UNIVERSITI PUTRA MALAYSIA

CASE STUDY ON INDUSTRILAIZED BUILDING SYSTEM (IBS)

MOHAMED ABDELGADIR SATTI OSMAN

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CASE STUDY ON INDUSTRILAIZED BUILDING SYSTEM (IBS)

By

MOHAMED ABDELGADIR SATTI OSMAN

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Project Report Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science in Structural Engineering and Construction, Faculty of Engineering, University Putra Malaysia
June 2006

Dedicated to my parents, brothers and sisters
The most compassionate, kindest persons in the world

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Abstract of project report presented to the Senate of University Putra Malaysia in partial fulfillment of the requirement of the degree of the Master of Science

CASE STUDY ON INDUSTRILAIZED BUILDING SYSTEM (IBS)

By

MOHAMED ABDELGADIR SATTI OSMAN

June 2006

Chairman: Assoc. Prof. Mohd Razali Abdul Kadir, Ph.D.

Faculty: Engineering

The construction industry suffers from many problems. The performance of this industry needs to be greatly improved if it so to survive from international competition and increased customer expectations.

The building industry which is still very traditional should move towards full industrialization to achieve higher quality, less time and reduce cost. This can be benefited by learning more from manufacturing industry.

Industrialised construction methods could be a practical alternative to traditional construction methods for construction projects. Industrialized construction methods are not much used in building projects. In this research three case studies where undertaken. These case studies were companies applying industrializing building systems in their projects. These projects have been conducted in relation with construction and manufacturing process. A number of

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visits and interviews were held to manufacturing factories of prefabricated components and construction sites and some governmental bodies such as CIDB. This was accomplished by designing a questionnaire and presenting it to a number of people in different positions related to this field.

It has been found that manufacturing and prefabrication in building offers a range of potential benefits to those who choose to use them. Quality control and precision can be sustained at a higher level in prefabricated building components due to the controlled factory working conditions and advanced technology available. Other benefits include a reduced number of material deliveries to the job site, resulting in less coordination conflicts among trades.

Even though IBS is not new in the Malaysian construction, the usage is still very low compared to conventional methods due to number of problems bordering these methods, and limiting them from expanding. These problems are also studied, and some conclusions and recommendation are given.

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Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

KES KAJIAN SISTEM INDUSTRI PEMBINAAN

Oleh

MOHAMED ABDELGADIR SATTI OSMAN
Jun 2006

Pengerusi: Profesor Madya Ir. Mohd Razali Abdul Kadir, Ph.D.

Fakulti: Kejuruteraan

Industri pembinaan mengalami berbagai masalah. Prestasi industri perlu ditingkatkan jika mahu bertahan daripada persaingan antara bangsa dan peningkatan harapan pelanggan.

Industri binaan yang masih sangat tradisional, haruslah bergerak kearah perindustrian sepenuhnya untuk mencapai kualiti yang tinggi dalam masa yang singkat disamping mengurangkan kos. Ini boleh dimanfaatkan daripada mempelajari industri buatan.

Kaedah industri pembinaan dan pra pembuatan merupakan alternative kepada kaedah pembinaan tradisional untuk projek projek pemanjangan vertical. Kaedah industri pbinaan tnakan dalam projek projek pembinaan dan kes kajian dijalankan. Dalam kes kajian keluasan pengunaan projekindustri binaan dikaji. Bagaimana projek projek dilaksanakan berasaskan proses pembinaan dan pembuatan turut dikaji.

Pembuatan dan prapembuatan dalam pembinaan memberikan potensi yang bermanfaat kepada sesiapa yang memilih untuk mengunakannya. Kawalan kualiti dan ketepatan boleh dikekalkan pada tahap yang tinggi dalam komponen prapembuatan. Ini kerana

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keadaan dalam kilang boleh dikawal dan teknologi yang lebih tinggi boleh didapati dalam kilang berbanding di tapak binaan. Selain itu pengurangan penghantaran bahan ketapak binaan juga menghasilkan kurang percanggahan antara dagangan.

Walaupun IBS bukanlah sesuatu yang baru dalam bidang pembinaan di Malaysia, pengunaanya sangat rendah berbanding kaedah konvensional disebabkan oleh beberapa masalah yang menghadkan kaedah ini daripada berkembang, masalah ini turut dikaji dan beberapa cadangan dan penyelesaian diberi.

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

اقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ ﴿ ١ ﴾خَلَقَ الإِنسَانَ مِنْ عَلَقٍ ﴿ ٢ ﴾اقْرَأْ وَرَبُّكَ الأَكْرَمُ
﴿ ٣ ﴾الَّذِي عَلَّمَ بِالْقَلَمِ ﴿ ٤ ﴾عَلَّمَ الإِنسَانَ مَا لَمْ يَعْلَمْ ﴿ ٥ ﴾

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Mohamed Abdelgadir Satti Osman
Faculty of Engineering,
UPM, Malaysia
June 2006

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APPROVAL SHEET

This thesis submitted to the Faculty of Engineering of University Putra Malaysia and has been accepted as partial fulfillment of the requirements for the Degree of Master of Science.

