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NUMERICAL PROPOSALS FOR THE SELF-REPAIRING ASSESMENT OF ECC MEMBERS

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Engineered Cementitious Composites (ECC), also known as flexible concretes, are a versatile category of mortars/micro-concretes reinforced with disperse fibers (e.g. polymeric fibers), characterized by self-compacting ability, high early strength and self-healing capacity.
The paper proposes expressions for the self-repairing assessment (i.e., the recovery of the mechanical properties of the material consequent to the self-healing process) obtained by processing through regression analysis the results of 4-point bending tests performed on ECC specimens. The expressions may calibrate the material parameters of the stress-strain relations proposed by many researcher, such as Davies and Jefferson [1]. ECC mixes design considered varying the fly ash content/cement content and the type of micro-fibers based on the Snoeck [2] mix. Four-point-bending tests were performed on witness specimens and pre-cracked and healed specimens at the age of 60 days [3], on various loading rates. Self-healing studied parameters were the cracking strength, flexural strength, initial tangent Young modulus and ultimate flexural tensile strain. The general trend in recovery of the self-repairing parameters is ascending in all three directions of interest: mechanical strength, rigidity and ductility. The recovery of the mechanical strength of the ECC members subjected to pure flexure (i.e., cracking and flexural strength) with increasing loading rate follows a decreasing power function pattern. The recovery of the stiffness and ductility (i.e., initial Young tangent modulus and ultimate flexural strain) has increasing trends with the loading rate and are best simulated by logarithmic functions.

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