

D4.2

Design model for innovative FRP
refurbishment of concrete deck bridges





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This publication is produced by SUREBRIDGE work group:

The main authors are: Cristiano Alocci, Fabio Ricci, Paolo S. Valvo

Co-authors are: Erika Davini, Antonfranco Pasquale

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1 Executive summary

This report presents deliverable D4.2 from Work Package 4 of the SUREBridge project, defined in contract documentation as “Design model for innovative FRP refurbishment of concrete deck bridges”.

The work behind this report has been carried out from May 2016 to September 2017. The responsible partner for deliverable 4.2 was AICE Consulting Srl (AIC) with scientific support from the University of Pisa (UniPI). The adopted approach was to study the literature – including, in particular, the European and national regulations and standards – on the subject and adapt the available design models to the strengthening technique developed within the SUREBridge project.

Based on the above, a design model has been defined for the evaluation of the resisting bending moment of strengthened cross sections at ultimate limit state (ULS). The proposed model is based on the adaptation of the ULS design model commonly used for reinforced and pre-stressed concrete cross sections [1]. Such model has been first implemented into a calculation data sheet used for the preliminary design of the case study bridge [2] and the full-scale laboratory test beams [3]. Later, a dedicated software tool has been developed [4].

Chapter 2 introduces the modelling assumptions behind the design model. The typical bridge cross sections that can be analysed are briefly recalled. Chapter 3 is devoted to the description of the material properties used in the design model. The stress-strain relationships for each material are illustrated. Chapter 4 is dedicated to the calculation of the resisting bending moment within the design model. Primary and iterative variables are briefly illustrated. The possible failure modes, taken into account by the design model, are presented and the iterative algorithm, enabling to evaluate the ultimate resisting bending moment of the strengthened cross section, is described.