UNIVERSITI TEKNOLOGI MARA

FATIGUE BEHAVIOUR OF A POLYMER CONCRETE WITH AND WITHOUT ADDED POLYESTER FIBRE

OMAR BAPOKUTTY

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ABSTRACT

The fatigue and fracture behavior of polymer concrete has been studied. The study has been conducted on polymer concrete plates with and without notch under fatigue loading of constant amplitude (F_a = 0.05 kN) and at frequency of 25 Hertz. The fatigue resistant of polymer concrete material reinforced with waste polyester fibers was also studied and compared with the former composite.

The polymer concrete used in this study was a series of formulated composite with ratio of 60:30:10 of sand, polyester resin and talcum powder respectively. For a fiber-reinforced polymer concrete, 0.25 percent waste polyester fiber mixture was added and 59.75 percent reduction of sand was formulated.

Polymer concrete has been found to exhibit better fatigue and fracture properties than the Portland Cement. The addition of fiber to the polymer concrete showed an increased in the fatigue resistant about 5% for without notch and 20% for notch specimens. Introducing precrack to the specimens (a/w = 4/22) reduced its fatigue resistant up to 6% for polymer concrete and up to 3% for fiber-reinforced polymer concrete. This is attributed to crack formation in the material during the specimen's preparation. The addition of fibers to the polymer concrete was found to enhance the crack resistance of the composite. The improvement in fatigue life by the addition of fiber was the fibers acted as barriers to the crack growth and its propagation.

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CHAPTER 1

INTRODUCTION

1.1 General

Centuries ago, human discovered that composite materials should have the combined advantages with superior performance in comparison with the individual material. The idea of combining two different materials to make single superior composite materials is not new. Some of the earliest building materials were composite materials. In composites, a second material is added to obtain specific performance not available in the unmodified material.

A composite material is a complex material such as wood or fiberglass, in which two or more distinct material or phases, structurally complementary substances, especially metals, ceramics, glasses and polymer, combined to produced structural or functional properties not present in any individual component. Simply state that, a composite is a combination of the materials joined into a whole to create an end product for a specific purpose. Composite materials are becoming more popular in the construction industry nowadays. They exhibit a behavior with properties that are not easily found in any simple material. Many of theses desirable features are obtained more efficiently an often at lower cost. Traditionally, the use of the composite materials in structural engineering applications has been limited to two very common materials, namely steel and concrete.

The range of composite is enormously diversified and the list of candidate materials is almost endless. Nearly all-conventional engineering materials can be used as a matrix and reinforcement. Composites can classify into laminar composite, particulate and fibrous. Laminar composite composed of layers of materials held together by the matrix binder and particulate composite consist of particles dispersed