

UNIVERSITI TEKNOLOGI MARA

**STRUCTURAL PERFORMANCE OF
STEEL FIBRE REINFORCED
CONCRETE RIBBED SLAB PANEL**

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ABSTRACT

Steel Fibre Reinforced Concrete (SFRC) has proven to be an attractive material for many applications in the civil construction industry due to it can reduce the formation of crack inside concrete. Furthermore, the excellent performance demonstrated by this composite is essentially due to its improve mechanical properties such as tensile strength, compressive strength, flexural strength and modulus of elasticity. This study describes the experiment works and the numerical model developed using London University Stress Analysis System (LUSAS) in order to understand the behavior of SFRC Ribbed Slabs structure in term of ultimate load capacity and deflection. The profile of ribbed slab, it can minimize the usage of concrete in construction industry today. The influence of steel fibers on the behavior of ribbed slab concrete structures was analyzed by performing bending tests with different number of ribs on each slab. There are two ribbed and three ribbed slab were studied having dimension 1000 mm x 1500 mm x 75 mm where two ribs and three ribs were formed for each slabs. The Hooked-ends steel fibers were used in this study. Based on the load deflection analysis, the SFRC two ribbed slab exhibited higher in term of ultimate load capacity and but lower deflection compared to SFRC three ribbed slab in experimental result. Meanwhile, the numerical result shows the SFRC two ribbed slab exhibited higher in term of ultimate load capacity and deflection compared to SFRC three ribbed slab. The result also shows that two ribbed slab design is the most suitable replacement for normal slab. Thus, on the overall, the ribbed slab has potential to be used as substitute of normal solid slab without losing strength, with concrete volume reduction and improving aesthetical values.

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CHAPTER ONE

INTRODUCTION

1.1 RESEARCH BACKGROUND

Concrete is one of the most important materials in the constructions nowadays that promises a lot of advantages. The ability of concrete itself can be cast in any shape. It is excellent resistant to water and high temperature, and it is also required less maintenance. These are among the obvious advantages of concrete. Concrete is also known as an economical material which can contribute to the reduction on the overall project cost. The combination with steel as reinforcement in producing reinforced concrete ends up with other excellent properties to concrete in resisting the compressive and tensile forces.

Nowadays, production of new material from the combination of concrete with other materials like fibre or another name is called composite material and is really interesting in the construction industry today. The composite material is defined as material which has two or more materials that are different physically or chemically in terms of its properties. It is either engineering or naturally created. Consequently, concrete has become the most popular material for producing a composite material by reinforcing it with other materials such as steel and FRP. In addition, research on concrete is very significant due to its unique characteristics. In fact, concrete is low in tensile strength but high in compressive strength. Because of that, by adding the steel fibre as the reinforced material inside the concrete, improvement of the tensile strength and compressive strength can be effectively achieved.

Although fibre has been introduced as additive material, concrete is still considered as a heavyweight structure. Therefore by changing the shape and design of the concrete structure, the amount of concrete use can be reduced and automatically the weight structure is reduced too. (Midaugas et. al, 2010 and Mosley et. al., 2012). Due to this, ribbed slab has been introduced to reduce the amount of the material used in the structure. Ribbed slab is something that works like a normal slab but in a way that it provides a lighter and stiffer slab than an equivalent flat slab. It can be