology. So, it is suitable for the construction projects which want to reduce the unskilled labor. The formwork system used as a mould with a wet concrete poured into it and act as a temporary support for the structure. It also can increase the level of accuracy of the design, the quality of the product and the time taken to finish the construction project.

Industrialised Building System (IBS) has proven that it can contribute many advantages in construction project. The Industrialised Building System (IBS) can reduce the number of unskilled and foreign workers on site. The presence of them can increase cost and wastage in construction industry. In addition, Industrialised Building System (IBS) can make the time period of construction progress become shorter and it can be finished before or on time. The quality of the structural works can be guaranteed because the size and the dimensions of the components had been specified through the design. The safe environment platform can be provided to the workers since the site is clean from the mess of construction tools, prevent the congested environment that full with too many workers and prevent social problems among the workers.

It is important to implement Industrialised Building System (IBS) in Malaysia because of high demand from the clients in construction activities. This attracts a high number of foreign labor to be employed to do the hand jobs. With the implementation of Industrialised Building System (IBS), the number of foreign labor and the cost of the construction project can be reduced. Besides, the economical forces can be one of the reasons why the Industrialised Building System (IBS) is so important to our country. This factor may affect the organizational of the clients and also the construction progress.

IBS offers benefits to adopters in term of cost and time certainty, attaining better construction quality and productivity, reducing risk related to occupational safety and health, alleviating issue on skilled workers and dependency on manual foreign labor and achieving ultimate goal of reducing overall cost of construction (Construction Research Institute of Malaysia, 2009).

1.2 Problem Statement

Nowadays, the construction industry in Malaysia has been changed due to the current technology which increases the level of quality and safety of the building. The Industrialised Building System (IBS) is the only solution for the problem happened in the construction industry. It is a construction process which is using the technique, product, and component or construction system involving the installation of construction component on construction site.

Before this, the construction industry in Malaysia had faced so many problems related to the increasing of using foreign workers, waste of building materials, uncontrolled quality of building materials, unsafe construction site and delay of construction period.

However, the use of Industrialised Building System (IBS) in Malaysia currently is still low. Based on the Industrialised Building System (IBS) survey which was conducted on 2003 stated that the usage level of Industrial Building System (IBS) is only at fifteen percent (15%). The government had attempted to promote to the construction sector on the application of Industrialised Building System (IBS) but yet they still use the traditional method that is definitely wasteful and create too many problems in construction site.

Nevertheless, the government effort could replace the unskilled foreign labour with the skill workforce.

In order to implement the Industrialised Building System (IBS) in local construction industries, the government had issued a circular requiring seventy percent (70%) of using Industrialised Building System (IBS) in all government projects. Furthermore, the government has expected to reduce fifty percent (50%) or one hundred-sixty thousand (160,000) of unskilled foreign workers with the implementation of hundred percent (100%) of Industrialized Building System (IBS) usage in local construction industry in 2010. Nevertheless, the foreign workers should be reduced to prevent the leakage of implementation stimulus package mainly in the flow of money.

Based on monetary of economic and financial IBS Roadmap 2003-2010, it has been assigned to use thirty percent (30%) of the one hundred-fifty (150,000) units of houses proposed to be built by Syarikat Perumahan Negara Berhad (SPNB) under the 2003 Economy Stimulus Package. Besides, it enforced the IBS usage in government (building) projects in phases (from thirty percent (30%) in 2004 to seventy percent (70%) in 2008). Furthermore, it offered levy exemptions from 2004 for low cost, low medium cost and medium cost housing projects and reduce fifty percent (50%) levy for other types of houses for the developers using modular dimension in their designs after end of the enforcement period of the 2003 Economy Stimulus Package (Industrialized Building System (IBS) Roadmap 2003-2010).

The industry provides job opportunities for 800,000 people which represented 8% of total workforce (CIMP, 2006). The construction industry is one of the productive sectors that constantly contribute to the economy. However, its growth rates fluctuates between extremities that varies from as

high as 21.1 percent in 1995 to as low as -24 percent in 1998. Since the 1990's, the contribution of the construction sector to the Gross Domestic Product (GDP) also fluctuated albeit at a more stable rate varying from a high of 4.8 percent in 1997 to an estimated low of 2.7 percent in 2005 (CIDB, 2008).

Evidently, it shows that there is high demand in construction activities that can attract too many foreign workers to this country. Simultaneously, it contributes to a huge number of unskilled labours to do the hand jobs. Since the current situation happened, it may cause the limited skilled and talented workers to work on site.

According to Construction Industry Development Board (CIDB) Malaysia, sixty-nine percent (69%) (552,000) out of total 800,000 of registered workers at June 2007 is foreign workers (CIDB, 2007). As a result, it can contribute to social problems among community and less opportunity for the local workers to take the job on site. When they first arrived to this country, they are generally not a skilled labour. This matter causes low quality and productivity in construction activities.

The adoption of Industrialised Building System (IBS) can develop benefits in economic, social and environmental to the country. Since the unskilled labours become less, the dependency on foreign labour force can be reduced. Moreover, a great opportunity and a new job can be created since the industries are using the manufacturing component system.

1.1 Objective of Study

The study is done to achieve the goals which satisfy the title of the study which is The Application of Industrialised Building System (IBS) in residential project. The objectives of the study are:

- i. To identify the number of Industrialised Building System (IBS) used in residential project.
- ii. To analyze the types of Industrialised Building System (IBS) used in residential project.
- iii. To analyze the suggestion method in order to widen the use of Industrialised Building System (IBS) in residential project.

