

## EGOLF RECOMMENDATION 056-2020

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### Problem

This question is a result of a discussion during the last EGOLF course on "TEST METHODS FOR DETERMINING THE FIRE RESISTANCE of LOADBEARING WALLS, FLOORS and ROOFS according to EN 1365-1 and EN 1365-2"

The EN 1365-2:2014, p. 5.2 states:

#### "5.2 Loading conditions

The test specimen shall be subjected to loads determined in accordance with EN 1363-1. The determination of the load shall be clearly indicated in the test report. The magnitude and the distribution of the load shall be such that the maximum moments and shear forces produced in the test specimen are representative of, or higher than those expected in practice.

The load shall be applied uniformly, **e.g. by a point loading system**. Point loads shall be transferred to the test specimen through distribution plates; the total contact area between these and the floor surface shall be not more than **0,09 m<sup>2</sup>** individually, or **16 % of the total surface area** collectively.

If the plates are made of steel or of materials with a similar high conductivity, they shall be insulated from the surface of the test specimen. The loading equipment shall not inhibit the free movement of air at the top of the test specimen and, other than at the loading points, no part of the loading equipment shall be closer than 60 mm to the unexposed surface of the test specimen."

### QUESTIONS:

1. What exactly can be considered as "uniform load"? Is the linear load considered to be uniform if it produces the required bending momentum and shear force like in EN 13381-3?
2. If linear load is applicable, how can you fulfil the criteria of 0,09 m<sup>2</sup> surface contact area per loading point? For example, a HEB 200 of 3,0 m length will give an area of 0,2 x 3,0 = 0,6 m<sup>2</sup> and there will be most likely two beams, so 1,2 m<sup>2</sup>.
3. While using some spacers between the load on the unexposed side (e.g. while using steel block weights - each 0,2 m<sup>2</sup> and gypsum board spacers of 0,05 m<sup>2</sup>), is there a

minimum distance between the unexposed face and the loading block? The block has area greater than the one allowed in the standard, thus the spacer. But the distance between the spacer and the block can be very low and may not provide the air flow the unexposed surface should have.

**Recommendations (see also photo attached):**

The word "uniformly" (in "The load shall be applied uniformly") lacks a more precise definition. For some test specimens it is certainly possible to produce the adequate moments and shear force only via dead load in form of weights (e.g. massive blocks, steel plates, etc.), but for some, e.g. pre-stressed concrete floors, it is not. High magnitude of load is problematic for many reasons among which the following are the biggest concerns:

1. Safety of the personnel while applying the load before the test and when removing it after the test, when the element is weakened.
2. Possible damage to the furnace and other equipment if the test specimen collapses into the furnace with additional tonnes of dead weight.
3. Exact positioning of the load to produce accurate moments and shear forces.

The approach given in test standard for beams (EN 1365-3) is more reasonable. It states in 7.3 of the standard that "the load shall be applied to simulate a uniformly loaded beam and may be applied by a point loading system, in which case there shall be a minimum of two points". Translating this one-dimensional case (beam) to a two-dimensional case (floor) would probably give "in which case there shall be a minimum of two lines", just like it is given in EN 13381-3.

Regarding the use of beams, see the attached picture (Fig. 1) showing beams rotated by 90° so that they will lay down on the edges of their soles. The spacing plates can be put between them and the unexposed face of the test specimen for a better load distribution. This arrangement allows to pile dead weights in the upper empty space of the beams and comply easily with all the standards requirements.

The other picture (Fig. 2) shows how the force can be applied with a hydraulic cylinder and steel load distribution beams placed over four steel plates.



Fig. 1. Steel beams rotated by 90° and dead weights inside (photo by: F. Dumont, Uni. Liège)



Fig. 2. Load distribution system (photo by: P. Turkowski, ITB)