Structural behaviour of fibre-reinforced concrete subjected to in-plane shear loads

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Abstract

It is widely acknowledged that the addition of fibres can improve the mechanical behaviour of reinforced concrete and, thus, fibres may partially replace conventional reinforcement. Furthermore, the substitution of manually assembled and placed reinforcing bars with an equivalent dosage of fibres directly added to the concrete mix can yield considerable economical and ecological benefits. In particular, fibres offer substantial potential as shear reinforcement: Various experiments have shown that even a moderate fibre dosage can prevent brittle shear failures in beams without conventional transverse steel reinforcement. Nevertheless, the theoretical understanding of the effectiveness of fibres as shear reinforcement is still limited and tests representative for real structures are scarce.

Within the scope of the research project, large-scale shear panel tests were carried out, providing reliable and meaningful results on the in-plane shear behaviour of fibre-reinforced structural concrete elements. On this basis, a mechanically sound model for fibre-reinforced concrete subjected to shear was developed and practical design recommendations were derived that aim at fostering the use of fibre-reinforced concrete in future structural applications.

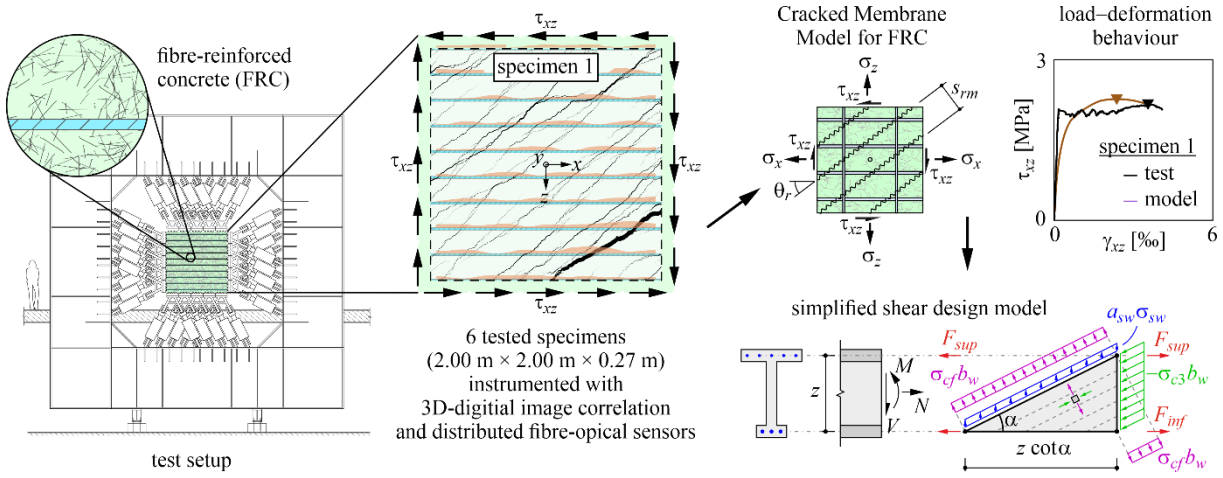

Figure 1: Large-scale fibre-reinforced concrete panel tests in the Large Universal Shell Element Tester (LUSET) at ETH Zurich, building the basis for the development of the Cracked Membrane Model for fibre-reinforced concrete and the derivation of a simplified shear design model for the design of fibre-reinforced concrete structures.