

Application of Bamboo Material for Thermal Health with pergola at the Santiburi Building the Residences in Bueng Kum -Thailand

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ABSTRACT: *The principle of green buildings that have a minimal carbon footprint in building construction is a symbol of multidimensional development. This santiburi construction study is in line with ongoing global efforts to develop robust green building technologies. Bamboo as a building material can offer its users a new cultural identity amid the siege of industrial culture, especially in the application of secondary skin on buildings. This is the first step in aligning bamboo as a material with culture and the rapid flow of progress so that bamboo is sustainable, both in terms of availability and utilization. , can be maintained properly and sustainably To get data about this project, the main method used is the calculation of the OTTV value using excel and later it will be supported by thermal comfet application software and for other information researchers collect data based on qualitative research parameters, literature studies on secondary skin or others. The collection of theories and literature studies related to the use of secondary skin for thermal health, supported by digital documentation in the form of an evaluation design carried out using exploratory and descriptive methods in this study.*

Keywords: *Sustainably, thermal comfet, bamboo*

I. Preliminary

Issue & problem

The need for materials that have sustainable properties is very difficult to apply to building users. It's time to develop strategies for multidimensional growth that meet the needs of the general public and address common global environmental concerns in the construction industry. The principle of green buildings that have a minimal carbon footprint in building construction is a symbol of multidimensional development. This santiburi construction study is in line with ongoing global efforts to develop robust green building technologies.

This makes bamboo a good building material and bamboo as a secondary or others leather technology is quite attractive and sustainable. The proposed concept will not only reduce the effect of excessive sunlight on the space and reduce the need for air conditioning, but also have eco-technological properties to make it healthy to use.

The appearance of a building with a facade using a double skin or others facade is the main attraction as a facade design work in interesting architecture and deserves

to be appreciated and observed. Double skin facade is a facade system consisting of two layers of building envelope which is placed on one side of the building facade or the entire building. Various patterns are displayed on this building's facade system as an effort to improve the visual quality of the building's facade.

The santiburi residential building has wide openings with glass material without ventilation so that the ventilation in this building is not naturally controlled, even though the concept of this building is to have natural elements in terms of materials or others. then the wood materials used are quite a lot to meet the needs of this building, including the facade of the ground floor so that other alternatives are needed to approach the natural concept of housing in its design evaluation.

Problem Formulation & Design Purpose

Every human activity to meet the needs of life must affect the environment. This has been asked by the angels to Allah, why did Allah create humans as khalifah on earth when humans will cause damage on earth. Remember when your Lord said to the angels, "Indeed I want to make a caliph on earth." They said: "Why do you want to make (caliphate) on earth a person who will do mischief on it and shed blood?" (Al-Baqarah:30)

Various solutions have been offered to reduce the impact of global warming such as planting trees to absorb carbon dioxide gas in the air,

Using environmentally friendly building materials such as bamboo which is environmentally friendly to be used as an alternative building material that is suitable for sustainable concepts. reduce the use of goods that cannot be recycled, use energy efficiently, and so on. The Qur'an further discusses the solution to these problems from a preventive attitude, namely not being excessive or not being extravagant (Al-Furqan: 67).

Based on several Qur'anic hadiths, it can be seen that the bamboo approach can be an alternative in applying environmentally friendly materials. One of the main categories of ecological materials is that they have safety requirements for human health and the environment that traditional building materials come from nature apart from bamboo materials there are some materials such as natural stone, wood and clay are materials that do not contain chemicals that can interfere with health. humans, in contrast to contemporary materials such as ceramics, tiles, plastic pipes, etc. This is because the composition of the mixed ingredients in the ingredients is still questionable because of its safety for human health.

