Finite Element Modeling of Prestressed Hollow Core Slab Strengthened with CFRP Sheets in Flexure and Shear

Rahman, M.K., Baluch, M.H. and Mahmoud, I.A.,

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Precast concrete construction with prestressed precast hollow core slab as floor and roofing is being extensively used in the Gulf region. These one way slabs are sometimes subjected to unforeseen loads with a partition wall in shear zone or as a cantilever. A detailed experimental program involving full-scale load testing of hollow core slabs has been conducted involving testing of virgin and CFRP strengthened slabs in flexure and shear. This paper presents the results of the experimental and numerical evaluation of flexural and shear behavior of the hollow core slabs. The hollow-core slabs were modeled using the nonlinear finite element software DIANA and the load deflection behavior and ultimate capacity were evaluated numerically. For the FE model, concrete was modeled using Drucker-Prager with tension cut-off failure criterion, and Von-Mises plasticity with multilinear isotropic hardening was used to model the prestressing strands. Comparison between the experimental and the numerical results indicated that the finite element model predicted experimentally determined results successfully.