Shallow Floor Solutions in Steel

In some circumstances designers may be faced with the need to restrict the depth of beams. In multi-storey construction this may be due to planning height restrictions or in an attempt to include an extra floor within the same height of building. On other occasions, it could be a cost saving measure to save on expensive cladding material for the same number of storeys or when service penetration of the beam web is not appropriate. This briefing note aims to remind the designer that, whatever the reason, shallow floor solutions in steel are efficient, economic and programme efficient.

Columns for beams

Whilst UKC sections are not as efficient in bending as UKB sections, their design is straightforward. Web bearing and buckling at the supports is less likely due to the reduced web d/t ratios and lateral torsional buckling is less likely to govern design due to wider flanges providing greater lateral stiffness. Wider flanges may also benefit in supporting flooring units.

Connections

Shallow beams will reduce the space available to accommodate the bolts to carry end shear. Welded cleats offer one solution. Extending the connection below the beam depth with seating cleats is an option although a need to limit the connection to be within the beam depth may restrict this method. Designing frames with moment connections will reduce beam mid-span moments and deflection thereby enabling shallower beams to be used. Whilst full fixity at the connections may be unrealistic, some degree of continuity between beam and column can be achieved with thicker end plates. Careful analysis of the frame will be required since the principles of simple construction will not apply.

Slimflor

Slimflor beams were developed at the start of the 1990s as a means of containing the structure within the depth of the floor slab. By integrating the structure, floor-to-floor depths can be typically reduced by 300mm and, when multiplied by the number of storeys of a modest building, this leads to significant savings on cladding costs.

A list of Slimflor beam section properties is printed in the Corus Advance sections brochure.

Slimdek

Slimdek (Fig.3) is a shallow floor system that incorporates a rolled Asymmetric Slimflor Beam (ASB) with ComFlor 225 metal decking. The ASB has thickened flanges to aid torsional stiffness and a patterned top flange to enhance composite action with the overlying concrete without the need for shear studs. Dynamic and static load tests have shown that a design shear bond of 0.6N/mm² may be developed around the top flange and pattern. ASBs are available in two depths, nominally 280 and 300mm deep, and a range of weights that enables an inherent 60 minutes fire resistance for some sizes.
Further Sources of Information

6. Slimdek CAD detail and SIDS software are available from www.corusconstruction.com
7. Sustainability and Thermal Mass information is available at www.corusconstruction.com