Bamboo as a building material can offer its users a new cultural identity amid the siege of industrial culture, especially in the application of secondary skin on buildings. This is the first step in aligning bamboo as a material with culture and the rapid flow of progress so that bamboo is sustainable, both in terms of availability and utilization. , can be maintained properly and sustainably. Certainly not an easy thing, and

requires the synergy of all parties involved and concerned about the existence of bamboo, including the government, which must be able to become a leading sector in involving all elements of society. With, bamboo is made as an alternative to the use of ecological materials that have an impact on preserving nature and the environment for future generations.

II. Brief Study & Solution

Offered Solution

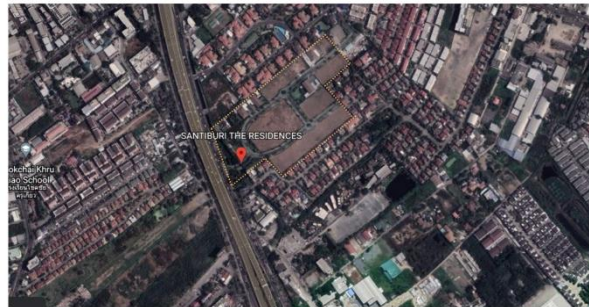
A good building is a building that can take advantage of the potential of nature and use building materials that exist in its environment. Sustainable buildings are buildings that can balance 3 factors, namely ecological, social and economic, in this case sustainable materials must be taken into account, namely age, production factors and energy from processing these materials. Global warming is one of the problems facing society today. This is caused by the negligence of the community itself in dealing with the environment, the large number of human works that can have a negative impact on the environment, the issue of global warming is not widely discussed in the field of cause and effect but has been taken too seriously. . it is included in the design or planning stage, which is an effective and appropriate action.

The construction industry is the second largest contributor to global warming after the food industry. This is due to the use of materials such as concrete, steel or metal which are currently widely used for structural elements such as beams, columns, walls and roof structures. In general, these materials are non-renewable materials. These materials will run out in a certain time and the effects caused by the continuous use of these natural resources can be detrimental to nature itself, including a large amount of energy expended during the extraction, processing and construction of these materials. This is a design evaluation solution for Santiburi the Residences in Bueng KumThailand which develops the principles of nature and ecology in an apartment.

The main challenge in building technology innovation is the delivery of materials quickly but with sustainable material properties. The need for new materials that can be produced quickly, easily transported, built more quickly and cheaply and, where possible, generate income for local residents. More importantly, it should not cause more harm to the environment. Responding to the need for investment and environmental safety, it is necessary to encourage innovation in architecture and construction.

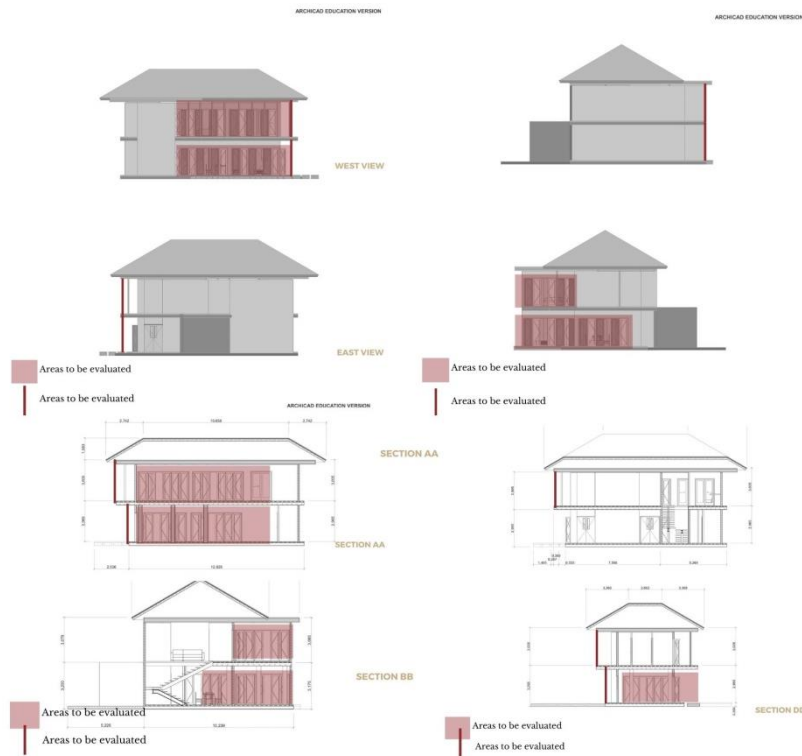
Currently there is a growing trend in the use of materials with investment and ecological benefits. Bamboo is a viable option because of its environmental benefits over conventional building materials. This is a design evaluation solution for the Santiburi residence in Bueng KumThailand that develops the principles of nature and ecology in a house

