

# SHEAR CAPACITY OF COMPOSITE DECK SLABS WITH CONCRETE FILLED STEEL TUBES



*This thesis was submitted to the Department of Civil Engineering of the University of Moratuwa in partial fulfillment of the requirements for the Degree of Master of Philosophy*



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## Abstract

Steel and concrete composite systems are generally used as major structural components in multi-storey buildings. Composite construction in buildings is more popular with profiled steel sheeting (steel decking) since it serves as a working platform to support the construction loads and also as permanent formwork for concrete. To achieve large column free spans (in the range of 8m-12m), as often demanded for multi-storey office buildings, “steel and concrete composite floor trusses” may form economical solutions since they provide the facility to accommodate various service ducts within the structural zone. The concept of introducing a concrete filled steel tube (CFST), instead of the conventional open flanged steel section, as the top chord of these floor trusses has been discussed. However, the viability of this new concept should be ensured by experimental evidence on the longitudinal shear transfer capacity at the composite stage.

This study discusses the experimental results of a series of push-off tests conducted on CFST embedded composite slab panels. The effect of providing different concrete top covers and effect of different concrete strengths have been investigated. With headed shear studs (two studs per sample, Configuration 3) 23%- 29% and 20%- 53% of increase in shear carrying capacity were achieved by increasing the concrete top cover from 20mm to 30mm and the concrete cube strength from grade 20 to grade 45 respectively. Composite slabs with CFSTs were 131% (only steel tube, Configuration 1) - 385% (steel tube with welded two steel strips, Configuration 2) higher than composite slabs with headed shear studs (two studs per sample). Then results of composite slabs with headed shear studs were compared with Eurocode-4 and it was at least 22% conservative.

**Keywords:** composite slab, steel, concrete, concrete filled steel tubes, steel decking

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## 5. ANALYSIS AND DISCUSSION

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