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CALCULATION OF THE FRACTURE STRENGTH OF IN-SITU REINFORCED CONCRETE STRUCTURES OF MULTI-STOREYED BUILDINGS CONSIDERING SHRINKAGE DEFORMATION PROPAGATION

Cracking of different nature may occur in the process of construction of multi-storeyed reinforced concrete buildings. Usually, the diagnosis of their causes is not complicated. However, in some cases the diagnosis is a sophisticated problem due to the special distribution of rigidities over the building frame.

The article focuses on the technique of the three-dimensional modeling and analysis of building frame elements based on shrinkage cracks using the finite element analysis in Abaqus. The concrete damaged plasticity model is used to describe reinforcement steel. Simulation of cracking process was made using the partial model of a building having solid elements (for the concrete) and membrane and beam elements (for the reinforcement).

Two cycles of simulation were implemented. Firstly, the calculation of crack propagation due to the nominal load was made. Simulation showed no cracks in the mid-span zones of beams. The second step was the simulation of crack propagation in case of shrinkage deformation propagation. This evaluation showed the possibility of crack formation and growth inside beams and slabs. The first shrinkage cracks appeared 25 days after the concrete curing completion. The first shrinkage cracks appeared in the mid-span zone of beams in the aftermath of 29 days.

Simulation of shrinkage deformations in the floor structure has showed that formation and propagation of cracks in the floor beams is possible. As a result of calculations, cracks appeared in the bottom part of the beams. In some beams, formation of shrinkage cracks may occur solely in the supports.

Key words: in-situ reinforced concrete structure, fracture strength, shrinkage, shrinkage deformation, nonlinear deformation model

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