Selected Existing Building



This building Latitude: 14.1° Longitude: 100.5 is located in Address: 88 Santiburi Pradit Manutham Road, Ekkamai-Ram Intra, Nuanchan, Bueng Kum, Bangkok 10230, Thailand. Growing in the urban scope, this housing is used as housing that is friendly to the environment, especially in building materials. This building has a natural concept in materials and the environment which is supported by the many resin trees in this residential area.





III. Precedent & Technology

Relevant Precedent

The house, which is located at a crossroads, uses the concept of sustainable materials used as a secondary skin. Owners renovating an old house needing repairs to rebuild it to meet old wishes and preferences. The owner started with a simple brief - a minimalist tropical house with a large social space on the ground floor for gathering with family and friends. His family wanted a private yet modern tropical home that suited Singapore's dense urban environment and tropical climate.

The owner loved the texture and color of the bamboo, leaving a deep impression and he was determined to dress up his new home with bamboo. Responding to the site with form and function, the bamboo bulkhead is conceptualized as a sheath, enveloping the building. As a unifying element, bamboo screens run around the rounded edges of the facade, creating a soft and organic layer sandwiched between the defined white roofs. The rounded edges of the facade respond to road bends, so that when one approaches from the bend one is greeted by a bamboo sheath.

Expected Output

In this project, the author tries to formulate the problem in the form of questions that are expected to help Design methods:

- How is the process of making secondary skin or others from bamboo with the principle of design evaluation at the Santiburi the Residences Building in Bueng Kum -Thailand?
- How to install the secondary skin or others of bamboo with the principle of design evaluation on the Santiburi Residences Building in Bueng Kum - Thailand?
- What is the effect of using secondary skin or others made of bamboo, especially on thermal health as well as in terms of aesthetics and efficiency?

Then this design evaluation is expected to improve the thermal health of the Santiburi the Residences Building in Bueng Kum -Thailand by applying a second skin with a sustainable material, namely bamboo. Thus, this design evaluation will be tested with a thermal temperature software application to control the thermal feasibility of the building.

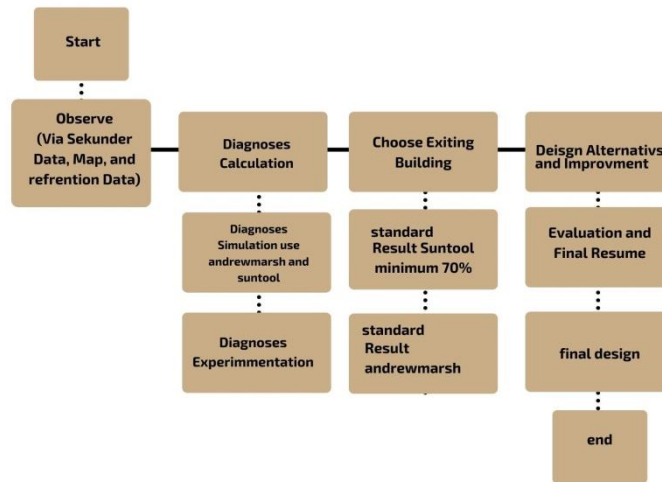
IV. Design Method & Existing Building Evaluation

Evaluating Tools and Method

To get data about this project, the main method used is the calculation of the OTTV value using excel and later it will be supported by thermal comfet application software and for other information researchers collect data based on qualitative research parameters, literature studies on secondary skin or others. The collection of theories and literature studies related to the use of secondary skin for thermal health, supported by digital documentation in the form of an evaluation design carried out using exploratory and descriptive methods in this study.

