EXPERIMENTAL TESTS OF RC SLABS, COMPARISON TEST OF CONCRETE AND FIBRE-CONCRETE

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Abstract

The article describes performance and evaluation of the static loading tests of the reinforced concrete and reinforced fibre-concrete slabs subject to 4-point bending. Experimental part compares values of deformation, tension in concrete and reinforcement developed continuous force loading until ultimate state bearing resistance. During loading is register formation and advancement a tension cracks in pulled areas of concrete. Measuring data from experimental examinations inclusive material characteristics are integral part for numerical evaluation and resulting compare with mathematical model built - up in software ATENA2D on the basis exaggerated mechanical parameters from attendant laboratory examinations.

Keywords: fibre, reinforced, concrete, FEM, RC slabs, mathematical model

1 Introduction

To comparison of reinforced concrete slabs from consistent concrete and consistent fibre-concrete were to be select proportions portfolio 2000x840x120mm reinforced by 9 ∅ R 8 at the bottom of slabs. Prescriptions concrete mixtures is mentioned in tab.1, Forta Ferro fibre was dose as a 1% from volume concrete mixtures. Loading of reinforced concrete slabs proceed continuously until ultimate failure. All tests and mixture concrete proceed in laboratory of experimental method on department Building Testing Faculty of Civil Engineering Brno.

material		weight [kg]
cement	CEM I - 42,5 R (Hranice)	300
fine aggregate	DTK 0-4mm (Tovačov)	820
coarse aggregate	DTK 4-8mm (Tovačov)	1150
fly ash	Třinec	35
flux	FM 350	5
water		165

Tab. 1 Structure of concrete

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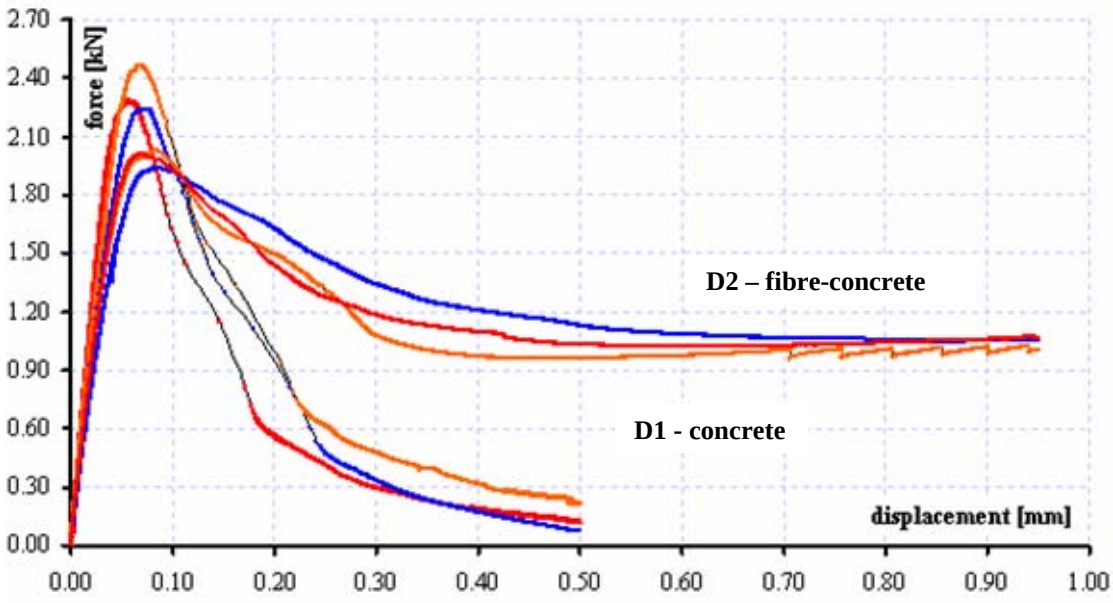
2 Experimental part

2.1 Material characteristic

For loading elements specification in terms of material model tp the software Atena2D was made and examine following sets of concrete specimen and fragments of reinforcing steel bars shown in tab.2.

