

# Shear Behavior of RC Deep Beam Strengthened by V-Shaped External Rods

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## Abstract

This research investigated the shear strengthening technique of Reinforced Concrete (RC) deep beams using a V-shaped external rod system. Shear behavior, the stress in an external rod, and the shear capacity at the diagonal shear failure of a strengthened beam were focused mainly. Experimental tests of control and two strengthened beams were carried out to observe the effect of the external rod on shear behavior of RC deep beam. A theoretical approach to compute the stress in the external rod and the nominal strength of the strengthened beam in the diagonal shear failure were examined based on the experimental test results and verified using Finite Element Method (FEM) in ABAQUS. The computed nominal shear strength of the strengthened beam was 10% higher than the experimental test. The strengthening technique shifted the brittle shear failure to ductile shear failure and improved the performance of RC deep beam.

**Keywords:** external posttension technique (EPT), nonlinear finite element, experimental investigation, shear strengthening, reinforced concrete deep beam, strut-and-tie model (STM)

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