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Simulation of 3D internal cracks formed in concrete around deformed tension bars using isotropic damage model

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3-D internal crack propagations formed in concrete around deformed tension bars [1] are simulated in the framework of finite element analysis with isotropic damage model. The isotropic damage model applied in this study is based on fracture mechanics for concrete, and is capable of simulating quasi-brittle fracture and crack propagation with the fracture energy. The parameters needed in the damage model are the yield strain, the fracture energy and the ratio of tensile and compressive strength along with the Young's modulus and Poisson's ratio. The modified von-Mises equivalent strain is employed in 2-D or 3-D simulations for modelling quasi-brittle materials such as concrete whose strength is different between tension and compression.

We first show the formulation of the isotropic damage model, and verify the basic performance of the damage model in several numerical examples. Then, we simulate 3-D internal crack propagations formed in concrete around deformed bar using the damage model. The sensitivities of mesh size and parameters are also examined for the verification of our crack propagation analysis. Finally, we assess the validity of the result of our crack simulation by comparing that of laboratory experiment.

REFERENCES

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