Experimental and Numerical Methods for Characterization of The Tensile Behavior of Textile Reinforced Concrete

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Summary

This paper reports on the ongoing development of experimental and numerical methods for characterization of the tensile behavior of textile reinforced concrete. Using a recently developed modular test setup, two series of tensile tests have been carried out, one with monotonic and the other one with cyclic loading conditions. Furthermore, in order to investigate the bond properties between the textile reinforcement yarns and the fine grained concrete matrix, in particular the required anchorage length of the reinforcement, additional double-sided pull-out tests have also been conducted. The results of the experiments investigations are briefly summarized. Then, in conjunction with the experimental results, the numerical modeling framework is introduced and discussed based on the preliminary results obtained.

Keywords: Textile reinforced concrete; tensile behavior; strain hardening composite materials; multi−scale modeling.

1. Introduction

Textile reinforced concrete (TRC) is a novel building material characterized by its high performance in terms of tensile strength and strain capacity. Moreover, the reinforcing textile of carbon, polymer or glass fibers is not prone to corrosion in comparison to the conventional steel reinforcement. Those favorable properties open up the possibilities of its applications in lightweight structures [1]. In order to fully utilize its potentials, it is necessary to understand the tensile behavior of TRC and the fundamental mechanism, in particular the properties of the bond interface between the reinforcing textile and the matrix. In this paper, we present an overview of the experimental and numerical methods and exemplify their results obtained during recently performed studies.

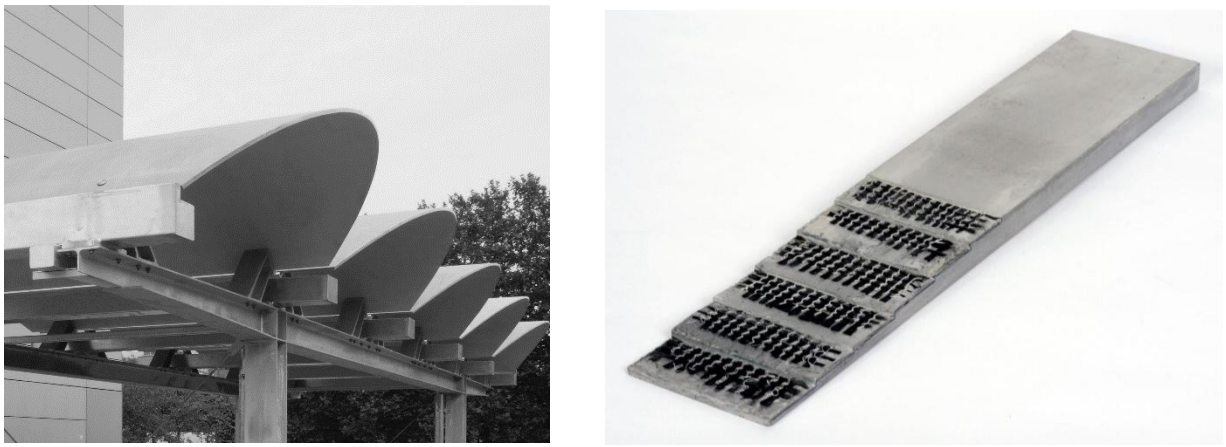

Fig. 1: TRC shell structure at RWTH Aachen University [2] (a); schematic view of the TRC cross-sectional layout (b)

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