related test method	**ENV 13381-3: 2002 Fire protection of concrete – by applied fire protection materials**
subject	**Avoidance of cracking / collapse of long slab and beam test specimens (> the 4 m standard length given in the standards)**
reference of original query	TC2 N268rev2 Helpdesk 2001-03 & 04

Problem

When testing large size concrete slabs, of longest dimension 5100 mm, built according to ENV 13381-3 §6.2.1 and §6.3.1 (but greater than the minimum 4000 mm length given in the standard) the initial deflections of the slabs, before application of the fire protection material, due only to the deadweight of the concrete, were greater than Lp/300 commonly acceptable for such kind of structural members.

Also for some slabs, transversal cracks could be noted on their exposed sides, essentially at mid-span.

Additionally, when testing large size concrete beams built and tested according to ENV 13381-3 §6.2.2 and §6.3.2, but with the length of 5100 mm (greater than the minimum 4000 mm length given in the standard) sudden collapse of the beams was noted at low steel reinforcement temperatures and much before the required deflection limit was reached.

These kinds of failure / problem were clearly never intended to happen.

Suggestions for changes to the test specimen and therefore test method to overcome this problem have been made, namely either:

- increase thickness of slab or beam, and/or
- increase size and thickness of reinforcing bars.

The philosophy of the ENV 13381-3: 2000 test is that “before applying the fire protection material the “dead weight” curvature of the specimen needs to be the same whether testing at 4 m or 6 m specimen length. After applying the fire protection material the “dead weight + applied load” curvature of the specimen still has to be the same whether testing at 4 m or 6 m specimen length.

In creating the standard the original specimen thickness and construction of both slabs and beams were chosen such that the initial deflection would be at the curvature limit up to 4 m span.

Greater than 4 m span puts it beyond the limit. Therefore, it must be noted that slabs and beams of length > 4 m will cause problems due to high initial deadweight deflection.

Therefore, the reason that a technical Recommendation is required is that laboratories testing long loaded concrete slabs and beams following the written test method, without being aware of the consequences, are liable to encounter this problem and the safety considerations must be recognized. Additionally, the laboratory if unaware of the problem will need to repeat the test at shorter span and at great cost to the laboratory and/or client.

A single procedure of how to test long loaded slabs and beams to ENV 13381-3: 2002 (to a standard longest size of 4.2 m) will avoid inconsistencies of procedure between laboratories and hence different test results. Additionally, in the spirit of harmonization of technical competence a common approach is necessary.

Recommendation

EGOLF members when testing long loaded concrete slabs and beams according to ENV 13381-3: 2002 shall implement the following instruction:

- **Laboratories shall not test concrete slabs or beams to ENV 13381-3 with test specimens of longest size greater than 4,200 mm [4.2 m].**

This instruction shall be followed until CEN TC127 completes an exercise to define and approve (by modification of the standard) the specification of concrete thickness or reinforcing bars thickness / distribution for slab and beam test specimens of each incremental increase in test specimen length.