This method will calculate material properties in existing buildings that have sustainable properties but the cost and convenience can be quite difficult, namely the bamboo material used in existing buildings. It's time to develop strategies for multidimensional growth that meet the needs of the general public and address common global environmental problems in the construction industry.

DESIGN VARIABLES/DIAGNOSIS
 Diagnosis (Simulation, Calculation, Experimentation)



The principle of green buildings that have a minimal carbon footprint in building construction is a symbol of multidimensional development. This santiburi construction study is in line with the ongoing global effort to develop robust green building technologies.

	Existing	Alternative 1	Alternative 2	Alternative 3
March	<ul style="list-style-type: none"> 10.00-12.00 :Behind 12.30 : 82 % 13.00 : 76 % 13.30 : 76 % 14.00 : 76 % 14.30 : 74 % 15.00 : 64 % 15.30 : 56 % 16.00 : 53 % 	<ul style="list-style-type: none"> 10.00-12.00 :Behind 12.30 : 0 % 13.00 : 65 % 13.30 : 82 % 14.00 : 87 % 14.30 : 91 % 15.00 : 95 % 15.30 : 97 % 16.00 : 98 % 	<ul style="list-style-type: none"> 10.00-12.00 :Behind 12.30 : 100% 13.00 : 100% 13.30 : 100% 14.00 : 100% 14.30 : 100% 15.00 : 100% 15.30 : 100% 16.00 : 100% 	<ul style="list-style-type: none"> 10.00-12.00 :Behind 12.30 : 82 % 13.00 : 76 % 13.30 : 76 % 14.00 : 74 % 14.30 : 64 % 15.00 : 56 % 15.30 : 56 % 16.00 : 53 %
June	<ul style="list-style-type: none"> 10.00-12.00 :Behind 12.30 : 95 % 13.00 : 92 % 13.30 : 92 % 14.00 : 86 % 14.30 : 86 % 15.00 : 89 % 15.30 : 64 % 16.00 : 54 % 	<ul style="list-style-type: none"> 10.00-12.00 :Behind 12.30 : 2 % 13.00 : 19 % 13.30 : 58% 14.00 : 83% 14.30 : 88% 15.00 : 91% 15.30 : 95% 16.00 : 96% 	<ul style="list-style-type: none"> 10.00-12.00 :Behind 12.30 : 100% 13.00 : 100% 13.30 : 100% 14.00 : 100% 14.30 : 100% 15.00 : 100% 15.30 : 100% 16.00 : 100% 	<ul style="list-style-type: none"> 10.00-12.00 :Behind 12.30 : 0 % 13.00 : 75 % 13.30 : 88 % 14.00 : 97 % 14.30 : 100 % 15.00 : 100 % 15.30 : 100 % 16.00 : 100 %
December	<ul style="list-style-type: none"> 10.00-12.00 :Behind 12.30 : 30 % 13.00 : 31 % 13.30 : 29 % 14.00 : 25 % 14.30 : 29 % 15.00 : 25 % 15.30 : 16 % 16.00 : 13 % 	<ul style="list-style-type: none"> 10.00-12.00 :Behind 12.30 : 0% 13.00 : 73% 13.30 : 84% 14.00 : 93% 14.30 : 94% 15.00 : 96% 15.30 : 100% 16.00 : 100% 	<ul style="list-style-type: none"> 10.00-12.00 :Behind 12.30 : 95 % 13.00 : 96% 13.30 : 98% 14.00 : 98% 14.30 : 100% 15.00 : 100% 15.30 : 100% 16.00 : 100% 	<ul style="list-style-type: none"> 10.00-12.00 :Behind 12.30 : 0 % 13.00 : 66 % 13.30 : 84 % 14.00 : 91 % 14.30 : 98 % 15.00 : 98 % 15.30 : 98 % 16.00 : 99 %