1.2 Scope of study

The study will be done based on the scope limit to ensure the objectives of the study can be achieved. The study will be focused on four (4) parts. There are the area of study, the method of study, the respondents involved and the area of topic of the study. This study will be conducted at Pahang which consists of several districts. The reason of choosing Pahang is the state has high number of housing company. This study will be conducted in two (2) methods. The first method will be done by interviewing the respondent involved with the questionnaires provided. The second method is by sending the questionnaires through postage delivery to the developer of the housing company. The targeted respondents involved in this study are the developer, the engineer, the architect and the quantity surveyor. The topic of the study will be focused on Industrialised Building System (IBS).

1.3 Methodology

Methodology consists of several procedures or methods which can be a guideline while doing the study. The stage of the method is arranged in sequence to ensure the good quality of the study and the objectives of the study can be achieved. Besides, the methodology is important to ensure that the progression of the study will be done right on time and avoid careless during the process.

Based on Figure 1.1, the step is initiated with field selection and meeting supervisor. Then, it followed by the next step that is problem identifying and objective determination. The problem is identified based on the current issues for the selected topic. As the problem is determined, the objective of the study is defined. The objective of the study is defined to achieve the determined goals. The scope of study is a method to specify the limit of the study. The next step is getting the information for the literature review. It can be a reference in order to develop a questionnaire. In addition, the purpose of literature review is to gain more understanding for this topic. The literature review is based on other resources such as journals, books, previous thesis, proceeding papers, internet and newspapers. The next step will be the data collection and data analysis. The data will be collected through distributing the questionnaire and conducting the interviews with the respondents involved. Then the data will be analysed by using the software such as Microsoft Excel and Statistical Packages for Social Sciences Software (SSPS). As the result obtained, the conclusion and recommendation will be suggested to improve the performance of the study.

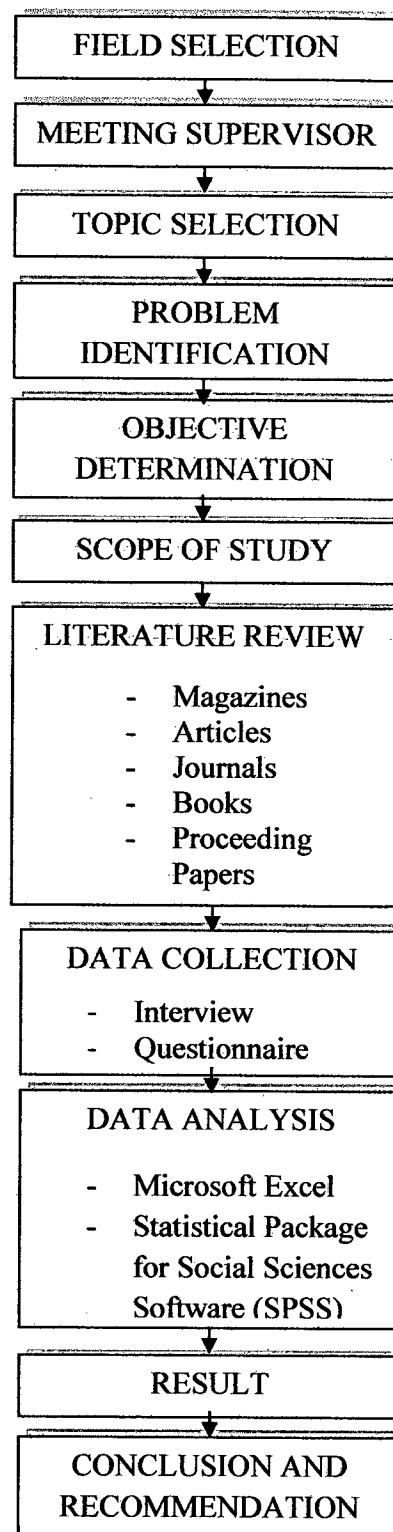


Figure 1.1: Flowchart of methodology

1.4 Significance of study

This study will be done to identify the number of housing company in Pahang which using the Industrialised Building System (IBS) in the project and to suggest and promote to the developers to apply the system. Besides, the study will be done to overcome the problems occurred in construction site and to help the government in managing the expenditure of local country based on 2010 budget by reducing foreign workers in construction site. In addition, the study is to determine the best solution and recommendation to solve the current problem by using the Industrialised Building System (IBS).

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Industrialised Building System (IBS) is a construction technological advancement that produced the construction material which is assembled on site. It is a very systematic system that can change the current scenario and problems occurred in local construction industry. The prefabricated components were fabricated at factory and then will be delivered to the site.

At the beginning process, the production of the component may involved planning, managing and maintaining quality to reduce waste (material and cost) and to ensure the component has no defect and can be delivered on time.

Industrialised Building System (IBS) can reduce unskilled and foreign workforce, provide a safe environment on site, shorten the time period of construction process, ensure the quality of the structural works, and saving cost.

2.2 Definition of Industrialised Building System (IBS)

Industrialised Building System can be defined in many terms based on their perception of Industrialised Building System (IBS) conceptual.

According to Rahman & Omar (2006), they defining Industrialised Building System (IBS) as a construction which is using prefabricated materials in construction which was manufactured and pre-assembled in factory then transported to the site to be fully assembled and erected. The fabricated components are manufactured mechanically by using the machine or formworks in factory.

IBS is also defined as an integrated manufacturing and construction process with well planned organization for efficient management, preparation and control over resources used, activities and results supported by the used of highly developed components (Lessing, *et al.*, 2005).

Chung & Kadir (2007) stated that Industrialised Building System (IBS) is a mass production of building components which is assembled in factory or at site based on the standard shape, size and dimension of the components. The component then will be delivered to the construction site to be re-arranged according to the standard requirement to construct the building.

The Construction Industry Development Board (CIDB) described Industrialised Building System (IBS) as building systems where the components are manufactured in a factory, on or off site or can be called as prefabricated components. Then the materials will be transported, positioned and assembled on site with less of additional site works.