_____ _____

Assoc. Prof. Ir. Dr. Mohd Razali Abdul Kadir **Date**
Department of Civil Engineering
Faculty of Engineering
University Putra Malaysia
(Supervisor)

_____ _____

Assoc. Prof. Ir. Dr. Mohd. Saleh Jaafar **Date**
Department of Civil Engineering
Faculty of Engineering
University Putra Malaysia
(Panel Examiner)

_____ _____

Assoc. Prof. Dr. Jamaloddin Noorzaei **Date**
Department of Civil Engineering
Faculty of Engineering
University Putra Malaysia
(Panel Examiner)

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

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MOHAMED ABDELGADIR SATTI OSMAN

Date:

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ABSTRAK

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

KES KAJIAN SISTEM INDUSTRI PEMBINAAN

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Walaupun IBS bukanlah sesuatu yang baru dalam bidang pembinaan di Malaysia, pengunaanya sangat rendah berbanding kaedah konvensional disebabkan oleh beberapa masalah yang menghadkan kaedah ini daripada berkembang, masalah ini turut dikaji dan beberapa cadangan dan penyelesaian diberi.

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Chapter 1

Introduction

1.1 Background

The construction industry suffers from many problems. Construction productivity lags behind that of manufacturing. Occupational safety notoriously worse than in other industries. The quality of construction is considered to be insufficient (Koskela, 2000).

The performance of this industry needs to be greatly improved if it so to survive from international competition and increased customer expectations.

The building industry which is still very traditional should move towards full industrialization to achieve higher quality, less time and reduce coast. This can benefit by learning more from manufacturing industry, thus, Industrilaized buildings systems could be a practical alternative to traditional construction methods for construction projects.

Manufacturing and prefabrication in building, offer a range of potential benefits to those who choose to use them. Quality control and precision can be sustained at a higher level in prefabricated building components. This is because factory working conditions can be controlled, and more advanced technology is available than at building sites. Other benefits include a reduced

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number of material deliveries to the job site, resulting in less coordination conflicts among trades (Obiso, 1997).

Construction as a manufacture process does not imply the use of assembly lines, rather it is the complete and consistence changeability of parts and the simplicity of attaching them to each other. If the building components (beams, columns, fixings, etc.) were standardized, and were designed to be assembled in a simple manner, it is obvious that productivity gains will result (Crowley, 1998).

The ideas of industrialised production methods for the construction industry have been discussed during many years. In the sixties the production of the structural components of buildings was industrialised and the material used was often concrete. The structural components were erected on the site and afterwards interior work, service and installation were installed on the site.
Concrete and steel were the main materials used in the elements and the components. Concrete slabs and columns result in heavy elements, which require a large crane to handle these elements at the construction site (Bergsten, 2005).

(Warsawski, 1999) points out that the share of industrialaized building in the total output is not increasing in most countries, as expected, mainly due to the following reasons:

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- The failure of designer and producer to think in systems rather than in individual elements resulted in less attractive buildings and less efficient building systems.
- The fragmented and diversified demand of that time made prefabrication less competitive than existing methods. Methods and tools for the automation of the building process were not yet developed.
- Lesser demand, lack of system approach and lack of efficient management resulted in a higher unit cost than that of traditionally constructed ones.

1.2 Problem Statement

The construction industry in Malaysia, unlike the manufacturing industry, suffered during last years from low annual growth, low return, and shortage of labor (Khairuddin, 2002).

Thus, there is a need to improve productivity in the industry, which will necessitate the use of new material and construction technique (CIDB, 2000).

Even though IBS is not new in the Malaysian construction, the usage is still very low compared to conventional methods. However, local contractors are reluctant to switch to the usage of IBS because they are at ease with the availability and relatively low cost of sourcing for unskilled foreign labor.

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To reduce the dependency on foreign labor, the government has put forward regulatory requirements and incentives. An example is the mandatory requirement of 50% usage of IBS in government building projects to qualify them for the CIDB levy exemption (CIDB, 2005).

1.3 Research Objectives

With respect to the problems generally facing construction industry, and IBS specifically, the main research objectives are as follows:

1. To verify that construction industry can benefit by learning from manufacturing techniques through industrializing building systems (IBS).
2. To study the problems facing the application of IBS in Malaysia.

1.4 Significance Of study

The significance of this study appears when a developer or client tries to get information from consultant on what system to be used in their project. The consultant will suggest to them a building system which will satisfy their needs regarding their budget, time given for handing the project, and the quality on the project.

The findings of this study should contribute towards improving the construction industry, and that is by comparing the industrialized building systems and conventional methods of construction.

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The study would assist clients, consultant, and contractor in choosing the suitable building system in terms of cost saving, labor saving, time saving among other benefit which can be gained.

1.5 Thesis Organization

This thesis is organized into five chapters including this introductory chapter. Chapter 1 will introduce the thesis by discussing the problem statement, mentioning the objective and justification are given. It gives also the overall content of the thesis.

Chapter 2 gives an overview of the construction industry, its methods, productivity, project life cycle, and a similarities and differences between construction and manufacturing industries was studied. Also a general idea about industrialized building systems (IBS) is proposed in the literature focusing on the IBS types and benefits, and the application and problems in Malaysia.

Chapter 3 includes the methodology followed in this study. The method of data collection, case studies observation, and the questionnaire design and methods are discussed and explained.

Chapter 4 presents the case studies which are representing three different companies using IBS. The case studies will be discussed to strengthen the

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finding of the interviews, visits, questionnaire, and the literature review. Each case study represents a building system, and studies its process of construction, benefit of the system used, and application's problems.

Chapter 5 draws the research conclusions and gives number of recommendations.

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