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A simple experimental and simulation framework for the design of steel fiber reinforced concrete

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Steel fiber reinforced concrete (SFRC) has proven to provide excellent mechanical performance in terms of increased strength, ductility and energy absorption capacity [1]. All these enhancements are provided by a combination of complex mechanical phenomena, such as fiber bridging phenomena and multiple-distribution of cracks.

Despite the clear enhancements provided by SFRC, it is still rarely seen in structural design. One of the main reasons is the mentioned mechanical complexity, combined with a lack of clear design normative and guidelines. In terms of simulation, available commercial codes do not provide models that can accurately describe SFRC behaviour. Oppositely, many of the accurate academic results require most of the time computationally demanding multiscale algorithms. Therefore, SFRC use is still limited to advanced applications.

This paper presents the implementation of an experimental and numerical framework for the design of structures by means of SFRC. The presented work is based on previous results obtained by other authors in modelling SFRC [2]. This framework combines standard solid mechanics Finite Element Method with the use of interface elements which characterise the bridging phenomena [3]. It has been implemented and validated in existing in-house FEM codes. In parallel, adequate experimentation has been carried out to define specific input parameters through usual tests [4].

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