

Innovation on Laminated Bamboo Panel Flooring in Interior Design

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Abstract: The usage of timber in construction has been increasing lately in the world, specifically in Malaysia. It will be lead to environmental destruction such as global warming. People are not aware that there is another natural material which can replace wood and timber in construction that is bamboo. This study aims to identify innovation that can be made in bamboo laminated panels for installation floors in interior building design field. The installation was made by referring the information about flooring method of laminated bamboo panels. A design and pattern of the panels was made by using a software AutoCAD application. The new innovation was produced-by the panel with allocation of the sizing, length and thickness. The floating technique was implemented for the installation of the panels rather than using of nail and glue. As a result, the new design and pattern innovation of laminated bamboo panels with the best and easy installation method has been introduced. These laminated bamboo panels have been created with new innovations. The flooring panel design has an aesthetic pattern and is eco-friendly. It was recommended to society because the installation method is easy to install and the users can create the panel by themselves. So that the user can arrange the panels with their own design. Other than that, the new panel has a natural look. These laminated bamboo panels will be in high demand in building construction in the future.

Keywords: Laminated Bamboo Panel, Flooring Panel, Installation Technique.

1. Introduction

Bamboo is one of the most important non-timber products in Malaysia. There are over 1200 species of bamboo worldwide and more than 50 species are widely used by the bamboo-based industry. Most of the products produced by this bamboo such as craft product, baskets shutters and also can use for construction. In the construction industry, people commonly use plants like timber and bamboo in building, interior design and construction, but nowadays bamboo receive attention in the construction industry [1]. Bamboo is a green building material that is environmentally friendly and has great development value [2].

1.1 Objective of Research

This study aims to identify the innovation of the laminated bamboo panel on applications installing flooring for building interior design. To identify the type design and the installing laminated bamboo

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panels flooring and to produce the new design product of laminated bamboo panels flooring with recommendation method and the easy installation.

1.2 Scope of Research

This study focuses on flooring products from laminated bamboo panels by identifying from the design aspects and installation methods as internal decoration in buildings. The researchers will produce floor product design innovations from the latest laminated bamboo panels using more convenient and economical installation techniques.

1.3 Characteristics of bamboo

All bamboo species have various characteristics and features, though. Naturally appropriate for a range of applications and advantages. Bamboo is often used as materials for constructions or used as the raw materials for the production of paper sheets, they are also used to control erosion and also for embellishments [3]. Advantages of bamboo in construction which is a fantastic, sustainable, and renewable factor in helping prevent potential deforestation of our precious rainforests. Bamboo is simple to cut, handle, fix, reposition, and maintain. Furthermore, bamboo is unpolluting and has no crusts or components that can be regarded as waste.

There are three parts of the bamboo culm which are middle lower, middle upper and top [4]. **Table 1** show the three sections of bamboo culm can produce various products according to their characteristics.

Table 1: Explanation about each part of bamboo culm[4].

Part	Application
Middle lower	Flooring, laminated furniture
Middle upper	Blinds, mats, carpet, chopsticks, toothpicks handicrafts
Top	Chopstick, toothpicks, bamboo pole scaffoldings

1.3.1 Laminated Bamboo Panel

This study is about laminated bamboo panels flooring. The laminated bamboo panels flooring is one of the new alternatives that can be apply in interior design since the growth rate of the bamboo is quite promising than trees. In addition, it is also found in parts of the world with more restricted timber supplies. As a result, it successfully navigates wood transport problems, therefore, increases costs and energy usage. The application of laminated material in house decoration is also relates to the applications of wooden materials for house’s interior.

1.3.2 Dimensional Bamboo Panel

The size of panels for flooring has their own size by referring to the consult bamboo flooring manufacturer which includes thickness, widths, length and availability. There are three types of bamboo flooring that have a place in the market which is solid bamboo flooring, engineered bamboo flooring and strand woven bamboo flooring [5]. In the **Table 2** below there are the sizes of each type according to bamboo flooring manufacturer and local distributor.


