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Modified Plastic-Damage Model for FRP-Confined Repaired Concrete Columns

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Abstract : Concrete Damaged Plasticity Model (CDPM) is capable of modeling the stress-strain behavior of confined concrete. Nevertheless, the accuracy of the model largely depends on its parameters. To date, most research works mainly focus on the identification and modification of the parameters for fiber reinforced polymer (FRP) confined concrete prior to damage. And, it has been established that the FRP-strengthened concrete behaves differently to FRP-repaired concrete. This paper presents a modified plastic damage model within the context of the CDPM in ABAQUS for modelling of a uniformly FRP-confined repaired concrete under monotonic loading. The proposed model includes infliction damage, elastic stiffness, yield criterion and strain hardening rule. The distinct feature of damaged concrete is elastic stiffness reduction; this is included in the model. Meanwhile, the test results were obtained from a physical testing of repaired concrete. The dilation model is expressed as a function of the lateral stiffness of the FRP-jacket. The finite element predictions are shown to be in close agreement with the obtained test results of the repaired concrete. It was observed from the study that with necessary modifications, finite element method is capable of modeling FRP-repaired concrete structures.

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