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A NEW BONDING TECHNIQUE FOR THE REHABILITATION OF OLD TIMBER FLOORS WITH CFRP COMPOSITES

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Abstract *Despite the number of applications with Carbon Fiber Reinforced Polymers (CFRP) have been grown in civil constructions, the studies available in the literature dedicated to the strengthening of old timber beams are very rare. This paper analyses the bending behaviour of old suspended timber floors flexurally-strengthened with CFRP laminates. A new bonding technique developed by the authors is presented which mainly consists on the embedding of both CFRP ends into the core of the timber beams. Differences between the traditional strengthening, i.e. Externally Bonded Reinforcement (EBR), and the new bonding technique are reported. A timber pavement without any CFRP laminate bonded to its soffit was also considered and the results were used as reference values for comparison with the strengthened specimens. The results revealed that the CFRP laminate used for the flexurally-strengthened of the specimen according to the EBR technique reached only 27.2% of the rupture strain of the CFRP laminate whereas the new bonding technique was capable to prevent the premature debonding of the CFRP from the timber substrate and the rupture of the CFRP laminate was observed. Furthermore, the strain distributions in the CFRP laminates and the bond stresses within the CFRP-to-timber interfaces were affected when the new technique was used. For the sake of better understanding the rupture modes observed, a numerical approach was developed which allowed us to conclude that, until the collapse of the beams, the timber never reached its yielding point and the collapse were mainly due to the poor quality of the timber (e.g. quantity of knot, cracks and irregular geometries) and the low shear capacity of the beams.*

efficient. Furthermore, depending on the amount of CFRP used and the configuration type, the rupture modes of the pavements numerically simulated varied but the rupture never occurred due to the yielding of the timber under compression.

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