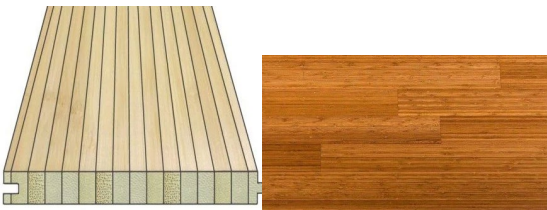

Table 2: The sizes of each type bamboo flooring panel[5].

Type of bamboo flooring	Thickness size	Width size	Length size
Solid bamboo flooring	13mm, 11mm and 16mm	75mm, 95mm, 190mm and 300mm	600mm, 915mm and 1830mm
Engineered bamboo flooring	16mm	137mm and 190mm	1830mm
Strand woven bamboo flooring.	10mm to 16mm	95mm and 190mm	915mm and 1830mm

1.3.3 Laminated Bamboo Panel Flooring Design

There are three types of bamboo panel flooring that were produced in the market. There is horizontal bamboo floor design, vertical bamboo floor design and strand woven bamboo flooring design. Furthermore, all these three types have their own beautiful looks. The **Table 3** below were presented with their own looks.

Table 3: Shown the explanation of type of laminated bamboo panel [6].

Type of Bamboo Panel	Name
	Horizontal bamboo flooring
	Vertical bamboo flooring
	Strand bamboo flooring

1.3.4 Type of Laminated Bamboo Panel Flooring

There are two types of bamboo flooring which is engineered bamboo flooring and solid bamboo flooring. These two types have their own characteristic as laminated bamboo plank flooring and they are made for indoor air quality.

The engineered bamboo flooring on the plank's top is constructed of a solid wood wear layer that is bonded to a substrate. This bamboo panel has a click lock in combination with another panel. It is easy to install with a floating (click lock) method or glue down method **Figure 1 (a)** [6].

The solid bamboo flooring uses the layer versus wood all the way through the plank. This bamboo panel has a groove section and a tongue section which is the way to combine with the other panel. This actively demonstrated that this bamboo panel has the perfect combination of toughness, eco-friendly and also affordability. Thus, the installation can be either nailed down or glued down **Figure 1 (b)** [6].

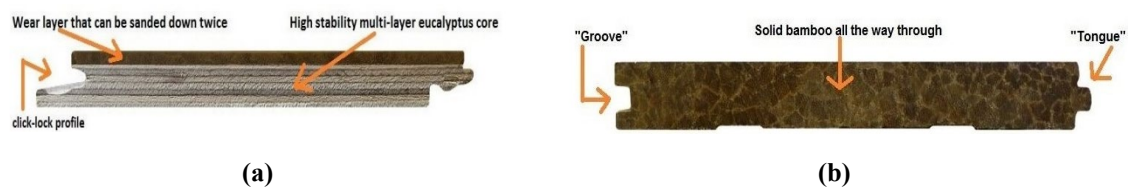


Figure 1: (a) Engineered bamboo flooring. (b) Solid bamboo flooring [6].

1.3.5 Process of Laminated Bamboo Panel Flooring

These are the following fundamental procedures are used to create laminated bamboo flooring. The first stage is to make longitudinal bamboo sheets (sections), and the second step is to bleach the sheets. The third stage is to dry, sand, and choose sheets before applying glue to them and allowing them to cure. Sheets are hot pressed together to form flooring. Creating a floor board, and the final step is to sand and paint the flooring [7]. **Figure 2** below shows the process of laminated bamboo flooring.

