

# AD 400: The degree of shear connection in composite beams and SCI P405

The [stud resistances](#) presented in both BS 5950-3.1 (as amended in 2010) and BS EN 1994-1-1 are lower than those given in the previous British Standard. This has resulted in many [composite beam](#) designs (that were previously satisfactory) becoming impossible to verify because the maximum number of studs that can be accommodated on a beam is often less than the number of studs needed to satisfy rules for minimum degree of shear connection.

The rules given in SCI P405<sup>1</sup> complement those given in [BS EN 1994-1-1](#) by allowing the user to take into account more parameters (affecting the requirements for shear connection) than are explicitly covered by the Eurocode. This means that, in many cases, the problems encountered by designers in satisfying the minimum degree of shear connection requirements can be overcome.

P405 offers minimum degree of shear connection rules that are tailored to a range of cases:

- Both propped and unpropped construction.
- Both transverse and parallel decking cases are covered as the deck orientation can have a significant impact on the required degree of shear connection.
- Beams that are only part utilised in bending (because their design is governed by serviceability considerations).
- Beams that carry high levels of loading, as found in plant rooms.

- [Cellular beams](#), i.e. beams with regularly spaced, large circular web openings.

The lower bound minimum degree of [shear connection](#) of 40% that is specified in BS EN 1994-1-1 and BS 5950-3.1 is modified in P405 accounting for the parameters indicated above. However, there remains a need for an absolute limit, to avoid the shear studs going beyond their elastic range under SLS loading. This is to prevent cumulative plastic deformation of the shear connection under repeated loading.

Because the rules for minimum degree of shear connection in P405 could result in the specification of significantly fewer studs than BS EN 1994-1-1 would otherwise require, the resulting composite beams may be less stiff. Rules for how to take this reduced stiffness into account when determining deflections are described in P405.

## Reference

- 1 SCI P405 Minimum degree of shear connection rules for UK construction to Eurocode 4

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