



Strengthening of reinforced concrete beams: RC versus UHPFRC layers

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Abstract

Strengthening of Reinforced Concrete (RC) beams is of high importance for the structural upgrade of existing buildings. The majority of the existing RC structures need to be upgraded either because they are designed with old or without seismic code provisions or because of existing damages. In this study the effectiveness of the use of traditional RC layers is compared with the use of Ultra High Performance Fibre Reinforced Concrete (UHPFRC) layers. Experimental investigation has been conducted on beams strengthened with these two techniques and the effectiveness of the examined methods has been evaluated via comparisons of the load-deflection and the interface slip results.

Keywords: strengthening, beams, reinforced concrete layers, UHPFRC.

1 Introduction

The structural upgrade of existing structures is a key priority worldwide and especially in earthquake prone areas. The selection of the most appropriate strengthening techniques and materials is case-dependent and is highly affected by the requirements of the examined structures.

Concrete reinforced with steel bars is traditionally used for the enhancement of the structural performance of deficient buildings [1]. Remarkable development has been achieved in the last decade

in the use of novel high performance materials and especially Ultra High Performance Fibre Reinforced Concrete (UHPFRC) [2-5]. UHPFRC is a material with enhanced strength in tension and compression and significantly high energy absorption in the post crack region. A high percentage of steel fibres is used to increase the tensile strength and enhance ductility. UHPFRC's superior mechanical properties, particularly its high tensile strength and the durability, make it suitable for the protection of existing structures while it also allows the construction of relatively thin layers or jackets.