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Shear-stress transfer across a crack in steel fibre-reinforced concrete

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Abstract

The ability of cracked reinforced concrete to transfer shear stresses is of major importance for concrete members designed to sustain high shear forces. Thereby, the maximum shear capacity is mainly affected by the aggregate interlock mechanism, the dowel action of longitudinal reinforcement, the restraining action of stressed reinforcement crossing the crack interface and the possible presence of stirrups. In case of steel fibre reinforced concrete (SFRC), where fibres are used to replace either completely or partially traditional stirrups, research has proven that the direct shear transfer capacity of cracked concrete is increased significantly by using fibres. By means of 69 direct shear tests, the shear-friction behaviour of SFRC with or without confining pressure has been studied further and existing empirical formulations have been checked. Since these models only provide a maximum shear strength, a more fundamental approach to model the direct shear behaviour of cracked SFRC is proposed in this paper. This model deals with the fibre-matrix interaction by means of fibre pull-out and aggregate interlock, as a function of the shear crack opening behaviour (i.e. combined opening and slipping).

Keywords: steel fibre reinforced concrete, shear-friction, fibre pull-out, aggregate interlock, direct shear, modelling.