INFLUENCE ANALYSIS OF FIBRES ON CRACKS RISE AND DEVELOPMENT IN MEMBERS OF LIGHTWEIGHT CONCRETE

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Abstract:

The paper be engaged in statical load tests from reinforced concrete girders at using lightweight concrete and lightweight fibre concrete. Main aim of the paper is estimation influence of added grains on bearing capacity, rise and development cracks in concrete and reinforced during loading. Integral part of effected experimental examinations is creation of corresponding numerical model in software Atena work with real material parameters with particular concrete types.

Keywords: lightweight concrete, fibres, load tests, numerical model

1 Introduction

In carrying out the experimental part of project was to verify the influence of the amount of fibers added to lightweight concrete (tab. 1). Great emphasis was placed on the carrying capacity of their own element, the possible difference in the quantity, origin, development and size of cracks on the assumption that the reinforced concrete element was normally reinforced.

They were always tested three elements of light concrete and three elements with added fiber. After the load tests were evaluated L-D diagrams for their mutual comparison. Based on the physical mechanical parameters of materials provided in the accompanying tests is based numerical model of the software ATENA to clarify the behavior of different types of elements.

2 Geometry, reinforced and method of load testing

The dimensions of the test elements are designed with regard to the possibility of a test facility for the use of laboratory conditions. Basic elements of the test on the dimensions of 2500x220x140 mm reinforced with ordinary reinforcing bars with Bst 500 (R 10505) have been supplemented by a series of additional elements appropriate for the determination of physical-mechanical parameters of concrete and reinforcement.

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Trial section about proportion will leid like simply supported beam and burden with four - point bending. Loading was performed after steps in specified time intervals and proceeded continuously until failure. At load test were to be all sensor connected to the central measuring station Spider8 HBM with frequence data stacking 5Hz. Loading was provided by hydraulic press with max. bearing 250 tons with scanned force by strain-gauge dynamometer. Member was plant by potentiometric track sensors in places supporting slab and in the middle of span. Deflextion below loads was sensing by inductivity sensors of tracks. During load test was emphasis on especially on strain in pulled areas cross - section of concrete, this provide under resistive tensiometers HBM 100mm. To informative valuables strain were tensiometers in pressure areas of concrete. Tensiometer HBM 10mm was in general tensile bar.

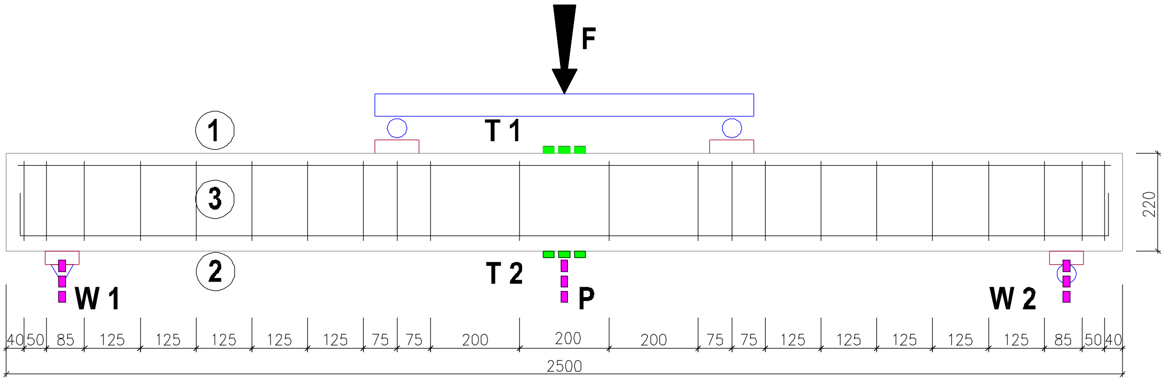

Fig. 1 Reinforcement schedule and method of loading an element

Sensors:	W1, W2	inductivity sensor, settling of support
	P	potentiometric sensor tracks, deflection on ½ of element
	T1	resistive tensiometers, compressive part of concrete
	T2	resistive tensiometers, tensile part of reinforcement
Reinforcement:	1	design longitudinal reinforcement at the upper surface 2 ∅ 8 mm
	2	longitudinal reinforcement of the main supporting element of the lower cheek 3 ∅ 12 mm
	3	shear reinforcement ∅ 8 mm

2.1 Concrete mixtures

Fresh concrete mixture was prepared from lightweight aggregates Liapor CZ/4-8/600, heavy-weight aggregates of 0–4 mm fraction, CEM I – 42.5 R cement, fly-ash, plasticizer and water. The water and lightweight aggregates were dosed by volume, the remaining components by weight.

