World Academy of Science, Engineering and Technology
International Journal of Civil and Architectural Engineering
Vol:14, No:04, 2020

Size Effect on Shear Strength of Slender Reinforced Concrete Beams

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Abstract : Shear failure in reinforced concrete beams without shear reinforcement leads to loss of property and life since a very little or no warning occurs before failure as in case of flexural failure. Shear strength of reinforced concrete beams decreases as its depth increases. This phenomenon is generally called as the size effect. In this paper, a comparative analysis is performed to estimate the performance of shear strength models in capturing the size effect of reinforced concrete beams made with conventional concrete, self-compacting concrete, and recycled aggregate concrete. Four shear strength models that account for the size effect in shear are selected from the literature and applied on the datasets of slender reinforced concrete beams. Beams prepared with conventional concrete, self-compacting concrete, and recycled aggregate concrete are considered for the analysis. Results showed that all the four models captured the size effect in shear effectively and produced conservative estimates of the shear strength for beams made with normal strength conventional concrete. These models yielded unconservative estimates for high strength conventional concrete beams with larger effective depths (> 450 mm). Model of Bazant and Kim (1984) captured the size effect precisely and produced conservative estimates of shear strength of self-compacting concrete beams at all the effective depths. Also, shear strength models considered in this study produced unconservative estimates of shear strength for recycled aggregate concrete beams at all effective depths.

Keywords : reinforced concrete beams; shear strength; prediction models; size effect
Conference Title : ICCCCD 2020 : International Conference on Concrete Construction and Concrete Design
Conference Location : Venice, Italy
Conference Dates : April 09-10, 2020