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BAMBOO RADIANT COOLING FLOOR SYSTEM (BRCFS)

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ABSTRACT

Green campus is a place where sustainable and eco-friendly activities are combined with education to promote sustainable and eco-friendly activities on campus. Numerous studies have investigated higher education institutions' efforts (i.e., campus garden, 3R-reduce, reuse, and recycling, energy and water management, transportation sustainability and green building construction materials) to create a green campus. However, through green campus analysis, the innovation of existing concrete floor slabs using green building construction materials (i.e., bamboo) with current technology is limited. As a result, this innovation project aims to improve the material of existing concrete floor slabs while solving the problem that has been occurring in concrete floor slabs in the hostel blocks at UiTM Seri Iskandar campus. Extensive literature reviews conducted via various databases (i.e., Scopus, Web of Science, and Science Direct) were explored. Later, the simulation model using SketchUp 2019 was used to visualize the concepts and ideas of Bamboo Radiant Cooling Floor System (BRCFS). The findings revealed that the proposed BRCFS has the potential to be marketed (i.e., local, or international) due to its great benefits (i.e., providing a healthy environment with minimal dust or particles, providing the ideal indoor temperature, and being cost-effective). Thus, the proposed BRCFS would improve the existing concrete floor slabs and achieve the green campus program goal.

Keywords: *Bamboo Radiant Cooling Floor System (BRCFS), Simulation model, green campus*

1. INTRODUCTION

The green campus concept allows an institution to lead the way in reinventing its environmental culture and forging new paradigms by developing sustainable solutions to the world's environmental, social, and economic requirements (Gandasari et al., 2020). In comparison to conventional educational institutes, the green campus program allows universities, schools, and colleges to conserve natural resources like water and biodiversity, optimize energy efficiency, manage waste, and educate about climate change and sustainability while addressing students' well-being. 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). Meanwhile, green building materials are derived from natural and renewable resources. These sources are gathered locally to save transportation energy costs and are maintained sustainably. Recycled components and prefabricated goods save time and money while often outperforming traditional options.

As time goes on, every building structure must be built according to the technology adoption to ensure the building structure withstands the test of time and be safe to live in. Concrete floor slab has been chosen as the main idea of this project's innovation because concrete floor slab is one of the most common floors used in Seri Iskandar UiTM Perak campus especially their hostel blocks. The most crucial function of a floor is to securely support the loads imposed on it as well as its weight during its lifetime. Nevertheless, the concrete floor slab used in this hostel have several problems which are shrinkage crack, efflorescence, impaired health, and uncomfortable feeling by students. The defects that occurred in concrete floor slabs are difficult to rectify and patchwork cannot adequately restore concrete flooring. In addition, it doesn't have good sound and heat insulation capabilities (Matysek & Witkowski, 2019)

Thus, Bamboo Radiant Cooling Floor System (BRCFS) was devised not only to alleviate the problem of hostel floors but also to ensure student rooms are more appealing and unique by using bamboo as a floor finish. Furthermore, a radiant cooling system can chill students' rooms while also giving comfort. Then, the finishes of the floor will use bamboo since it provides the best alternative to green construction material as well as having a natural beauty, sturdiness and renewability.

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) were used as a literature review in this study. After intensive literature was conducted, a simulation model was carried out to visualize the concepts and ideas of the proposed BRCFS.

3. FINDINGS

The proposed idea of BRCFS is from the combination of bamboo (green building materials) with the building services equipment. The proposed BRCFS is made up of a polyethylene (Plastic), water tank, water chiller, compressor pump, manifold, PEX pipe and bamboo flooring.

Furthermore, BRCFS was proposed to minimize problems such as shrinkage crack, efflorescence, impaired health, and uncomfortable feeling. This innovation will help to maintain the low temperature in the room by using an eco-friendly material.

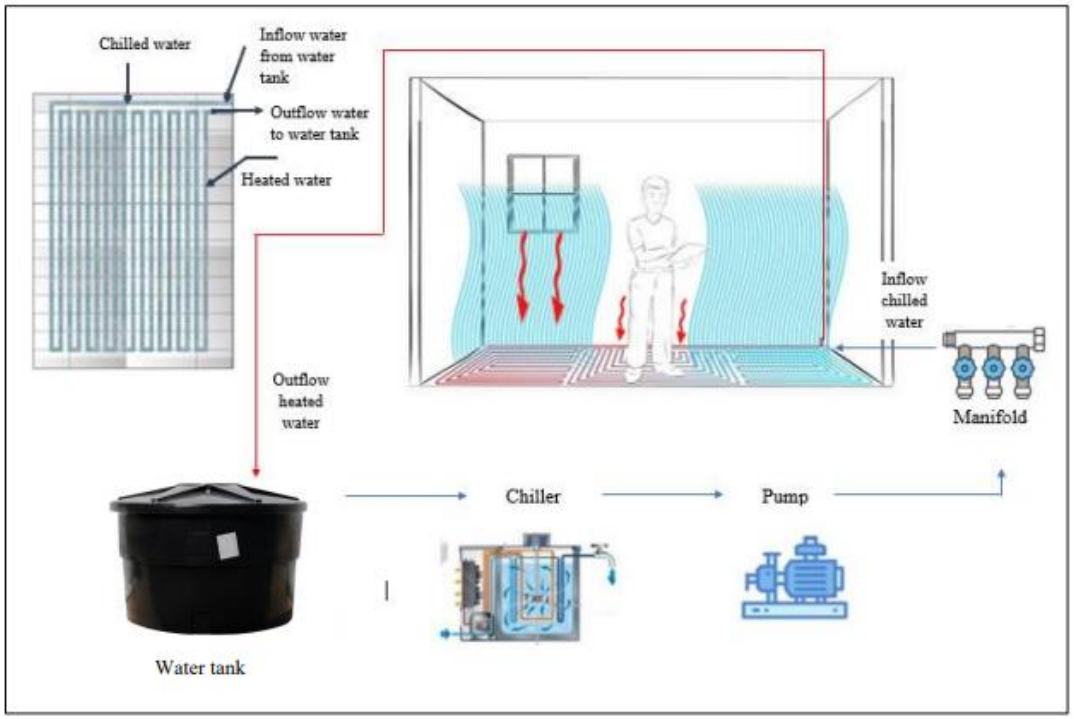

Figure 1 Concept of BRCFS

4. CONCLUSION

In conclusion, the proposed BRCFS can improve the existing concrete floor slab in the hostel blocks at UITM Seri Iskandar campus and any building that used concrete floor slab. With the aid of a combination of polyethylene (plastic), water tank, water chiller, compressor pump, manifold, PEX pipe, and bamboo flooring will allow the performance of the BRCFS. Moreover, this product will provide a healthy environment with minimal dust or particles, ideal indoor temperature, and be cost-effective. Hence, it is hoped that the proposed BRCFS will improve the existing concrete floor slab and achieve the green campus goal. This innovation will benefit the local and international contractors, clients, suppliers, and manufacturers in the future.

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