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Composite Action Between Light Steel And Concrete for Beams, Walls and Floor

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Abstract: *In this paper — The composite behaviour of steel beams and columns with concrete is well understood for hot rolled steel members and hollow steel sections, but is not properly researched for cold formed steel sections. In this case, the behaviour is affected by the relatively flexible shear connection between the steel and concrete and by local buckling of the thin steel sections. Shear connection may be in the form of mechanical connectors such as bolts or screws, or embossments or perforations rolled into the thin steel. In both cases, the shear connection may be assisted by local confinement of the concrete within the steel profiles. In this project addresses the behaviour of light steel composite beams using C-sections acting in tension and in shear with different forms of shear connection, and also the behaviour of composite columns using perforated C-sections in a form of box sections. The aim is to show to what extent composite action increases the stiffness and bending resistance of the thin C profiles in bending and compression. For composite beams, tests were performed on 0.8m, 1.1m and 1.7m span beams of approximately 150 mm depth using 100x 50x 1.2 mm C-sections as tensile reinforcement. The shorter span beams failed by shear-bond and possibly by pure shear, and some of the longer span beams failed in pure bending without end slip. The shear connectors were in the form of 4.8 mm diameter screws and 6 mm diameter bolts with double nuts, and also perforated webs with 5 lines of 5 mm wide slots. It was shown that the shear-bond strength of the perforated C-sections was over 1.2 N/mm^2 when expressed as a stress over the web area times the shear span. Tests were also performed on beams with side C-sections which greatly improved the shear resistance of these beams. The stiffness of the beams was analyzed by elastic theory and it was shown that the elastic stiffness of the shear connection to the perforated section is 10 N/mm/mm^2 area of web. This reduces to 4 N/mm/mm^2 for the mechanical shear connectors, partly because of the rotation of the screws and bolts at their connection to the thin web .A study will made of the application of this method of construction using perforated base and side C-sections for a beam span of 7.2m with various end conditions and it was shown to be sufficiently stiff and strong for residential loading added to the self-weight.*

Keywords: Composite Action; C-Section; CFS-Cold Formed Steel ; Shear Connection; ABAQUS; FEA; Ansyis Software

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