

VERTICAL SHEAR IN COMPOSITE BEAMS

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Abstract

An investigation has been made into the behaviour of composite beams in hogging bending and vertical shear near a support. A composite beam is defined as a reinforced concrete slab fixed by steel connectors to a steel joist. In hogging bending, the longitudinal reinforcing bars in the slab are in tension and the slab acts as a tensile membrane.

Theoretical and experimental work has been done on cantilever beams at collapse. It is shown that almost all the shear is carried by the joist once a plastic mechanism forms. However, the slab so modifies the force state at the slab-joist interface that shear strengthening of the joist occurs.

Design rules are proposed for longitudinal reinforcement that will prevent failure by punching of the support and joist through the slab.

Experimental and theoretical work has been done on the plastic design of joist-column connections. It is shown that failure of the beam may occur due to the fracture of the connection bolts. Design rules are proposed in the light of this.

Bond-slip of the longitudinal and transverse bars is shown to exist. This may be more critical than in ordinary reinforced concrete beams and requires more examination.