

INTI INTERNATIONAL UNIVERSITY

Faculty of Engineering and Quantity Surveying

**Effect of cross-sectional area of reinforcement on ultimate shear strength of
RC deep beams**

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Final Year Project

2016

SUPERVISOR'S DECLARATION

This project report entitled (Effect of cross-sectional area of reinforcement on ultimate shear strength of RC deep beams) is prepared and submitted by (Farooq Mustafa Al-Obaidi, I12001919) as partial fulfillment of the requirement for Bachelor of Engineering (HONS) in Civil Engineering, INTI International University.

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STUDENT'S DECLARATION

I hereby declare that the final year project is based on my original work except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at INTI INTERNATIONAL UNIVERSITY or other institutions.

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ABSTRACT

The behavior of RC deep beams in shear failure is different from convention beams, and consequently, the design methods and analysis of these beams are different. Strut-and-tie Model (STM) is used to model the compression flow within the concrete strut. A series of simply supported deep beam were analyzed to seek how the shear span-to-effective-depth ratio (a/d), transverse reinforcement, longitudinal reinforcement as well as the size of cross-sectional reinforcement affect the ultimate shear strength of reinforced concrete deep beam. A free-licensed software called "CAST" is used to draw and analyze the (STM) of RC deep beam. Based on the results, when the shear span-to-effective-depth ratio (a/d) increase, the ultimate shear strength decreases; and observed that increasing in concrete compressive strength effect more on the ultimate shear strength when ($a/d > 1$) compare to ($a/d < 1$) which has a lesser effect. Furthermore, an increment in the ultimate shear strength occurs when the amount of reinforcement, bar designation and the number of bars are increasing. However, shear strength ratio slightly decreases for ($a/d < 0.5$) and this is due to large effective transverse compression. The results obtained that by increasing the amount of shear reinforcement after a certain level, the shear strength of deep beam will be ineffective, and when the transverse reinforcement ratio exceeds a certain value, the ultimate shear strength of RC deep beams does not increase.

ACKNOWLEDGMENT

I would like to express my sincere gratitude to my thesis supervisor, Dr. Mohammad Panjehpour who have been guiding me all this while, giving invaluable advice and a great source of inspiration during the research process.

Also, I would like to take this opportunity to thank Faculty of Engineering and Quantity Surveying (FEQS), INTI International University, for giving instructions and information to complete my final year project,

Last but not least, I would like to express deep appreciation and indebtedness to my family and friends their constant support.

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on the shear strength for (a/d) less than or equal to (0.5)

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| ρ_v | Reinforcement ratio of transverse steel |
| ρ_h | Ratio of total horizontal tensile steel |
| R | Reaction |
| s | Spacing of transverse reinforcement |
| T | Tensile force |
| v | Shear stress |
| V | Shear force on the cross section |
| V_{ay} | Aggregate interlock across the crack zone |
| V_d | Dowel action of the tension reinforcement |
| w_s | The width of strut, |
| w_t | The effective width of the tie |
| z | Lever arm |