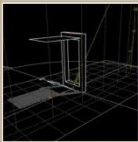
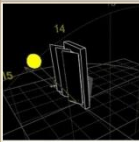
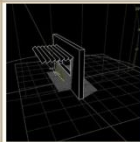
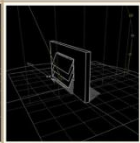




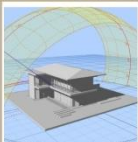
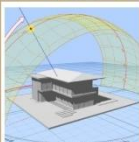
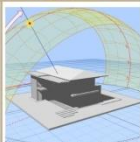
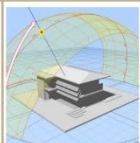
This makes bamboo a good building material and bamboo as a secondary skin or others technology quite attractive and sustainable. The proposed concept will not only reduce the

effect of excessive sunlight on the space and reduce the need for air conditioning, but also have eco-technological properties to make it healthy to use. Modern construction mainly uses non-renewable and environmentally harmful materials, such as concrete and steel, which have an impact on the environment and ecosystem. Products made from non-environmentally friendly materials require a lot of energy for processing and transportation, which contributes to the greenhouse effect. In addition, a high foreign exchange rate is required for the import of heavy equipment and its constituent materials for its production.

Evaluating Result& Recommendations

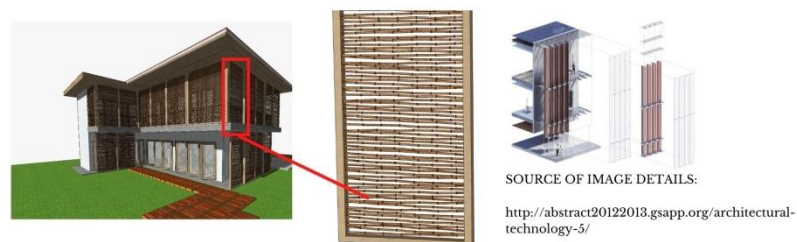
From the results of the analysis of the table above that the value generated from the 3 alternatives above, namely in March, June and December which has an average of 100%, this value is very good compared to the two alternatives listed, namely the second alternative. although all alternative designs have met the stated standards of around 70%, the second alternative is much better, namely 100%.

PERFORMANCE ANALYSIS OF INITIAL CONCEPTS AND THEIR TESTING

	Existing	Alternative 1	Alternative 2	Alternative 3
suntool simulation				
Design				
andrewmarsh simulation				

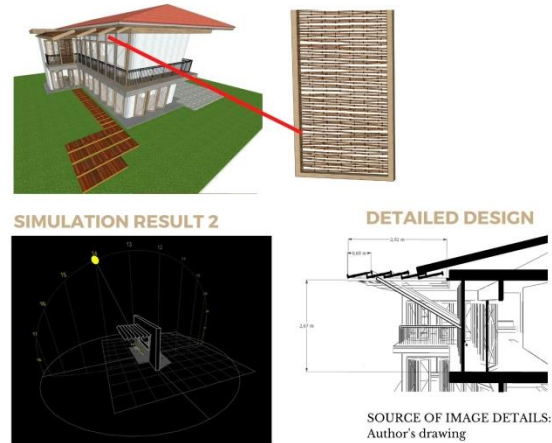
Design Alternative & Evaluation

Improvement PBD (evaluating result from one alternative design)