Loading of reinforced concrete slabs proceed continuously until ultimate failure. All tests and mixture concrete proceeds in laboratory of experimental method on department Building Testing Faculty of Civil Engineering Brno.

Tab. 1 Overview of the materials used in concrete mixtures

Mixture	Units	**1 m^3**
Aggregate Liapor 4-8/600(2006)	m^3	0,44 (0.44*1025 = 451kg)
Aggregate 0-4/A	kg/m^3	580
Cement CEM I/42,5 R	kg/m^3	400
Fly ash	kg/m^3	50
Plasticizer	kg/m^3	5
Water	l	190

For the production vláknobetonu was identical to the recipe used light concrete fiber Econo Net 38 mm on a dose of 0.9 kg/m3.

Quantity of water was adjusted according to actual weight of moisture pórovitého aggregates, aggregates average humidity was 20%, the dose of water was reduced at 170 l/m3; average moisture content of aggregates vláknobetonu was 17%, the dose of water was reduced to 180 l/m3

3 Grafical outputs of load tests

Evaluated in the following graph of load testing for load depending on the deformation forces in the middle of the beam are given the differences between the elements of lightweight concrete and lightweight fibreconcrete.

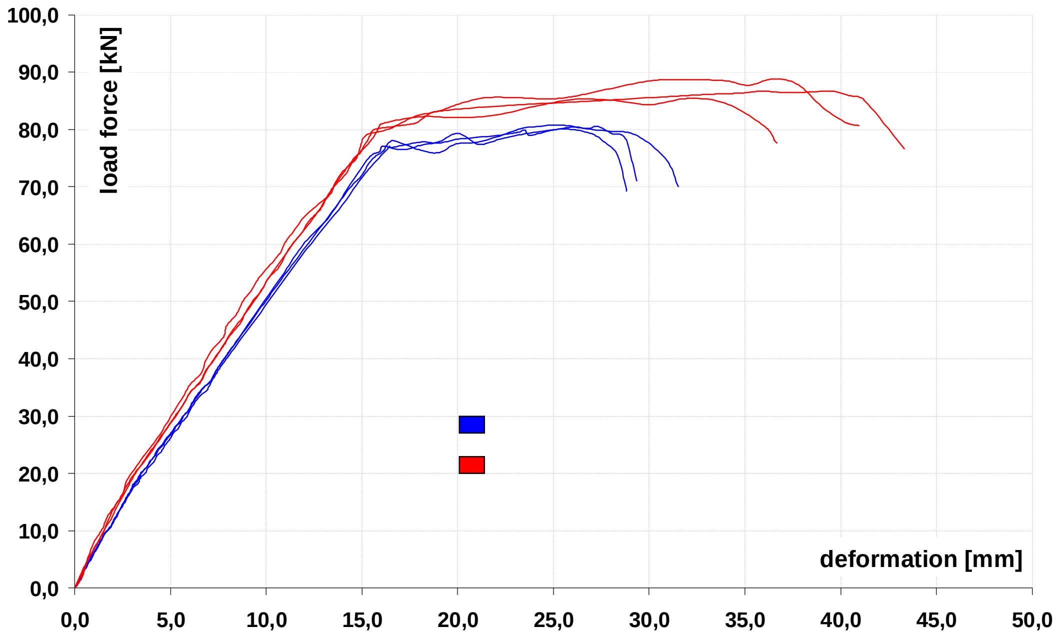

Fig. 1 L-D diagrams from load tests

4 Conclusions

The test elements of the lightweight concrete and lightweight fibreconcrete were in the implementation of load test set L-D diagram of these values, see. tab. 2

Tab. 2 Limit characteristics values from load tests

load state	member from lightweigt concrete	member from lightweigt fibreconcrete
	load force [kN]	load force [kN]
loading force on the creation of cracks	14.0	14.5
loading force on the application	39.0	43.0
ultimate load force (bearing capacity)	80.0	86.0

These values point to the assumption that the element limits the emergence of cracks in the fibers have virtually no importance in terms of loading capacity. 0.5 kN The difference is probably due to difference in the production of components. Fibers added to concrete in the beginning to show at a time when cracks are open. However, whereas this is a normal component of reinforced reinforcing reinforcement, and a strength increase or reduce the deformation is not significant.

In our case, the fiber affects only the maximum load capacity and a longer time element resistant strains of the maximum loading before the destruction of the element.

Aknowledgements

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