AD 367
Construction loading for composite slabs – update to P364

This Advisory Desk Note provides clarification about the different design approaches adopted in worked examples in SCI publications P359 and P364. Although the numbering sequence of these two publications would suggest otherwise, P359 was published after P364 and, in relation to construction loading, incorporates a later interpretation of the design loading according to the Eurocodes. Therefore, the advice on construction loading in P359 (which incorporates advice given in AD346) supersedes that in P364. This Note highlights the differences between the two publications and advises where P364 should be updated.

Differences between examples in P364 and P359

The three key differences in determining the design effects due to construction loading between worked example 8 of P364 (published in 2009) and the worked example given in P359 (published in 2011) are as follows:

i) In P364, the weight of the wet concrete during construction was taken as 26 kN/m^3, (this includes an allowance of 1 kN/m^3 for its wet condition and 1kN/m^3 for steel reinforcement). In P359, the weight of the wet concrete is taken as 25 kN/m^3 and a separate allowance is made for the weight of the mesh reinforcement (for the A193 mesh, the value is 0.03 kN/m^2, significantly less than 1 kN/m^3 multiplied by a slab depth of 250 mm).

ii) In P364, the self-weight of the concrete slab during construction was considered as a permanent action (for which a partial factor of 1.35 applies, according to the UK National Annex to BS EN 1990). This interpretation overlooked the requirements of clause 4.11 of BS EN 1991-1-6, which states that the weight of fresh concrete is one example of construction load and that (all) construction loads should be treated as a single variable action (for which a partial factor of 1.5 applies). In P359, the weight of wet concrete is considered as a variable action.

iii) From its interpretation of wet concrete self weight as a permanent action, P364 concluded that expression 6.10(b) of BS EN 1990 results in the more onerous load combination at the construction stage. In P359, the weight of wet concrete is considered as a variable action and, since the combination factor for construction loads $\psi_0 = 1.0$ according to the UK NA to BS EN 1991-1-6, combination 6.10(a) is more onerous and thus determines the design effects at the construction stage.

Amendments needed to P364, example 8

In Section 8.3.1, replace the permanent action of slab self weight with that of the mesh (use 0.04 kN/m^2). Include an additional variable action due to self-weight of wet concrete at a density of 25 kN/m^3.

In Section 8.4.1, replace the statement that expression 6.10b applies with the statement that expression 6.10a applies, since $\psi_0 = 1.0$ according to the UK NA to BS EN 1991-1-6. As a consequence, the design udl will be 18.70 kN/m rather than 16.64 kN/m. Design moments and shears will increase as a result.

References

Brettle, M.E. Steel building design: Worked examples - open sections (P364), SCI, 2009

Simms, W.I. and Hughes, A.F. Composite design of steel framed buildings (P359). SCI, 2011

Advisory Desk Note AD346: Design actions during concreting for beams and decking in composite floors. New Steel Construction, vol. 18 (6), June 2010.

BS EN 1991-1-1: 2002. Eurocode 1. General actions. Densities, self-weight, imposed loads for buildings. BSI.

BS EN 1991-1-6: 2005. Eurocode 1. General actions. Actions during execution. BSI..

BS EN 1990: 2002. Basis of structural design, BSI.

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New and revised codes & standards

From BSI Updates April 2012

BS EN PUBLICATIONS

BS EN ISO 14174:2012
Welding consumables. Fluxes for submerged arc welding and electroslag welding. Classification
Supersedes BS EN ISO 760:1996

CORRIGENDA TO BRITISH STANDARDS

BS EN 1998-2:2005+A2:2011
Eurocode 8. Design of structures for earthquake resistance. Bridges
CORRIGENDUM 2
Also incorporates Corrigendum 1 and Amendments 1& 2

BRITISH STANDARDS WITHDRAWN

BS EN 760:1996
Welding consumables. Fluxes for submerged arc welding. Classification
Superseded by BS EN ISO 14174:2012

BRITISH STANDARDS UNDER REVIEW

BS EN ISO 14556:2000
Steel. Charpy V-notch pendulum impact test. Instrumental test method

NEW WORK STARTED

PD 6695-2:2008/A1
Recommendations for the design of bridges to BS EN 1993