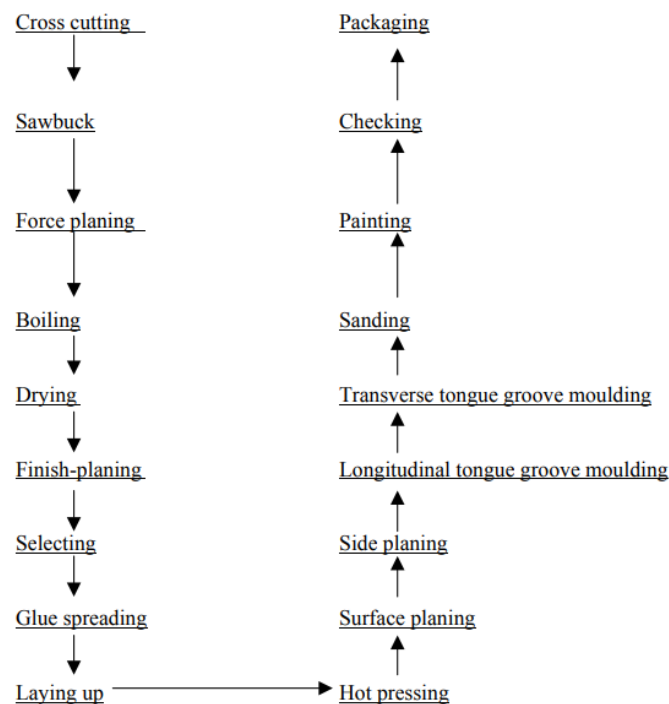


Figure 2: Process of laminated bamboo panel flooring.

1.3.6 Laminated Bamboo Panel Flooring Installment Pattern

Nowadays there are many types of patterns laminated bamboo panels for flooring and it is called parquet flooring. The parquet flooring means tiles created by arranging small pieces of hardwood in repeating patterns [8]. It is commonly used in the interior design field. Other than that, the parquet flooring is very friendly to the environment, has high durability and reasonably affordable flooring options in the long term. Furthermore, parquet flooring is long lasting and requires simple maintenance. There are a few examples of parquet flooring pattern which bond pattern, Old German bond pattern, Herringbone pattern and Chevron pattern [9] [10].

1.3.7 Installation of Laminated Bamboo Panel Flooring Method

There are three installation techniques for bamboo flooring, as well as some of the benefits and drawbacks of each approach. Understanding which installation technique is ideal may aid in estimating the amount of labor required and the cost of the installation. Thus, three method of installation is nail method, glue down method and floating method.

Nail method is the method when installing bamboo floors, the nail down technique is one of the most common since it is generally the choice that provides for the most durable floors. This method includes securing the bamboo panels to the subfloor with either a nail or a staple and is suitable for tongue and groove bamboo floors [11].

The glue down method is commonly used for tongue and groove bamboo flooring, and it involves the application of an adhesive to both bind the bamboo planks together and to bind the planks to the subfloor or underlayment. The advantages of this method are adhesive provide a water-resistant layer [11].

The floating technique considered to be the easiest technique for people who wish to install bamboo flooring themselves. The installation procedure much smoother for both regular joes and experts. The floating technique entails joining the bamboo planks together using either the click-lock type of bamboo floors, which requires no glue, or the tongue and groove technique [11].

2.8 Product Based-Bamboo Panel Flooring

The products from the based-bamboo have their own feasibility. Thus, bamboo laminated panels have the mechanical and physical properties of bamboo. It has characteristics of high size, small deformation, stabilized size, high strength, good stiffness and wear resistance [12]. There are two examples of the product based-bamboo panel flooring which is staircase and living room flooring.

2. Methods

The methodology is producing a new design of laminated bamboo panels. In this study, there are more information needed to find out about the requirements of laminated bamboo panels in the interior design field. Next, to identify the pattern or design of bamboo panels that have been produced in the market and to study the type of installing laminated bamboo panel flooring. Therefore, the objective is to create a new product of laminated bamboo panels could be achieved based on this research with the new idea.

In order to satisfy the objective, a software application was used in this project to create a new design of laminated bamboo panel for flooring. In this project, the AutoCAD is used in creating the new design and new pattern for the panel bamboo flooring. Furthermore, the design that is created must include the size, length and thickness. In research, the best method in installing the laminated bamboo panel is using the floating method. This method is chosen for the new design of the laminated bamboo flooring panel installation.

