UNIVERSITI TEKNOLOGI MARA
College of Built Environment

Poster Book

IIIDBEEX 2023

20 JANUARY 2023

International Invention, Innovation & Design Exposition for Built Environment and Engineering 2023

College of Built Environment
UiTM Puncak Alam
20 January 2023 I Friday

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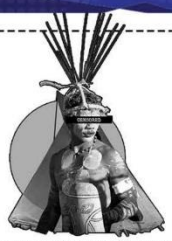
IIIDBEEX 2022
International Invention, Innovation & Design Exposition For Built Environment And Engineering 2022

AN APPLICATION OF CONSTRUCTION TECHNIQUES IN VERNACULAR ARCHITECTURE USED BY INDIGENOUS PEOPLE IN MALAYSIA

Universiti Teknologi MARA | Fakulti Senibina, Perancangan dan Ukur

ABSTRACT



BAMBOO CONSTRUCTION TECHNIQUES BY INDIGENOUS PEOPLE IN MALAYSIA

WHAT?

Bamboo has become a popular material choice in architecture and design projects because of its sustainable qualities and hardwearing characteristics as it has a higher compressive strength than concrete or wood, and rivals the tensility of steel.

WHY?

Bamboo plants can be found almost worldwide and it is one of the materials that is very familiar to the indigenous people especially in Malaysia. They used bamboo as their main construction material in the early days.

HOW?

Observations were done in the aboriginal village where bamboo is the main material in building practice and part of their lifestyle. Also precedent studies in foreign countries were done to analyse another kind of construction techniques available.

LITERATURE REVIEW

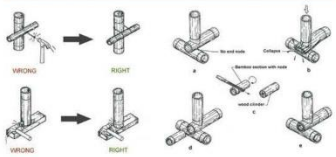
Bamboo Basic Principles

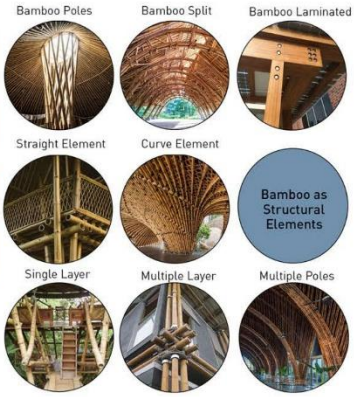
Not to use conventional wood nails in bamboo joinery, as it will cause them to split.

To make sure that the lower part connecting with the surface ends with node when using bamboo as column.

When connecting bamboo poles with bolts, make sure to bolt them together in between 2 nodes, otherwise the bamboo will crush.

In construction, using bamboo nodes is very important. Bamboo columns or beams need to have a node at both ends.





PROBLEM STATEMENT

The vernacular architecture using traditional materials such as timber and bamboo has slowly being forgetten by the indigenous people where it was their main construction materials during early days.

Most of the indigeous people did not take advantage on their building skills using traditional materials and make living out of it due to lack of awareness.

Community from urban areas are no longer aware on the sustainability and the versatility of traditional materials such as bamboo in helping their environment.

RESEARCH AIM

The major purpose of this study is to highlight bamboo as a construction material and what may be created from it. What kind of bamboo may be utilised in construction and what procedures should be employed in building construction are investigated. Bamboo is expected to make significant progress as a construction material and to provide confidence that it is an environmentally beneficial material.

RESEARCH QUESTION

a) What is the best construction techniques for vernacular architecture?

b) How can vernacular architecture improve the sustainability of a building?

c) What is the advantages of using bamboo as building construction material?

RESEARCH OBJECTIVE

a) To study on the construction techniques that can be used for vernacular architecture

b) To explore on the sustainability of vernacular architecture

c) To discover the advantages of using bamboo as building construction material

LIMITATION

+ Previous study publications and instruction on the topic are few.
+ Lack of site visit to existing bamboo-built buildings since the existing building located faraway.

SIGNIFICANT OF RESEARCH

+ The construction method used can be implemented to the vernacular architecture in modern days.
+ To promote the sustainability and versetility of bamboo construction.

CONSCLUSION

Education: The first step in using bamboo as an architectural material is to get educated on the sustainability of the bamboo construction.
Creation of jobs: If bamboo became a material used in Malaysia, more jobs would become available.

In closing, bamboo is a material that can change the way architects and engineers design in the future. It had the ability to be a sustainable source used to create LEED certified buildings across Malaysia. This will allow for architects in Malaysia to create architecture that is not only sustainable, but also aesthetically pleasing designs.

