

Behavior of under and over-reinforced concrete slender beams at failure

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Abstract

The focus of this paper is to examine the behavior of under and over-reinforced concrete slender beams at failure. The total number of the beams were five, with the provision of the following percentage of tension reinforcements: 1.01% for beam 1 (B1), 1.51% for beam 2 (B2), 2.01% for beam 3 (B3), 2.62% for beam 4 (B4) and 3.01% for beam 5 (B5). The beams were loaded with point loads at the center, with shear span/depth ratio of 3.8. The actual ultimate load of the experimental beam B1 was 141% of the estimated ultimate, while for beams B2, B3, B4 and B5, the actual ultimate loads were between 68% and 87% of the estimated ultimate loads for the beams respectively. The reinforced concrete beams B1, B2 and B3 had the capacity to sustain large deformation under constant loads before their ultimate failure, hence will give warning about the impending failure. For beams B4 and B5, although failed at higher loads had limited rotation capacity, hence will not give warnings about the impending failure. Therefore, 2.01% tension reinforcement is recommended as the maximum to be provided, so that the beam section can behave as a ductile section.

Keywords: Reinforced concrete; Under-reinforced concrete; Over-reinforced concrete; slender beams; Ultimate load; Collapse mechanism.

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