

UNIVERSITI TEKNOLOGI MARA

**STRUCTURAL DESIGN PROCESS FOR
PREFABRICATED ROOF TRUSS SYSTEM
IN MALAYSIA**

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of the requirements for the degree of
Master of Science

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

This study focuses on the structural design process for prefabricated roof truss system in Malaysia. To gain insights on the central focus of this study, three research objectives were addressed: 1) to identify the methods employed in the design of prefabricated roof truss system, 2) to determine the constraints in designing prefabricated roof truss system in accommodating the specifications, 3) to establish the structural design software capability in assisting the design decision-making of prefabricated roof truss system. Salient discoveries were obtained qualitatively, through in-depth interviews, and observations with the truss designers who are experts in the field of proprietary roof truss industry. Data analysis was conducted using NVivo version 10, simultaneously with data collection. Coding process validated the basis for emerging themes where meanings were comprehended and organized thematically. The findings painted a vivid picture of the truss designing experience. Firstly, the findings revealed the significant methods employed in the design of prefabricated roof truss system consist of two types of design: i) descriptive design method, ii) prescriptive design method. Initial conceptual design decision-making were highly characterized by technical experiences, user preference, attitudes towards requirements and specifications, constraints associated with design/construction stages, cost, raw materials, support systems and production setup. Initial communication-related stress related to the players within and between players and acclimatizing to choices evolves towards offer and acceptance of the end product. Secondly, findings warranted the constraints in designing prefabricated roof truss system in accommodating the specifications were hindered by the limitations of the system itself, constructability, and conflict in the local standard practices. Thirdly, aspects of the structural design software capability assisting decision-making, relies on the perceived understanding by the users on what the software can/cannot do, level of expertise of the support system and setup in the trade scope of work in assisting the design decision-making of the prefabricated roof truss system.

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CHAPTER ONE

INTRODUCTION

1.0 RESEARCH BACKGROUND

The Malaysian building construction industry is facing greater challenges through series of development and initiation to a variety of innovative construction technologies. In the heavy construction sector, to begin with, Ng Weng Seng et al., (2012) highlighted that there are four major domains of firms' innovativeness that affect the degree on innovation and adaption to be developed. New approaches to the construction industry encompass every aspect in the built environment from material to changing technology to meet with the demands of the industry. This is evident in the advancement in technologies of green building, prefabrication practice, smart building, and energy efficient building (Valentine and Vargas, 2007).

The roof truss industry as part of the total construction went through development from conventional to the new approach of system prefabrication or industrialization solutions in project implementation. This has led Malaysia's building construction industry to a greater deployment of what is termed as industrialized building systems (IBS). The concept of IBS however is derived from off-site mass production in which prefabricated timber roof trusses has been among the first structural building component to be prefabricated off site and has been in existence in the world market since the 1950's (Gang-Nail System Inc.,1981). In the case of Malaysia, the industrialization of prefabricated timber roof truss system has developed since early 1980's (General Lumber (Holdings) Berhad, n.d.) from a single-proprietary entity, known as the principal system provider with a set of licensee fabricators to a number of similar proprietary system providers with another set of licensee fabricators.

The general scope of work in practice among the roof truss fabricators in the construction related to roof trusses in Malaysia is to design, fabricate, deliver and install prefabricated roof trusses complete with the necessary components and fixing ancillaries.