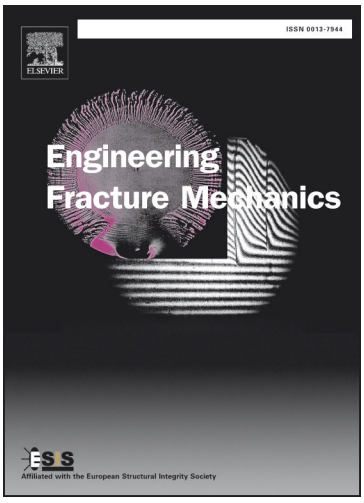

Cracking Load of High Strength ECC-Steel Composite Bridge Deck with Impact of Shrinkage Stress---Test and Simulation

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[1]Cracking Load of High Strength ECC-Steel Composite Bridge Deck with Impact of Shrinkage Stress---Test and Simulation

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Abstract: In this paper, developed high strength engineered cementitious composite (HSECC) with low drying and autogenous shrinkage characteristics was used in HSECC-steel composite bridge decks. The flexural performance of the composite element, especially the cracking load of the HSECC layer, is investigated by experiments. In the study, two kinds of cement, normal Portland cement (OPC) and calcium sulfoaluminate cement (SAC) that possesses extra high early-age strength, were used respectively as cementing material in HSECCs. The effect of shrinkage of HSECC on cracking load of the HSECC layer in the structure is evaluated. The test results show that the shrinkage of HSECC in the composite structures will result in obvious shrinkage stresses, which will greatly reduce the cracking load of HSECC layer in the structures. The use of internal curing with pre-wetted calcined zeolite particles will greatly reduce the autogenous and drying shrinkage of HSECC, which in turn, can effectively reduce the shrinkage stress and enlarge the cracking load in the structures. The developed numerical method on shrinkage stress and mechanical loading capacity coupled with shrinkage load can be used in analyses of composite structures. Based on numerical calculation, after coupling with shrinkage stress, the highest and lowest load carrying capacity as cracking of the HSECC-steel composite deck at 28 days may be achieved as 91.91, 47.04 kN and 86.13, 6.17 kN respectively under sealed and drying.

Key words: High-strength engineered cementitious composite; Composite bridge deck; Shrinkage stress; Bending; Cracking load

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