element	concrete					steel	
	density	**fc,cyl**	**fc,cube**	**Eb**	**Gf**	fyd	Es
	[kg*m^{-3}]	[MPa]	[MPa]	[GPa]	[J*m^{-2}]	[MPa]	[GPa]
D1	2317	33.6	39.7	26.9	93.0		
	(14.4)	(2.6)	(2.5)	(1.7)	(18.2)		
	-0.62-	-7.68-	-6.21-	-6.35-	-19.56-	593.7	215.3
D2	2285	30.1	36.2	24.4	260.7	(6.1)	(9.4)
	(15.2)	(2.9)	(3.5)	(1.8)	(6.6)	-1.03-	-4.37-
	-0.66-	-9.68-	-9.68-	-7.38-	-2.53-		

Tab. 2 Concrete parameters



Graph. 1 Tests of fracture energy Gf – L-D diagrams

2.2 Load test

Loading of RCslabs proceeded continuously until failure. At load test were to be all sensor (fig.1) 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. RC slabs was plant by potentiometric track sensors in places supporting slab and in the middle of span fig.1. 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 50mm (fig.1). To informative valuables strain were tensiometers in pressure areas concrete.

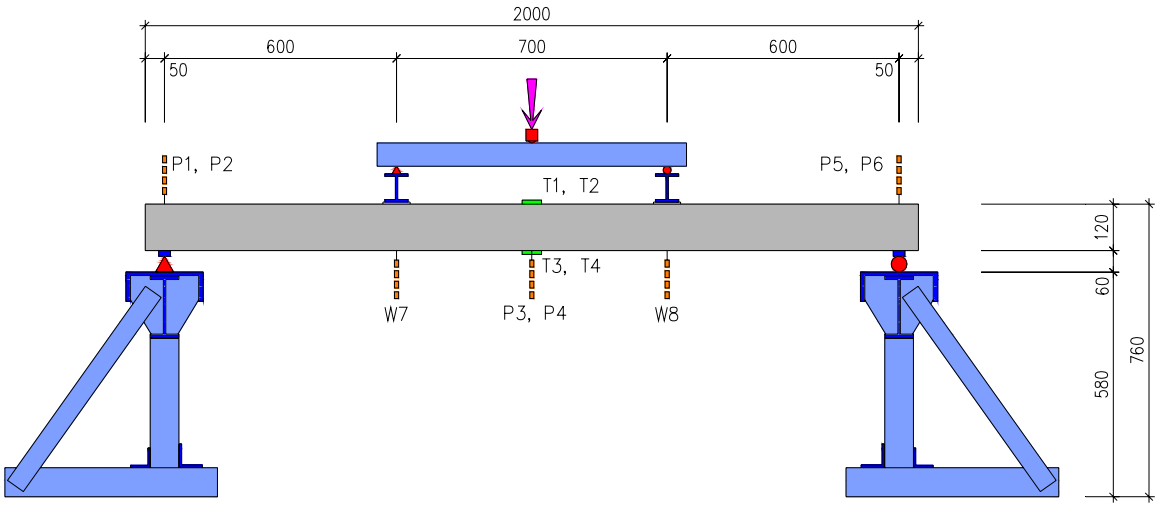


Fig. 1 Chart rigging out element sensor

Sensors: P1, P2, P5, P6 … potentiometric sensor tracks, settling of support
P3, P4 …… potentiometric sensor tracks, deflection on ½ of element
W7, W8 ……. inductivity sensor, deflextion below empty weight
T1, T2 ……resistive tensiometers, compressive part of concrete
T3, T4 ……resistive tensiometers, tensile part of concrete