2.1 Process in Create a New Panel

Some research has been done about the process in producing the new design and pattern of bamboo panels. After that, come out with a new idea in designing the new product of laminated bamboo panels for flooring. Then, start to draw the panel bamboo flooring in AutoCAD software with all the new size, pattern, length and thickness. The new size of laminated bamboo panel flooring for the length is 600mm, the width is 200mm and the thickness is 15mm.

2.2 The Installation Arrangement for Laminated Bamboo Flooring Panel Drawing

According to the new design that had been created, bond pattern was used in the installation panel. The panels are installed parallel with each other and the new panel is fulfilling the requirement in the bond pattern method installation. **Figure 3** show the pattern arrangement panel from AutoCAD.

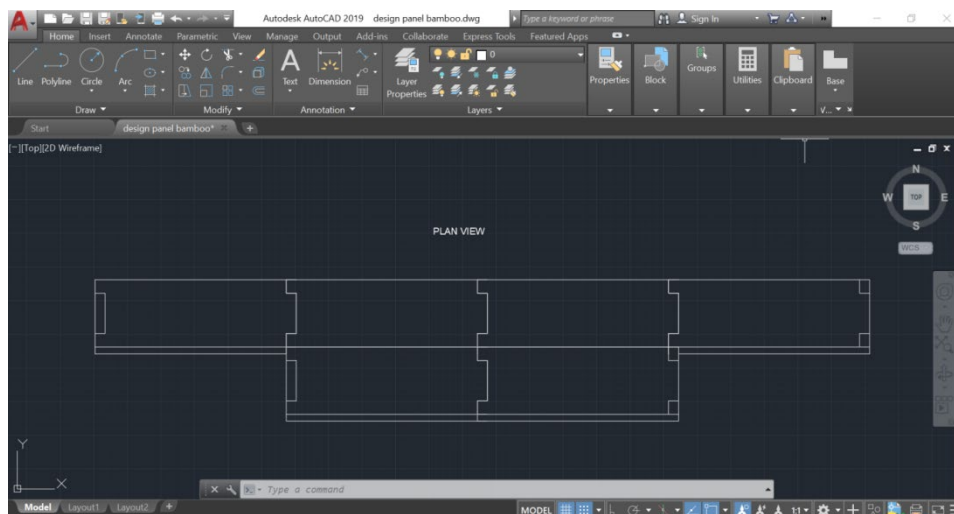


Figure 3: The drawing installation arrangement panel before and after combine.

2.3 Research Limitation

The scope of this project's title focuses solely on the field of the interior building. This shows that the laminated bamboo flooring panel for the interior design of this project is manufactured. The example of interior design which is suited for laminated flooring bamboo, is located in the house, bedroom, cafe, toilet, hall, and many others.

3. Results and Analysis

The analysis is based on the literature review of the research in this study. The wide, length and thickness of design for the bamboo floor panel has been determined. The panels were made for a spacious room and the thickness of 15mm are just fine to avoid slipping. Then there is a comparison for the best panel arrangement for the industry has been compared which is the finest, safest, and most time-saving comparison for the installation. A comparison of size was carried out to select the possible and fair size to be applied on the bamboo flooring

3.1 Comparison of The Design Panel

According to the design of bamboo panel flooring in the market **Figure 4 (a)** and the new design that has been created in this study **Figure 4 (b)**, there are similarities in design which both designs have a tongue and groove section. The new panel has maintained a design that has grooves and tongues at the panel bamboo flooring. However, the new panel has been modified with the design puzzle- shaped

on the surface of the panel. The puzzle design on the surface of the panel is intended to look like geometry and also stand out in that area.

