UNIVERSITI TEKNOLOGI MARA

BEHAVIOUR OF FOAMED CONCRETE FILLED STEEL TUBES (CFST) UNDER AXIAL LOAD

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ABSTRACT

Composite structures such as concrete-filled steel tube (CFST) structures are steel hollow sections that are filled up with concrete. The application of this structural element has become increasingly popular in structural applications in many countries. There are many advantages to using composite structures compared to conventional reinforced concrete (RC) structures and steel structures due to its structural behaviour, advantages in terms of cost and duration of construction. However, the usage of CFST structures is not very common in Malaysia as compared to conventional RC structures. At present, the behaviour of CFST columns filled with normal strength concrete has been studied by many researchers. However, use of foamed concrete as infilled material is rare and has not comprehensively study. Thus, this research was conducted to investigate the shear bond strength capacity, the confinement effect between the steel tubes and concrete core and the axial load capacity of concrete-filled steel tubes, with foamed concrete as the concrete core, through experimental work. A series of short columns of 200mm x 200mm section and 2mm thick with additional 25mm height of longitudinal stiffeners and 40mm height of tab stiffeners were filled with different densities of foamed concrete namely, 1400 kg/m^3, 1600 kg/m^3 and 1800 kg/m^3. The height of the column was 600mm. Nine samples for each series of specimens were made where three samples were loaded at the entire surface of the specimen to find its axial capacity, three following samples were loaded only at the concrete core surface to find the confinement effect, and the other three samples were also loaded at concrete core to allow the concrete core to slip down to determine the shear bond strength. The results of this experiment showed that all series of the column specimens failed at loads less than 90% of the analytical values although the specimens show a high confinement effect. For the shear bond strength, although density of the concrete was increased at only 28% from the lower density (1400kg/m^3) to the higher density (1800kg/m^3), the shear bond strength of the higher density increased until 117% from the lower density.

Keyword: Concrete filled steel tubes, foamed concrete, axial load, confinement effect, bonding strength.

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