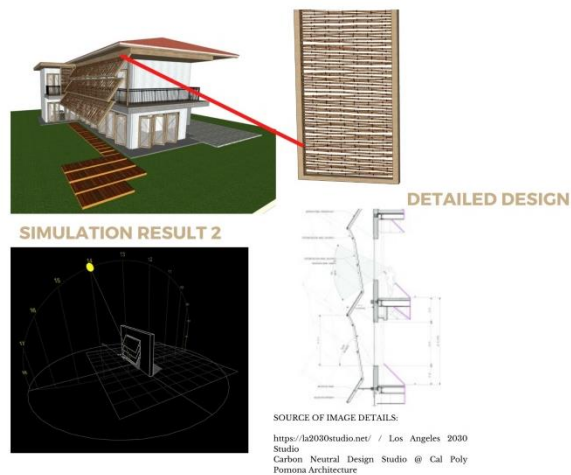
from the first alternative design using a suntool simulation, the proposed formation is vertical shedding with a pattern of abstract bamboo stacking with Japanese bamboo or some kind of rattan to add aesthetics and usability according to the targets mentioned.

Improvement PBD (evaluating result from two alternative design)

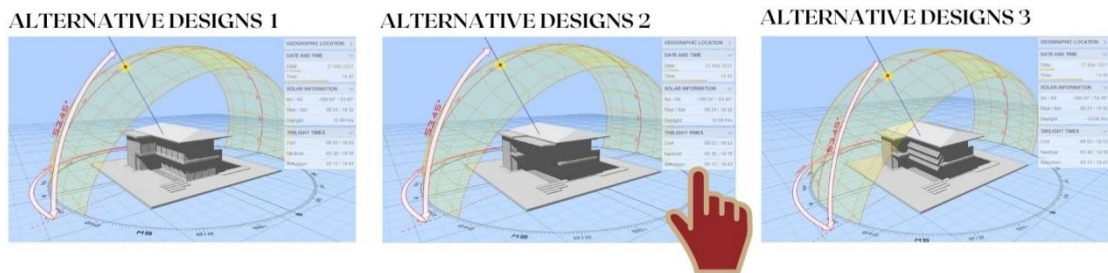


from the second alternative design using suntool simulation, the proposed formation is horizontal shedding using a pergola arrangement with several panels with a slope of 35 degrees. From this alternative, the sun capture or shedding is very good because sun exposure can block up to 16.00

Improvement PBD (evaluating result from three alternative design)



from the third or last alternative design using suntool simulation, the proposed formation is a horizontal shedding type that uses a fin tilt of about 65 degrees with 3 panels needed. from the 3rd alternative design, the test in June was quite good from the test results, namely 100% at 14.30 to 16.00 at the highest sun exposure, but in March and December it decreased by 74%-53% so that this value was good only at June only.



V. Design Exploration

Conclusions

it is known that the test results in March and June there are very low results, namely in March 19% and July around 65%, so if there is a skendary skin that does not meet the standards as a sufficient barrier to sunlight in buildings as stated from the first alternative design, the test in December was quite good from the test results, namely 73% at 13.00 to 15.30 on the highest sun exposure, but with the presence of skendary skin the 73% result could be hindered by the abstract bamboo motif.

from the second alternative design using suntool simulation, the proposed formation is horizontal shedding using a pergola arrangement with several panels with a slope of 35 degrees. From this alternative, the sun capture or shedding is very good because sun exposure can block up to 16.00 . from the alternative design, the two tests in December were quite good from the test results, namely almost 100% imagining of sun exposure at 13.00 to 15.30 at the highest sun exposure, then in December it decreased from 95%-98% so that the results of the alternative both of these are very good.

from the third or last alternative design using suntool simulation, the proposed formation is a horizontal shedding type that uses a fin tilt of about 65 degrees with 3 panels needed.from the 3rd alternative design, the test in June was quite good from the test results, namely 100% at 14.30 to 16.00 at the highest sun exposure, but in March and December it decreased by 74%-53% so that this value was good only at June only.

The three alternative designs can only be seen with the best results, namely in alternative 2 because the value shows in March, June, and December that is 100% at the specified time, which is 14.00-16.00 because the sun is highest from the west in the area. this santiburi housing.

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