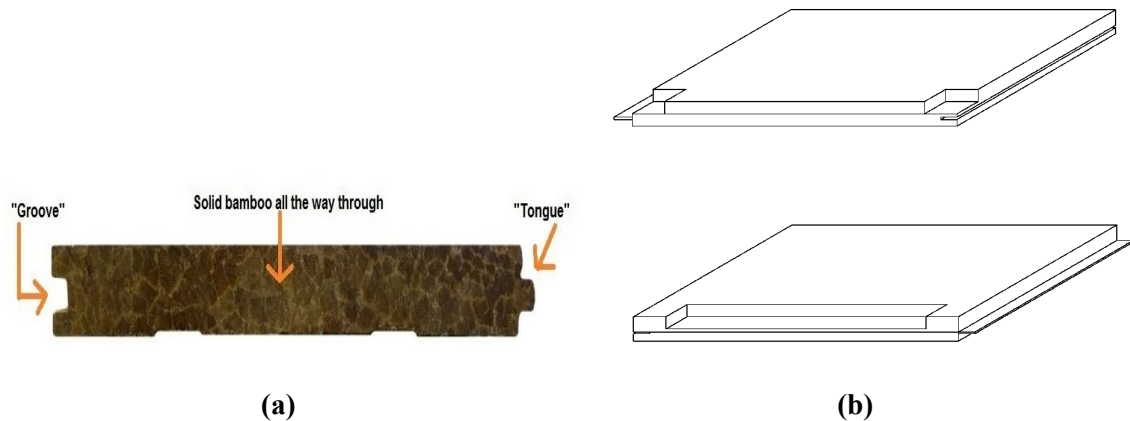


Figure 4: (a)The design of laminated bamboo flooring panel in the market. (b) The new design in this study.

3.2 Comparison of The Arrangement

The pattern that has been chosen in this research is the Old German bond pattern for the new design with little modification. That pattern was parallel and offset each one of the panels with a full strip, equipped with two layers on each panel. Thus, the new design panel of laminated bamboo flooring has a groove section and the tongue section which is that function for binding it with other panels. The bond pattern which is this pattern was arranged parallel and offset each one of the panels with half stripes that have already been used in the construction building.

3.3 Comparison of The Installation Panel Method

The floating method is chosen as a method of installation for the new design laminated bamboo flooring panel. This method not using nails or glue in the installation of the flooring panels. Moreover, the new design was created with a groove section and a tongue section which is easy to install and is strongly combined for each panel. This proves that the floating method in this study is the appropriate way to use the new design panel without utilizing the panel installation. The example of flooring that used floating method in building is Luxury Vinyl Flooring (LVF) which bind together the panels with a click-lock feature [13].

3.4 Comparison of The Size

There are various sizes of bamboo panel flooring according to their type. The new design uses solid bamboo flooring. The size of solid bamboo flooring for thickness is 13mm to 16mm, the width is in the range of 75mm to 300mm and the length is range 600mm to 1830mm. In the market, the size of the solid bamboo flooring is randomly picked by clients. So, for the new panel to be created the size with the thickness of 15mm, the width of 100mm, and the length of 600mm. The new panel measurement is suitable and the size is still in the range according to the characteristics of solid bamboo flooring.

3.5 Discussions

The new design of the laminated bamboo flooring panel succeeded in achieving the objective in this study which is to create a new panel design that is a requirement in construction building. Moreover, the new design panel has been created according to the requirement of laminated bamboo flooring panels based on the research. Therefore, the new design panel has been created with the ideal design, the pattern of installation, the method of installation, and the size. The panels on the new design are easy to install since it using click-lock on each side of panels instead of glue and nail method which require an equipment to install the panels. Then, these panels just need a few minutes to merge between

panels. The panels in the market require more time because it need some time to setup for the equipment before combine the panels.

4. Conclusion

To conclude, it is hoped that this study about producing the new design of laminated bamboo panels has given a clearer view. The knowledge about the laminated bamboo panel can expand in the next stage in the construction building field and improve the product with a better design. Therefore, to expose the laminated bamboo panel to the world with the good characteristic of bamboo which is very friendly to the environment, natural looks, and the laminated bamboo panel could be of high demand in the construction building.

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