



## Long-term structural and durability performances of reinforced concrete elements strengthened in flexure with CFRP laminates: a research project

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### Abstract

Over the last two decades, the use of fibre reinforced polymer (FRP) materials for strengthening existing reinforced concrete (RC) structures has been constantly increasing, and nowadays it is considered state-of-the-art and is frequently used by the construction industry. Typically, these composite materials are externally bonded (EBR technique) or near-surface-mounted (NSM technique) on the elements to be retrofitted. Although substantial research has been performed and design rules have been established, most studies focused on the short-term structural performance of the strengthened elements without considering their long-term behaviour. The FRPLongDur R&D project aims at studying the long-term structural behaviour and durability performance of RC elements strengthened in flexure with Carbon FRP (CFRP) laminates according to the EBR and NSM techniques, under various real environmental exposure and loading conditions (carbonation, moisture, chlorides, thermal and freeze-thaw cycles, initial FRP pre-strain level and sustained loading). For this purpose, several prototypes have been installed in different sites of Portugal, each one being representative of the above listed environments under investigation, currently considered as the most critical exposure conditions. Additionally, test specimens of the materials involved – CFRP laminate, epoxy adhesive and concrete – and bond specimens have been prepared and installed near the other prototypes in order to evaluate their own durability. The present paper presents the initial insights on the ongoing FRPLongDur project.

**Keywords:** Strengthening; CFRP laminates; durability; long-term behaviour; accelerated ageing; outdoor ageing.