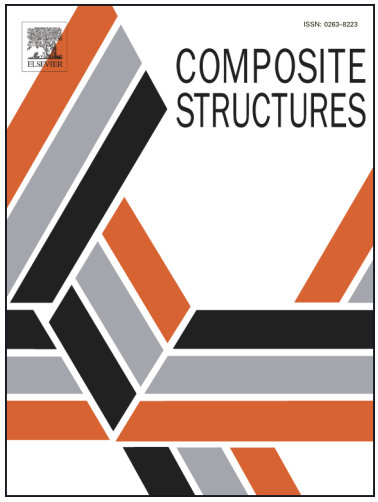

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Constitutive Model of Ultra-high-Performance Fiber-Reinforced Concrete for Low-velocity Impact Simulations

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ABSTRACT: Ultra-high performance fiber reinforced concrete (UHPFRC) is regarded as a promising material to resist impact and shock loadings. Many physical experiments have been performed for UHPFRC members under static and dynamic loads. However, less emphasis has been placed on the rationality of the constitutive model of UHPFRC in finite element (FE) simulations. Hence, this paper aims to develop an adequate constitutive model of UHPFRC for low-velocity impact simulations. The Karagozian & Case concrete (KCC) model used for blast analysis is first proved to have low accuracy in predicting the impact-induced responses. Therefore, the continuous surface cap model (CSCM) that behaves well in concrete modeling are modified to model UHPFRC by using the existing experimental data. The failure surface functions of UHPFRC including triaxial compression (TXC), triaxial extension (TXE) and torsion (TOR) are completely calibrated. The strain rate parameters in tension and compression are modified based on the current experimental data of UHPFRC. Numerical results show that the proposed material model is capable of adequately exhibiting the tensile strain-hardening behavior and predicting the uniaxial and triaxial compression strengths of

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