

**MANUFACTURE OF LAMINATED STRIPS BOARD FROM IVORY
BAMBOO**
(Bambusa vulgaris var. striata)

MUHAMMAD HANIF BIN MAZLAN

**This Final Year Project Submitted in Partial Fulfillment of the
Requirements for the Bachelor of Science (Hons.) Furniture Technology
in the Faculty of Applied Sciences, Universiti Teknologi MARA**

JULY 2017

CANDIDATES'S DECLARATION

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

In the event that my final year project work is found to violate the conditions mentioned above, I voluntarily waive the right of conferment of my degree and agree to subject to the disciplinary rules and regulation of Universiti Teknologi MARA.

Sign of Candidate

: 

Name of candidate : Muhammad Hanif Bin Mazlan

Candidate's ID : 2015217474

Programme : Bachelor of Science (Hons.) in Furniture Technology

Faculty : Applied Sciences

Thesis title : Manufacture of Laminated Strips Board from Ivory Bamboo (*Bambusa vulgaris var. striata*).

Date : JULY 2017

ABSTRACT

MANUFACTURE OF LAMINATED STRIPS BOARD FROM IVORY BAMBOO (*Bambusa vulgaris var. striata*)

The world market for bamboo is lucrative considering billions of USD worth of commodity and bamboo-related products are being traded annually. The increased global awareness and demand for bamboo as one of emerging green products from sustainable resources has led to more usage of bamboo in commercial applications. Realising the potential and importance of bamboo, Malaysia has embarked on concerted efforts to elevate bamboo to become a vital resource commodity. This study was conducted to determine the basic, mechanical and physical properties of ivory bamboo (*Bambusa vulgaris var. striata*) at different strip orientation and strip layer. The mechanical properties of *B. vulgaris var. striata* were loaded in bending and internal bonding while the physical properties were density, thickness swelling and water absorption. The bamboo specimens were selected from bottom part and towards 8 metre up. The specimens were oven dried until 8% moisture content for board manufacture. The board were conditioned to achieve 12% moisture content before tested. The boards were replicated by 4 for each parameter. The statistical analysis showed that there were significantly different for number of board layers and board orientations except for water absorption and thickness swelling at different layers. The board properties indicated that the 3 layers board is stronger than 5 layers board. Meanwhile, the parallel orientation board gave better performance as compared to cross orientation. Therefore, it can concluded that the manufacture laminated strip board was successfully because it has achieve minimum requirement Malaysian Standard (MS 1787) for wood based panel and it has comparable modulus of rupture for flooring accordance to Malaysian Standard (MS 3.44: 1978).

TABLE OF CONTENTS

	PAGE
APPROVAL SHEET	i
CANDIDATES'S DECLARATION	ii
ACKNOWLEDGEMENT	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF PLATES	ix
LIST OF ABBREVIATIONS	x
ABSTRACT	xii
ABSTRAK	xiii
CHAPTER	
1 INTRODUCTION	
1.1 Background of Study	1
1.2 Problem Statement	4
1.3 Justification	4
1.4 Scope and Limitation	5
1.5 Objectives	5
2 LITERATURE REVIEW	
2.1 <i>Bambusa vulgaris var. striata</i> (Ivory Bamboo)	6
2.1.1 Plantation	8
2.2 Application and Uses	10
2.2.1 Medicine	10
2.2.2 Non-structural	11
2.2.3 Structural	11
2.3 Structural Composite Lumber	12
2.3.1 Laminated Veneer Lumber (LVL)	12
2.3.2 Parallel Strand Lumber (PSL)	12
2.3.3 Laminated Strand Lumber (LSL)	13
2.4 Application for Structural Composite Lumber	13
2.5 Laminated Product from Bamboo	14
2.5.1 Cross Laminated Bamboo (CLB)	14
2.5.2 Laminated Crushed Bamboo Panels(C-BAM)	15
2.5.3 Strand Woven Bamboo (SWB)	15
2.5.4 Wood V-BAM	16

2.5.5 Bundle Laminated Veneer Lumber (BLVL)	16
2.6 Adhesive	17
2.6.1 Method of Adhesive Application	18
2.6.2 Method of Bond Curing	19
2.6.3 Bonding Pressure	20
3 MATERIALS AND METHODS	
3.1 Materials	23
3.2 Board Manufacture	26
3.2.1 Bamboo Strip Sample Preparation	26
3.2.2 Board Sample Preparation	26
3.2.3 Sampling Method	28
3.3 Physical Testing	33
3.3.1 Thickness Swelling Testing	33
3.3.2 Water Absorption Testing	33
3.4 Mechanical Testing	34
3.4.1 Bending Testing	34
3.4.2 Internal Bonding Testing	35
3.5 Statistical Package for the Social Science (SPSS)	36
4 RESULTS AND DISCUSSION	
4.1 Introduction	37
4.2 Physical Properties	37
4.2.1 Basic properties	38
4.2.2 Density	40
4.2.3 Water Absorption	43
4.2.4 Thickness Swelling	43
4.3 Mechanical Properties	46
4.3.1 Bending	46
4.3.2 Internal Bonding	50
5 CONCLUSION AND RECOMMENDATIONS	
5.1 Conclusion	52
5.2 Recommendations	53
REFERENCES	55
EVALUATION OF FINAL YEAR PROJECT REPORT	
PUBLICATION OF THE PROJECT REPORT UNDERTAKING	
PERMISSION FOR REFERENCES AND PHOTOCOPYING	
CURRICULUM VITAE	