Rattanasak Hongthong 2014: Influence of Transverse Reinforcement on Behavior of Reinforced Concrete Deep Beams. Master of Engineering (Civil Engineering), Major Field: Civil Engineering, Department of Civil Engineering. Thesis Advisor: Associate Professor Piya Chotickai, Ph.D. 236 pages.

A Strut-and-tie model is commonly used as a design method for reinforced concrete deep beams. The method can provide an estimate of beam capacity; however, limited information on serviceability performance is obtained. Several standards have adopted the strut-and-tie method and specified as an alternative procedure for the design of concrete deep beams. The requirements of transverse reinforcement to prevent diagonal cracks in the standards are however different. Therefore, this research was aimed to study the influence of transverse reinforcement and a number of stirrup legs on serviceability and ultimate performances reinforced concrete deep beams.

Twelve reinforced concrete deep beams were tested in the laboratory. The size and reinforcement details of the beams were obtained by reducing the size by five times of a typical bridge cross beam used in Thailand. During the tests, the fist diagonal crack, crack pattern, diagonal crack width, and applied load were recorded. The ultimate load and failure mode of the beams were used to evaluate the influence of an amount of reinforcement and a number of stirrup legs on the ultimate performance and compared with the computed capacities obtained from the ACI 318-08 (Appendix A) and the AASHTO LRFD 2007. In addition, finite element models were developed to evaluate the performance of the reinforced concrete deep beams at serviceability and ultimate stages.

The experimental results showed that for the beams with a transverse reinforcement ratio in a range of 0.32% to 0.75% and a number of stirrup legs in a range of 2 to 6, the serviceability and ultimate performances of the beams were similar. The strut-and-tie model provided a conservative estimate of the ultimate loads. The developed finite element model could be used to predict the behavior of the reinforced concrete deep beams at serviceability and failure conditions.

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