Universiti Teknologi MARA

Expert System for Glulam Roof Beam Design

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ABSTRACT

Glulam (Glued-laminated timber) is a combination of dimensioned timber to create a structural engineered type of wood. Vast number of research have been conducted worldwide, but not in Malaysia particularly as it still considered as contemporary type of beam. Therefore, this project seems to have an indomitable potential through the construction industry in this country to promote the usage of Glulam as Malaysia is one of the top timber supplier (1.9%) of the world supply with profit up to $3.8 billion in the year 2015. Hence, opportunity taken to develop a knowledge based expert system that acts as a platform for civil engineering field to construct a structure using Glulam beam for roof truss. Rules, equation and knowledge were extracted mainly from the book Second Edition-Design of Structural Timber to Eurocode 5 written by William M C McKenzie & Binsheng Zhang as a base for generating knowledge based structure. This project focuses on straight Glulam beam (rectangular) type. Modification factor regarding strength which are the shear strength and system strength will be carefully analyze in order to satisfy the strength and stiffness criteria. They are bending strength, shear strength, bearing strength, lateral stability and lastly deflection in order to achieve an adequate result which act as the final output desired by the Eurocode 5. In order to obtain the final safe output design, all of the modification factor mentioned earlier need to be adequeately calculated based on it's own specific rules. For example, the bending strength need to fulfill the requirement of adequacy in order to get to the next level, which is the shear strength and so on. Nevertheless, future enhancement of this project can be implemented in order to improve this system such as adding the flexural design members or combining with axially loaded members.

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CHAPTER 1

INTRODUCTION

For the first part of the chapter, issues regarding this particular project Development of Prototype of Strength Glulam Beam for Roof Structure will be further discuss in problem background, problem statement and project question in order to determine the motivation for the completion of this project. Project objectives, project scopes, project significance and project outline will also be further deliberate in this section.

1.1 Background of Study

In this globalization era nowadays, things like machines, gadgets and other technologies kept improvising within a blink of an eye. The world is growing fast with high-tech innovation in various of field such as medicine, aviation and even engineering. Vast of research has taken place for so many years in improving the engineering especially in construction which conclude the innovation of highly-engineered timber, known as Glued-Laminated Timber (Glulam). It might be large numbers of our local doesn't heard about it, as it still considered as new to this industry, but not for North American and European countries. In a short brief, Glulam is a lamination of low and high quality timber to produce a whole new timber beam which is much stronger, tougher, versatile as it can be bend depends on the design of the timber and it is eco-friendly in numerous ways. Based on the statistics shown by the Malaysian Department of Forest Plantation, 2013, Malaysia is known to be one of the largest country in the world for tropical timber exportation. Besides that, other panel woods such as plywood, particle board and medium density fibreboard were also on the lists alongside with other wood supply like flooring, and other joinery products. In addition, Malaysia gain up to RM19.5 billion for both Peninsula of Malaysia, Sabah and Sarawak. This precious fact that leads to the motivation in doing this project.