

# **COMPRESSIVE MEMBRANE FORCES IN REINFORCED CONCRETE SLABS**

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## **Abstract**

Four theoretical post-yield analyses, with the necessary condition for compressive membrane action in the reinforced concrete slabs are presented. In the first two methods, solutions are based on the assumptions of rigid-plastic behaviour for concrete, and no slab deformations are allowed away from the yield lines. The other two methods have modifications in the form slab deformations due to the presence of compressive membrane forces in the slab.

A non-linear deflection-increment finite difference analysis which progressively takes into account the crackling phenomenon of concrete is also developed. At each point, stress resultants are derived in the principal curvature plane and cracks are allowed to develop in any two orthogonal directions. Cracks may close only if the current cracked layer is in compression.

Tests were carried out on 14 square slabs, simply supported but laterally restrained, and comparisons are made between the test results and the predictions by the finite difference method and on of the post-yield solutions. During the tests, membrane forces at grid points along the boundary were measured with the help of specially designed support jacks, some of which were calibrated to serve as load cells.