

SCHEDULING ON TRANSPORTATION FOR INDUSTRIALIZED BUILDING
SYSTEMS

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Dedication

To my beloved father and mother

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ABSTRACT

Now, the construction is facing the challenges from the four main aspects, which are quality, cost, time and safety. However, by implementing the industrialized building system (IBS), all those challenges can be faced easily. In this study, double storey shop houses will be used as a model to illustrate the management of IBS transportation for fabricators. Besides, the number of trucks required each day will be discussed here based on proper scheduling using project management software. Other than that, this study focuses on the scheduling by optimization. This project highlights a proper management of the trucks used in the delivery of IBS components for construction.

ABSTRAK

Kini, industri pembinaan sedang menghadapi cabaran daripada empat aspek iaitu kualiti, kos, masa dan, keselamatan. Namun demikian, melalui pelaksanaan sistem bangunan secara berindustri (IBS), semua cabaran dapat dihadapi dengan mudahnya. Dalam kajian ini, rumah kedai dua tingkat akan digunakan sebagai model untuk mengilustrasi pengurusan bagi pengangkutan IBS untuk pembuat-pembuat IBS. Selain itu, bilangan trak yang diperlukan bagi setiap hari akan dibincangkan bergantung kepada penjadualan yang sistematik dengan penggunaan pengurusan projek perisian. Di samping itu, kajian ini menumpu kepada penjadualan dengan menggunakan kaedah optimum. Projek ini menitikberatkan pengurusan yang sistematik dalam penghantaran komponen IBS untuk pembinaan.

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LIST OF SYMBOLS

λ	-	Intensity coefficient
ρ	-	Probability
t	-	Time
Y	-	Length of the full busy period
$G(y)$	-	Busy period distribution
$\hat{G}(s)$	-	Moment generating function
$f(w)$	-	Cost of building a road
w	-	Width
$F(w)$	-	Capacity
D	-	Minimum capacity
N	-	Minimum number of roads
$S1$	-	Site 1
$S2$	-	Site 2
$S3$	-	Site 3
$S4$	-	Site 4
SB	-	Short beam
LB	-	Long beam
C	-	Column
$()$	-	Day

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CHAPTER I

INTRODUCTION

1.1 Introduction

The construction industry plays a very vital role in the economic growth besides providing basic necessity for everyone. Besides, it also provides various types of job opportunities to the Malaysian. However, due to the advancement in the science and technology, the construction industry now is very competitive and also facing the challenges. Besides, according to the concrete association of India (1973), the use traditional building materials and construction practices has become rather costly due to one or more of the following reasons such as substantial increase in the cost of materials, uneconomical structural designs, slow and laborious process of construction, comparatively shorter life or higher cost of maintenance.

In fact, the construction industry now is unlike the past twenty years ago. Now, the construction industry put more emphasis on the aspects of time, cost, quality and safety. It can be said that each construction process is related to the four aspects as stated earlier. Time is a significant aspect in the construction in which every project should be completed on time or earlier in order to prevent the undesirable losses of money. Therefore, the control of time in each construction process is very important. Other than that, each project now ought to be controlled within the estimated cost. The quality of the construction product is also a common issue that be disputed. In this case, quality control is a very important aspect in this industry. Besides, the construction industry also faces the challenge of safety. For instance, how to prevent accident and implementing safety regulations at site are the

issues that always been emphasis on. Those four aspects are the most challenges that construction industry has to face today.

In order to achieve those aspects, the construction method used must progressing. The traditional method of construction that always been adopted in Malaysia is cast-in-situ method. Although this construction practice has been used for a long time, however, it is found that this method still has its own weakness. Hence, a systematic system, which is the industrialized building system (IBS), should be used in the construction industry in Malaysia in order to supplement the traditional method.

IBS or precast concrete has been in the use since the latter part of the 19th century (Joseph J. Waddell, 1974). However, it is seldom been utilized in Malaysia. According to Fazlur R. Khan (1976), the early use precast construction for structural members of multi-storey buildings was mostly dictated by the need for quality control of construction constraints due to extreme bad weather and unusual location of construction. Industrialization of building or 'system building' is a term in the building industry which indicates the industrialized process by which components of a building are conceived, planned, fabricated, transported and erected on site (Syed Mansur Syed Junid, 1986). Generally, by using this system in the construction industry, a lot advantages can be gained compared to the conventional method.

In this rapid development of science and technology era, the demand of houses also quite high and sometimes it cannot fulfil the demands. However, by using the IBS, this problem can directly be solved. It is because with the IBS system, it can help to reduce the time that normally required building a house. It means that the total construction time of a building will become shorter by implementing the IBS.

Other than that, comprehensive prefabricated elements that are produced in the plant considerably reduce both the amount of work on site. Moreover, it also reduces the dependence on the weather and the skill of available labour. Therefore it is no doubt to implement industrialized building system in the construction industry

can make the construction faster, economy, and the product of the construction is more quality. Besides, prefabrication also offered a wealth of architectural shapes and finishes. In this paper, the industrialized building system and its transportation used in the shop houses will be discussed.

1.2 Problem Statement

In these few years, the demand for houses and shop houses are quite high. By using the conventional method, the speed of the construction is quite slow. Nowadays, a lot of construction cannot be completed on time as required in the contract document. It can lead losses to the contractors due to the late finish of the construction.

Other than that, by using the conventional method, the quality in the end of the construction is not so good. For instance, after removing of formworks, there are existence of honey comb in the beams and columns. Therefore, industrialized building systems have been introduced in order to solve those problems.

However, by using industrialized building systems, there also some problems exist. For instance, the late delivery of the precast components to the site and as a result, the construction progress is affected. Besides, sometimes the precast components delivered to the site are not in the right quantity or not in the right types of precast components. The fabricator has to redeliver the components to the site. It is waste of time and also money.

In addition, in some cases, the delivery of precast components to the site is too much early. The space at the site is so limited and therefore causing congestion of precast components at site. Moreover, there are high probability that the damages may occur on the precast components if there is no proper storage area for them. All

these problems occur are due to the improper management of fabricator who do not have a detail scheduling on it.

1.3 Objectives

The objectives of this master project are:

- To optimize the number of trucks by scheduling it at specific distance and quantity.
- To find out the number of trucks that should be controlled in the condition of break down.
- To introduce a proper management of the delivery of IBS componenet for fabricator.

1.4 Scope of Study

The scopes of this study are:

- Emphasis on the study in shop houses on prescribed IBS building components
- Sites at Taman Universiti, Skudai, Johor.
- Do the scheduling for site demands and rescheduling to optimise the delivery process.

1.5 Significant of the Study

As the construction industry now is facing the challenges of four aspects; time, cost, quality and safety, it is crucial to have a systematic system or method to be used in this industry. In this study, an industrialised building system used in the shop houses will be introduced.

Other than that, this study will be a model for the fabricator of the precast components as a guidelines or ideas in order to know how to manage their trucks in the delivery to the site. Besides, this study will show the fabricator how to optimise their schedules in the delivery. The idea of this study of may help the fabricators to prevent unnecessary problems.

In addition, the progress of construction at site will not be affected due to the late problem of delivery in terms of types and quantity. It is because proper scheduling will make the delivery smoothly. Moreover, it is also a way to accomplish the vision of 2020.