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7th European Conference on
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September 10-12, 2014

Edited by
Raffaele Landolfo
Federico M. Mazzolani

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Abstracts book of the conference edited by
Raffaele Landolfo
Federico M. Mazzolani

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DUCTILITY FOR MEMBRANE ACTION OF STEEL FIBRE REINFORCED CONCRETE SLAB EXPOSED TO FIRE

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KEYWORDS: Steel to fibre concrete, Fire, Materials properties, Behaviour of the composite slab

ABSTRACT

In recent years, there were created many tests of the composite floor slabs with fibre concrete at ambient and at elevated temperature in real scales. Rectangular floor concrete slabs reinforced only by steel fibres and supported by steel beams were tested. One of the main purposes of those experiments was to create and evaluate new analytical model, which precisely predict fire resistance of the composite slabs. For this analytical model, there were introduced basic boundary conditions, which defined field of the utilization. At the elevated temperature, slabs were only partially protected. Only edge beams were protected by the floor slabs. Intermediate beams and fibre concrete slab were without protection. Suitable properties of the fibre concrete in fire were clearly demonstrated during the tests. There is important for the fire resistance of the floor slabs that material has a necessary tensile strength and ductility. The same mixture of the concrete, but with different kinds of fibres was used in the course of the tests. The fibres had different length, strength and amount. The material properties of the fibre concrete allow creating a different load bearing mechanism, which increase fire resistance of the floor slabs. Thanks to this mechanism, the fire resistance of the slab can reach 60 min and more. Experiments of determination of material properties were made. These tests were carried out at ambient and at elevated temperature.

CONCLUSIONS

Membrane action enhances fire resistance of the floor slabs. Using of ductile material is necessary for the developing of the membrane action of the composite slab. From the experiments is clear that suitable fibre concrete is sufficiently ductile to creating the membrane action (see *Fig. 1*). The fibre concrete has better tension strength at elevated temperature than plain concrete, because decrease of material properties mainly depends on the dispersed steel fibres (see *Table 1*).

Table 1: Comparison of reduction factor of measured tensile strength of fibre concrete to standardised reduction factor of the design yield strength of the cold-formed steel sections

Temperature °C	Max tensile strength of fibre concrete at macrocracking (MPa)	Reduction factor k_{fc} relative to tensile strength of fiber concrete at 20°C	Reduction factor (relative to f_{yb}) for the design yield strength of cold formed class 4 sections $k_{p0.2,0}$
20	5.78	1.00	1.00
500	3.38	0.59	0.53
600	1.47	0.26	0.30

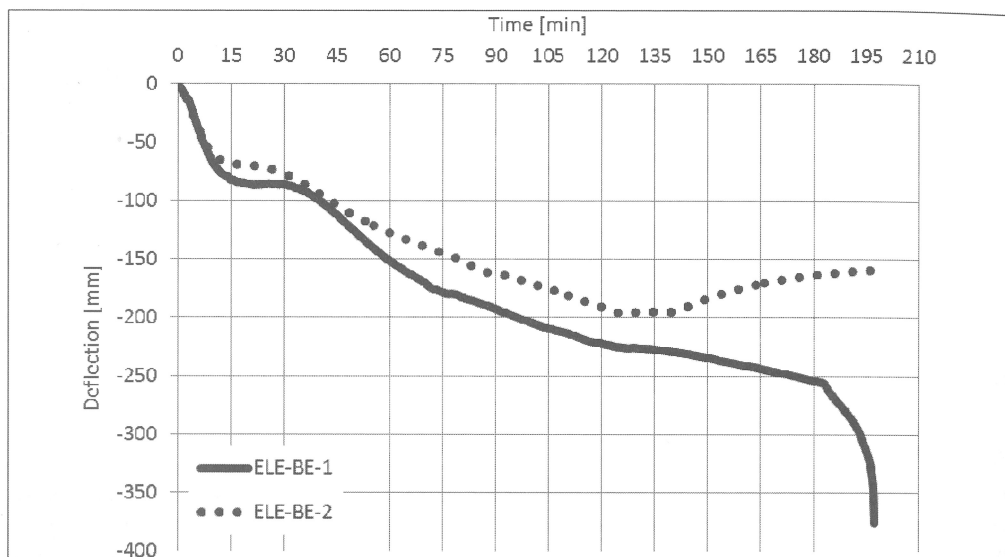


Fig. 1: Time-deflection diagram of the composite slab at elevated temperature in 2010 and 2011

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