COMPOSITE ACTION AT THE SUPPORTS OF CONTINUOUS VESSELS

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Abstract

An investigation is made of the composite action of unhaunched reinforced concrete slabs connected to uncased rolled steel joists by sheer connectors when the slabs are in tension. The effects of this composite action on the behaviour of steel concrete beams are studied.

A form of push out test is described in which tensile strains are applied to the slab reinforcement at the same time as the connectors are loaded in shear. The results of such tests on 5/16 in. dia. stud connectors are given and analysed. An interaction relationship is developed for studs embedded in concrete slabs, which relates the shear force at which the studs fracture to separation at the slab-joist interfaces.

Tests on simply-supported beams, loaded so as to simulate the portions of continuous beams between the points of inflection and the supports, are described. The results of these tests are compared with the results of a computer analysis which uses the measured stress-strain properties of the materials. Recommendations are made for limits to the moment and rotation capacity of composite beams when bending induces tension in the slabs.

Analytical methods, suitable for hand calculation of these limits are presented. An evaluation is made of the total moment capacity of continuous beams when the rotations of regions in which the slabs are in tension are restricted to the proposed limits. Effective widths of concrete slabs for use in the calculation of moments of resistance are determined. Recommendations are made for the transverse reinforcement required to prevent splitting and for shear capacity of studs when the slabs are in tension.

Where the results indicate a need for further investigation, conservative limits are adopted and suggestions for research are made.