UNIVERSITI TEKNOLOGI MARA

The 11th International, Invention, Innovation & Design 2022

INDES 2022

Ushering in the Age of Endemic

THE 11TH INTERNATIONAL INNOVATION, INVENTION & DESIGN COMPETITION INDES 2022

EXTENDED ABSTRACTS BOOK

e ISSN 2756-8733

9 772756 873009

Perpustakaan Negara Malaysia Cataloguing in Publication Data

No e-ISSN: e-ISSN 2756-8733

Cover Design : Nazirul Mubin Mohd Nor
Typesetting : Wan Nurul Fatihah binti Wan Ismail

The 11th International Innovation, Invention and Design Competition 2022

Organised by

Office of Research, Industrial Linkages, Community & Alumni Networking (PJIM&A)
Universiti Teknologi MARA Perak Branch

and

Academy of Language Study
Universiti Teknologi MARA Perak Branch

BAMBOO METAL ROOFING

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ABSTRACT

Green campus is a program that incorporates environmental management and preservation into higher education institutions. Numerous studies have investigated higher education institutions' efforts (i.e., 3R-reduce, reuse, and recycling, campus garden, energy and water management, green building construction materials, and transportation sustainability) to create a green campus. However, through analysis of green campuses, the innovation of existing roofing (i.e., metal) using green building construction materials (i.e., bamboo) with current technology is limited. As a result, the objective of this innovation project is to create improvement in the material of metal roofing while solving the problem that has been occurring in metal roofing in the Malaysian construction industry. Extensive literature reviews are conducted via various databases (i.e., Scopus, Web of Science, and Science Direct). Later, the simulation model using Google SketchUp was used to visualise the concepts and idea of Bamboo Metal Roofing. The findings revealed that the proposed Bamboo Metal Roofing has the potential to be marketed (i.e., local or international) due to its great benefits (i.e., less corrosion and leakage, strengthened structure strength, and fire resistance). Thus, it is hoped that the proposed Bamboo Metal Roofing would improve the existing metal and achieve the green campus program goal.

Keywords: *Bamboo Metal Roofing, Simulation model, green campus*

1. INTRODUCTION

A green campus is an overall effort in environmental management aimed at creating a sustainable campus. The green campus concept offers an institution the opportunity to take the lead in redefining its environmental culture and developing new paradigms by creating sustainable solutions to the environmental, social, and economic needs of mankind (Gandasari et al., 2020). Green building is a comprehensive idea that begins with the recognition that the built environment may have tremendous impacts on the natural environment as well as the people who live in buildings every day (Khan et al., 2019). Green building materials are composed of renewable, rather than nonrenewable resources. Green materials are environmentally responsible because impacts are considered over the life of the product.

As time goes on, every building structure must be built according to the technology adoption to ensure the building structure will stand in the long term and be safe to live in. Metal roofing has been chosen as the main idea of this project innovation because metal is one of the most common roofing materials for commercial structures, and it is also gaining appeal among homeowners. Nevertheless, the existing metal roofing causes numerous problems (i.e., sun exposure, corroding due to excessive weather, and unsafety) to their occupants. Consequently,

this innovation project was carried out to innovate the existing metal roofing with creative concepts that may improve the metal roofing.

2. METHODOLOGY

The research method in this study focused on a literature review from past research. Sources such as journal articles gathered from three main databases (i.e., Scopus, Web of Science, and Science Direct) have been used as a literature review in this study. After intensive literature is conducted, a simulation model is carried out to visualize the concepts and ideas of the proposed Bamboo Metal Roofing.

3. FINDINGS

The proposed Bamboo Metal Roofing is made up of Metal, Bamboo, Polyurethane Foam, Epoxy Coat, and Polyurethane Adhesives which undergo six manufacturing processes (i.e., adhesive, cooling, cutting, coating, stacking, and wrapping).

The proposed Bamboo Metal Roofing concept that was inspired by Lego will come out with these three designs which are left, middle and right (Figures 1-3) that can solve problems such as installation, corrosion, and oil canning of metal roofing. This design is easy to install because it will not be using any screws or nails as its binder. The installation of the proposed Bamboo Metal Roofing was visualized better as depicted in the figures below.

