

Application of Three-Dimensional Rigid Body Spring Method in Evaluation of Size Effect on Shear Behavior of RC Deep Beams (Postprint)

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Abstract

Typical shear tests of reinforced concrete (RC) deep beams were selected, and the three-dimensional rigid body spring method (3D RBSM) was developed and applied to simulate the shear failure process of large-section deep beams and the influence of stirrups on the shear behavior of deep beams. The results demonstrate that 3D RBSM can not only accurately calculate the cracking load, nominal shear strength, and strengthening effect of stirrups for RC deep beams, but also simulate crack propagation and member failure. Compared with the finite element method, 3D RBSM offers the following advantages: it significantly improves the computational accuracy of nominal shear strength, enables visualization of distributed cracking simulation and intuitive, quantitative evaluation of concrete crack widths; and it can better capture the softening behavior after peak load. Therefore, 3D RBSM provides an effective research tool for simulating shear failure of large-section deep beams, clarifying the size effect mechanism of shear behavior, and improving the design of large-scale RC members.

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