Finite element modeling of concrete specimens confined with metal sheet strips

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Abstrak

This paper introduced a nonlinear finite element model using Msc.MARC to study behavior of concrete columns partially confined with metal sheet strips under uniaxial compression. The concrete and the metal sheet parts were modeled using the linear Mohr-Coulomb yield criterion and the Von-Mises yield criterion, respectively. Behaviors of the interface (bonding) material, both in the normal direction and the parallel direction to the interface, were modeled as a bilinear function based on the cohesive energy and the crack widths. The columns in this study had circular cross sections with the diameter of 15 cm and the height of 75 cm, wrapped around by 5 cm metal sheet strips. The results from 3D finite element modeling were analyzed for internally induced stresses and strains. The predicted column behavior was compatible with observed experimental data. The detailed mechanisms that were difficult to visualize during the laboratory experiments could be obtained from the analysis. It was revealed that the area of confinement and the number of applied metal sheet layers were important factors to the strength increase. The discrete confinement system was shown to be a promising alternative to the one-piece full-wrap system.