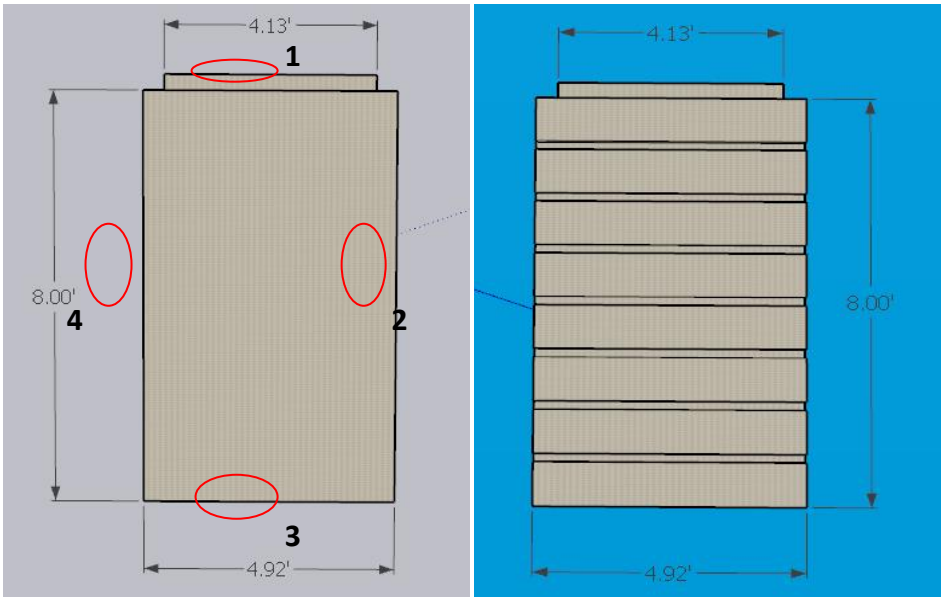

Figure 1 Top and Bottom of Left Roofing

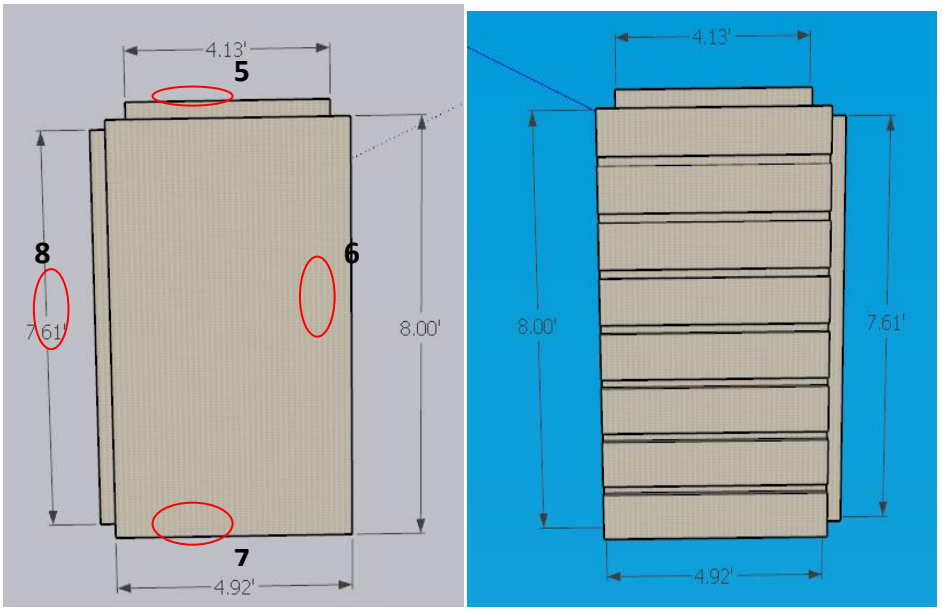

Figure 2 Top and Bottom of Middle Roofing

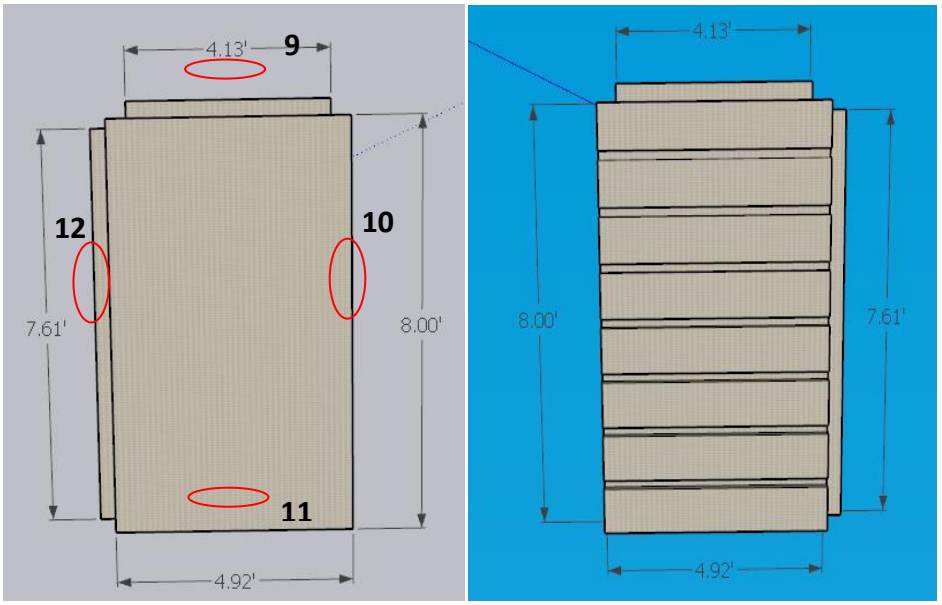

Figure 3 Top and Bottom of Right Roofing

4. CONCLUSION

In conclusion, the proposed Bamboo Metal Roofing can improve the existing metal roofing in the Malaysian Construction Industry. A combination of metal, bamboo, polyurethane foam, epoxy coat, and polyurethane adhesive will allow the performance of the Bamboo Metal Roofing. Moreover, this product will prevent corrosion, leakage, and can give strength to the roof structure. In addition, the selected material of Bamboo Metal Roofing also provides fire resistance that can protect the roof from fire. Hence, it is hoped that the proposed Bamboo

Metal Roofing will improve existing metal roofing, achieve the green campus goal as well as benefit local and international contractors, clients, suppliers, and manufacturers in the future.

REFERENCES

Gandasari, I., Hotimah, O., & Miyarsah, M. (2020). Green campus as a concept in creating sustainable campuses. *KnE Social Sciences*, *2020*, 1–9. https://doi.org/10.18502/kss.v4i14.7853

Khan, J. S., Zakaria, R., Shamsudin, S. M., Abidin, N. I. A., Sahamir, S. R., Abbas, D. N., & Aminudin, E. (2019). Evolution to the emergence of green buildings: A review. *Administrative Sciences*, *9*(1). https://doi.org/10.3390/admsci9010006

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Surat kami : 700-KPK (PRP.UP.1/20/1)
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