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Title:

Debonding of concrete-epoxy interface under the coupled effect of moisture and sustained load

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Abstract

Fiber reinforced polymer (FRP) is a prevalent and efficient material for strengthening or retrofitting concrete structures. It has been found that the effectiveness of entire strengthening or retrofitting scheme highly depends on the bond performance of concrete-epoxy interface. During service life, structures are exposed to complicated and unavoidable mechanical and environmental situations that can cause bond deterioration. In order to ensure the structural safety in a long run, a comprehensive experiment focusing on the coupled effect of sustained load and moisture on the bond property of concrete-epoxy interface is conducted. A drastic deterioration of concrete-epoxy interfacial fracture toughness, up to 77%, is observed under coupled sustained load and moisture exposure. Based on experimental investigation, a predictive model is developed to describe the bond property variations of concrete-epoxy interface against long-term sustained load and moisture exposure. The proposed predictive model can be used to obtain a more reliable and accurate service life prediction and maintenance planning of FRP-bonded concrete structures.

Keywords

concrete-epoxy interface; debonding; sustained load; moisture

1. Introduction

Fiber reinforced polymer (FRP) is now commonly used in strengthening or retrofitting civil structures around the world when an increase of load capacity is needed, or when damage appears due to physical aging and environmental deterioration. The externally bonded FRP technique has been investigated by extensive studies and demonstrated to be effective in