

Section 2

Executive Summary of the Project:

Steel and concrete composite floor trusses are an economical solution to achieve large column free spans (in the range of 8m ~ 12m), for multi-storey buildings. They provide the facility to accommodate service ducts within the structural zone.

To design composite trusses with concrete filled steel tubes (CFST) as top chords, experimental evidence is required on the longitudinal shear transfer capacity. The longitudinal shear force in composite beams is transferred across the steel/concrete interface by shear connectors. If the concrete slab fails to resist the longitudinal shear stresses produced by connectors, longitudinal cracking along the line of the beam may occur leading to a loss of interaction between the steel beam and the concrete compression flange, resulting in a drastic reduction in the moment capacity of the composite section.

Shear transfer capacity is determined by “push out tests” on deck-slab specimens.

The objective of this project was to experimentally verify the best structural configuration for the shear transfer mechanism for top chord members of composite trusses and to determine the effect of cover and compressive strength of concrete, on shear transfer capacity of the slabs.

A total of 45 push out test specimens were carried out to experimentally verify the best structural configuration for top chord members of composite trusses. Three configurations using 114 mm diameter GI pipes as the truss top chord were tested for different values of cover thickness of concrete and different concrete grades.

The shear transfer mechanism in the first configuration is the friction between the concrete filled steel tube and the concrete slab. The second configuration comprises two steel strips welded symmetrically at an angle on either side of the concrete filled steel tube for the shear transfer. The third configuration relies on headed studs welded to the top of the concrete filled steel tube for transferring shear.

The effect of cover on shear transfer capacity of the deck slab configurations was investigated using 3 commonly adopted values of 20 mm, 25 mm and 30 mm. The effect of compressive strength of concrete, on shear transfer capacity of the slab specimens was tested using concrete corresponding to grades 20, 30 and 45. .

The experimental evidence from this study on the longitudinal shear transfer capacity of concrete filled steel tubes as top chords of composite trusses, indicate that steel tubes with two steel strips welded symmetrically at an angle on either side of the concrete filled steel tube using concrete grade 30 and a top cover of 25 mm is the best option.