REFERENCES

1. Community Centre. (2022). Wikipedia. https://en.wikipedia.org/wiki/Community_centre
2. Indigenous People. (2022). World Bank Group https://www.worldbank.org/en/topic/indigenouspeoples#
3. What is Vernacular Architecture? (2020). ArchDaily. https://www.archdaily.com/951637/what-is-vernacular-architecture#:~:text=Vernacular%20architecture%20can%20be%20defined,where%20the%20building%20is%20located
4. Sam Bedford. (2018). Culture Trip. https://theculturetrip.com/asia/malaysia/articles/the-history-of-malaysias-orang-asli-people/
5. Lauren Thomann. (2022). https://www.thespruce.com/vernacular-architecture-4801653#:~:text=The%20term%20'vernacular'%20became%20part,was%20better%20and%20more%20refined.
6. Sarah Edwards. (2011). https://www.archdaily.com/155224/vernacular-architecture-and-the-21st-century
7. Rethinking The Future (2022). https://www.re-thinkingthefuture.com/rtf-fresh-perspectives/a900-9-things-architects-should-learn-from-vernacular-architecture/#:~:text=Vernacular%20Architecture%20is%20known%20for,domestic%2Cnative%2Cindigenous.

METHODOLOGY

PRIMARY DATA

Observation
- Study about the history of bamboo construction.
- Understanding the versatility of bamboo and the sustainability of the material.
- Analyse on the limitation of the material and the availability in Malaysia.

SECONDARY DATA

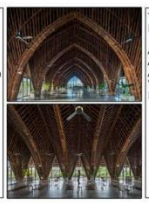
Literature Review
- Study about the history of bamboo construction.
- Understanding the versatility of bamboo and the sustainability of the material.
- Analyse on the limitation of the material and the availability in Malaysia.

Precedent Studies
- Study on how the connections were done by the architects.
- Study on the linitation and the benefits of the connections used.

Step 1:	Step 2:	Step 3:	Step 4:	Step 5:
Define the objective of the survey	Determine the sampling group	Record the data gathered from the observation	Analyse the data from the observation	Impliment the data gathered to the design

PRECEDENT STUDIES

Sharma Springs
Architect: IBUKU
Area: 750sqm
Year: 2012
Location: Indonesia

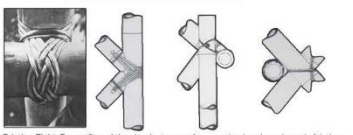


Ting Xi Bamboo Pavilion
Architect: VTN Architect
Area: 480sqm
Year: 2018
Location: China

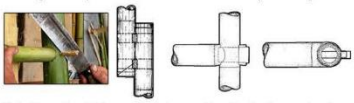
Nocenco Cafe
Architect: VTN Architect
Area: 687sqm
Year: 2018
Location: Vietnam

FINDINGS

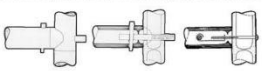
Low-Technology Connections



Friction Tight-Rope - One of the simplest ways of connecting bamboo pieces is friction tight-rope connection. Lashing can have variations of complexity as well. With joining members cut appropriately to fit the snug to each other, the bamboo pieces can be lashed together with pre-drilled holes in each of them and the rope tied through them.

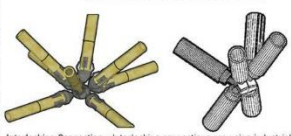


Wedge Connection - Driving a wedge at the connection of two bamboo members is a simple way of connecting bamboo. The horizontal member end needs to be rounded in order to fit and not move around the connection. On the opposite end of the vertical member a wedge is driven through and ends on the other side, inside the horizontal member.

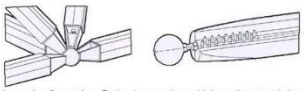


Plugin Connection - Plugin conections are similar in connections in wood with mortise and tenon, and are considered seldom used in bamboo structure. It used with rope connection sometimes as well. To be installed not too close to edge of bamboo, due to chances of the plug breaking out and the bamboo splitting.

High-Technology Connections



Interlocking Connection - Interlocking connections are using industrialized dditional components. It involve gluing or shedding that around bamboo members. This involve applying a wood piece in the inner surface of the bamboo and gluing it. Also for this work, two slots need to be in the bamboo to prevent cracking when the wood in being lodged in the bamboo.



Induo-anchor Connection - For bamboo members with large diameters, induo-anchor technique an be used to transfer 100% of the load of the cane cross section. The anchor is a cast-iron core with teeth connection on its side. The induo-anchor can be easily sheded with a bamboond used with concrete or artificial resin. The advantagefor this is it is simple manufacturing with a threadedbar and two counter nuts, and steelbal with threadbores are used as jointpoints.

Transportation Armature - Transportation armature involves pressed concrete in the connection and depends on the concrete/bamboo connection, specifically the concrete compressive strength. Another factor involves the armature's thread diameter, the tractive direction and the joint design.

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