BEAM STRUCTURE MADE OF OIL PALM FIBRE-EPOXY COMPOSITE

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LAPORAN AKHIR PROJEK "BEAM STRUCTURE MADE OF OIL PALM FIBRE-EPOXY COMPOSITE – INVESTIGATION OF MECHANICAL PROPERTIES"

Dengan hormatnya perkara di atas adalah dirujuk.

Bersama ini disertakan sesalinan (*hardcopy & softcopy*) laporan tersebut untuk rekod dan rujukan Y. Bhg. Prof. Laporan kemajuan projek turut dilampirkan.

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Dilampirkan

ABSTRACT

In those days, the construction of bridges mainly utilized components made of steel in the form of trusses, arches and beams. Nowadays, a large numbers of researchers and institutions have been working towards exploring the potential of such new materials and their adequate application to structural engineering design. The potential for the use of natural fibre reinforced composites for this application is enormous, which also contribute positively to waste management solutions in the oil palm mill or plantation. The objectives of this fundamental research project are to obtain basic mechanical properties of composite materials (bars) made of indigenous natural fibres sourced from oil palm tree namely the oil palm empty fruit bunch (OPEFB) fibre and oil palm frond (OPF) fibre mat and sugar cane husk (SC). The OPEFB samples consist 10 % and 20 % (mass fraction) of EFB fibres while the SC sample is made of 10 % of SC fibre. The tensile strength of composites made from OPEFB appreciates 35% as compared the homogeneous epoxy. Although the average flexural strength for both of the composites is less than the homogeneous epoxy, the flexural modulus of the OPEFB composite increased up to 62%. The presence of OPEFB fibre and OPF fibre mat improved the impact strength of the homogeneous epoxy as much as 40%. Based on these results, we have simulated the use of the composites, which we term *semi-structural-members*, namely the column and beam to build short span bridge (SSB) using LUSAS®. Results of the FEM analysis indicated that the 10% OPEFB composite would be able support about 200 kg load with a maximum deflection of 0.05 mm and 0.2 mm for the 5-m and 7-m span SSB, respectively using the T-beam configuration. This outcome, when compared to the strain at failure, indicates the potential use of OPEFB to build moderate load supporting structures but also in reducing the cost of SSB for usage in the rural areas as well as in recreational spots in the urban areas.

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CHAPTER I

INTRODUCTION

1.0 Introduction

This chapter is intended to discuss the general introduction, objective, literature review, problem statement and methodology of this research.

1.1 Research Background

Bridge construction has been started for centuries. The construction of early bridges was a necessity to facilitate the movements of people and goods such as to cross river, drain or even strait. In those days, the bridges were mainly made of steel in the form of trusses, arches and beams. Nowadays, a large numbers of researchers and institutions have been working towards exploring the potential of such new materials and their adequate application to structural engineering design. The combinations of composite materials with traditional materials such as concrete, steel and masonry provides new construction components and attractive solutions for structural strengthening. Further development is required concerning long term behavior, durability, established criteria for design and safety assessment. Fibre reinforced polymer (FRP) is one of the new materials for bridge construction. The potential for the use of fibre reinforced