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Longitudinal shear strength considerations for the design of concrete-filled steel tubes

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ABSTRACT

Steel and concrete composite construction has achieved a high market share in multi-storey buildings and bridges. Composite columns, or concrete-filled steel tubes (CFSTs), using circular hollow sections have become popular because: greater resistance than rectangular or square hollow sections is achieved through confinement of the concrete core; more structurally efficient cross-sections can be achieved, due to reduced local bucking from the presence of the concrete infill; and improved ductility and damping characteristics. A key consideration in the design of CFSTs outside the areas of load introduction in the longitudinal shear strength at the interface between the concrete and the steel tube.

The current Eurocode 4 (EN 1994-1-1) presents design values for the shear strength, which have been widely used for several years. However, the original research that led to the development of these values is based on tests on relatively small square and circular hollow sections undertaken by Roik *et al*. More recently, Tao *et al*. have confirmed the Eurocode 4 relationship for circular and square hollow sections, where the former possesses a higher shear strength for identical cross-section dimensions. However, it was shown that the shear strength reduces as the overall cross-sections increase, or when the age of the concrete increases. The present paper will propose revisions to the shear strength values that should be used in design, which may be suitable for including within the second generation of Eurocode 4 (prEN 1994-1-1), which is currently under development.

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