

Cementitious adhesives for NSM carbon laminate strengthening system with treated surfaces

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Abstract

One of the main concerns of using structural composites as an effective technique for strengthening and rapid restoration of concrete structures is the behaviour of these systems in fire condition. Epoxy resins are currently used to bond structural composites to concrete substrate, but the vulnerability of their properties to high temperatures can compromise the strengthening effectiveness of these systems. Hence, finding an alternative adhesive is of a great importance. Recent studies presented promising results with the use of cement based materials as adhesives due to their good ability for transferring stresses and compatibility to the substrate. This study explores the adoption of a pre-treatment procedure for carbon fibre laminates for increasing the bond strength according to the near surface mounted (NSM) strengthening technique. Pull-out tests results confirmed the effectiveness of the proposed approach for enhancing the bond strength.

Keywords: FRP; Carbon laminate; NSM; Cement adhesive; Surface treatment.

1. Introduction

Strengthening and rehabilitation of structures are major issues worldwide. These interventions are due to several known reasons including calculation errors, alterations in building organization or functionalities, updating of design codes, loss of strength caused by deterioration and aging, and natural disasters, etc. [1]. As a result, restore and upgrading buildings and infrastructures are a worldwide necessity and one of the most prominent technical and scientific fields in civil engineering. Intense research and development on high performance and multifunctional construction materials have been carried out with the aim of constituting efficient systems for upgrading existing structures

efficiently from the technical and economic point of views [2].

Fiber reinforced polymer (FRP) composites are one of these materials, today used for various applications, such as reinforcement for concrete structures in the form of passive or prestressed bars, stay cables, and newly built structures. Significant benefits of FRP composites such as low weight, corrosion resistance, high tensile strength and ease of handling have increasingly attracted the structural engineers' attention in recent years [3]. In construction industry, FRPs are most used in the repair and strengthening of existing structures. The near surface mounted (NSM) technique is one of the most effective FRP-based techniques for the flexural [4], shear [5], torsional [6] and punching [7] strengthening of reinforced