ULTIMATE BEHAVIOUR OF CONTINUOUS COMPOSITE CONCRETE SLABS

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Composite one-way concrete slabs with profiled steel sheeting as permanent formwork are commonly used in the building construction industry. The steel sheeting supports the wet concrete of a cast in-situ reinforced or post-tensioned concrete slab and, after the concrete sets, acts as external reinforcement. In this type of slab, longitudinal shear failure between the concrete and the steel sheeting is the most common type of failure at the ultimate load stage. Design codes require the experimental evaluation of the longitudinal shear capacity of each type of steel decking using full scale tests in simple-span slabs. However, there is no procedure in current codes to evaluate the longitudinal strength and ultimate strength of continuous composite slabs and this is often assessed by full scale tests.

This paper presents the results of three full-scale tests on continuous composite concrete slabs cast with using trapezoidal steel decking profile (KF70) that is widely used in Australia. Slab specimens were tested in four-point bending at each span with shear spans of span/4 as shown in Figures 1 and 2. The longitudinal shear failure of each slab is evaluated and the measured mid-span deflection, the end slip and the mid-span steel and concrete strains are also presented and discussed. For all slabs, the maximum flexural capacity was controlled by yielding of the reinforcement at the interior support with significant slip at the concrete-steel interface in the shear span, well before the fully plastic moment of the composite cross-section could be reached. All slabs satisfied the ductility provisions given in Eurocode 4.

Figure 1. Final deflected shape of slab S1

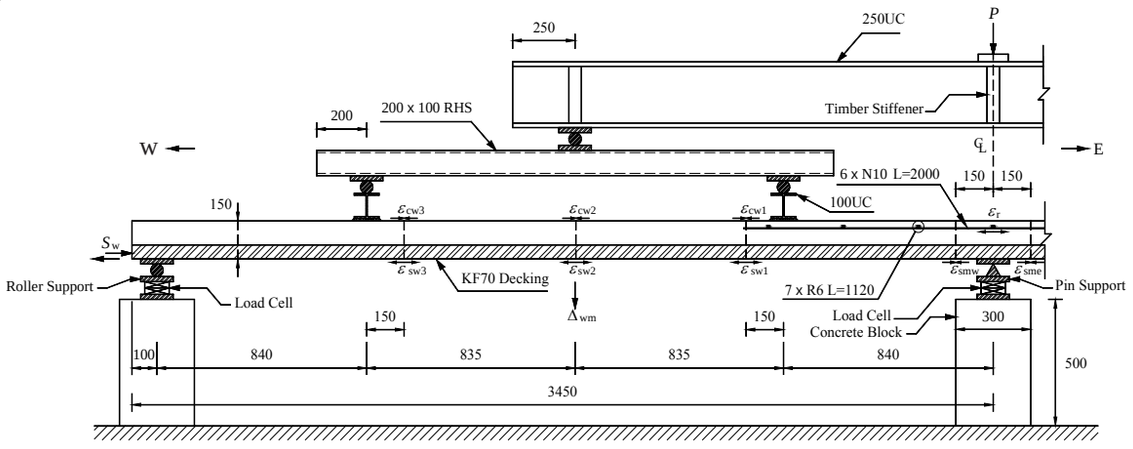

Figure 2. Test setup, loading arrangement and measured parameters

The slabs are subsequently modelled in a nonlinear finite element (FE) software package using interface elements to model the contact between the steel decking and concrete slab. In lieu of the expense involved with full-scale testing, the good agreement between the finite element modelling and the test results obtained in the study (as shown in Figure 3) suggests far less expensive numerical modelling can be used to verify the performance of continuous composite slabs.

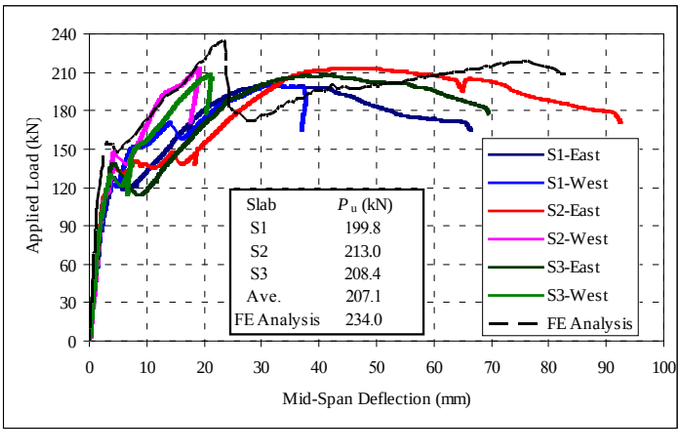

Figure 3. Load versus mid-span deflection comparisons

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