論文 / 著書情報
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Title(English)	ESTIMATION OF SHEAR CAPACITY OF SLENDER AND SHORT REINFORCED CONCRETE BEAMS WITH STEEL FIBER CALCULATED BASED ON FAILURE MECHANISMS
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（博士課程）
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論 文 要 旨

THESIS SUMMARY

系・コース： Department of, Graduate major in	Civil and Environmental Engineering Civil Engineering 系 コース	申請学位（専攻分野）： Academic Degree Requested	博士 Doctor of (Engineering)
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要旨（英文 800 語程度）
Thesis Summary (approx.800 English Words)

Concrete is a widely famous construction material in the world that can be formed into any shape and gives a high compressive strength but has a low tensile resistance. Steel fiber reinforced concrete (SFRC) is a concrete mixing with steel fiber to improve concrete tensile resistance. This research aims to estimate the shear capacity of slender and short reinforced concrete beams with steel fiber (RSF beams). Four-point bending tests of RSF slender and short beams were conducted to investigate their shear failure mechanisms. The estimation methods for the shear capacities were proposed based on the failure mechanisms. The estimation for RSF slender beams was based on the residual tensile stress perpendicular to the surface of critical diagonal crack and the angle of critical diagonal crack. In the case of RSF short beams, digital image correlation (DIC) was utilized to determine the width of compressive strut necessary for strut-tie model. Finally, the proposed methods were verified with the experimental data including the literature.

Chapter 1 introduces background, objectives, and outline of this research. The background of RC and RSF beams were included. The objectives were described with details of experiments. The outline includes the content of each chapter.

Chapter 2 describes the literature review from previous researches. The background of concrete, SFRC, shear capacity of RC and RSF beams, and DIC are shown in this chapter.

Chapter 3 illustrates the experimental program of RSF slender beams. At first, three-point bending tests of SFRC notched beams were conducted in order to investigate the tension softening behavior of SFRC. The load-mid-span displacement curves, fracture energy, and tension softening curves were obtained. Then, the four-point bending of RSF slender beams were conducted. It was found that the shape of hooked-end of steel fiber has a more significant effect in high strength SFRC than that of normal strength SFRC. Moreover, the concrete compressive strength has a significant effect on shear capacity of RSF slender beams.

In Chapter 4, the estimation of the shear capacity of RSF slender beams was proposed according to shear failure occurred along the critical diagonal crack. The data from various background was used. The range of parameters were expanded. The estimation is based on the estimations of residual tensile stress along the critical diagonal crack and the angle of the critical diagonal crack. Various parameters were investigated which are concrete compressive strength, volume fraction of steel fiber, shear span ratio, and tensile reinforcement ratio. Finally, the estimation of the shear capacity of RSF slender beams was proposed.

Chapter 5 illustrates the experimental program of RSF short beams. Four-point bending tests and DIC were applied. The aim is to investigate the shear capacity and compressive strut of RSF short beams. DIC was used to analyze the minimum principal strain (ε_2) in compression for the investigation of the width of compressive strut. The width of compressive strut will be used for the estimation of the shear capacity of RSF short beams. The results showed that the increase in volume fraction of steel fiber is more significant in normal strength RSF short beams than that of high strength RSF short beams in terms of the shear capacity. Moreover, the shear span ratio affected the shear capacity of RSF short beams significantly especially in high strength cases.

In Chapter 6, after the four-point bending tests of RSF short beams were conducted and the data from DIC was obtained, the shear capacity of RSF short beams was proposed. This chapter shows the attempt to use ε_2 captured directly by DIC to determine the width of compressive strut for the estimation of the shear capacity of RSF short beams. The results showed that the shear span ratio has a significant effect on the width of compressive strut followed by concrete compressive strength. In the case of volume fraction of steel fiber, the effect was likely to be small. ε_2 was concentrated near the loading point and showed the distribution similar to the parabolic shape which was used to determine the width of compressive strut. The compressive strut can be used for the estimation of the shear capacity of RSF short beams. This also shows that DIC can be used to estimate the width of compressive strut.

Chapter 7 concludes the experimental results and findings in this research. The conclusions and recommendations are described. This research estimates the shear capacity of RSF slender beams and RSF short beams which provides the further understanding and new information for the design of RSF beams.