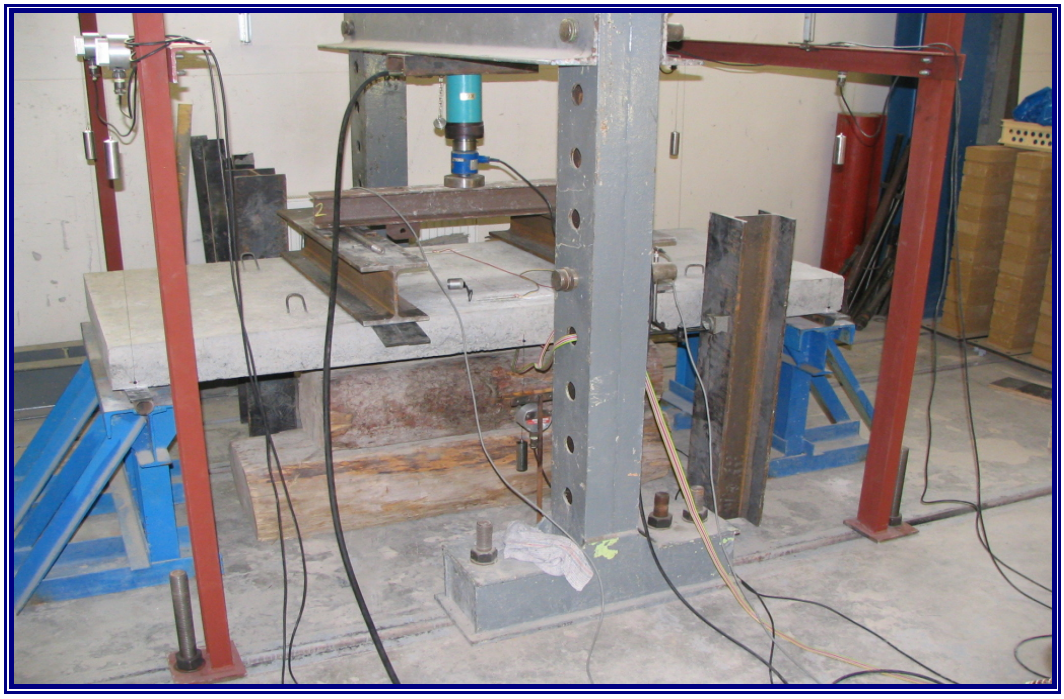
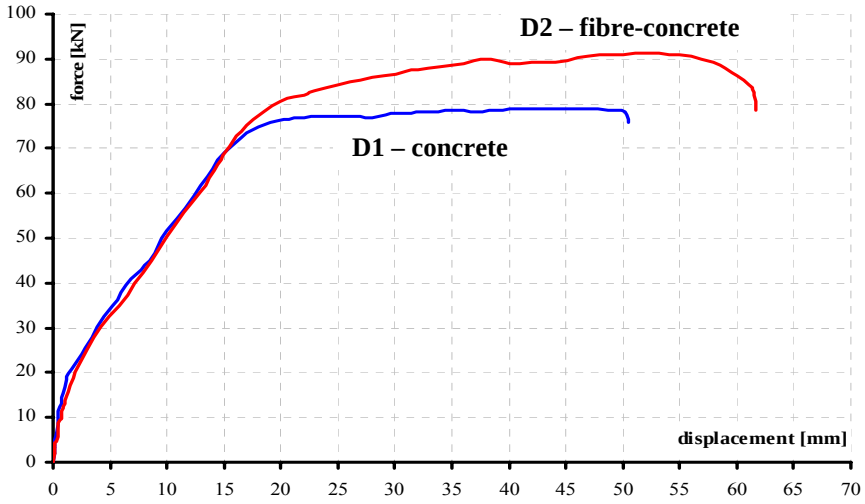
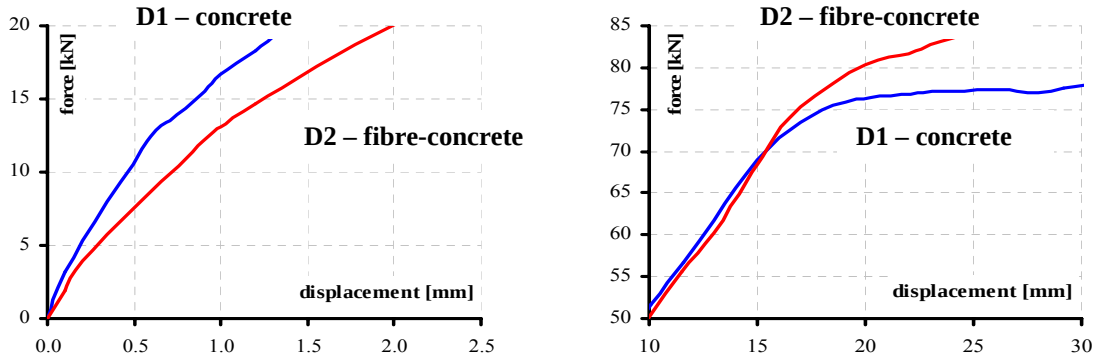


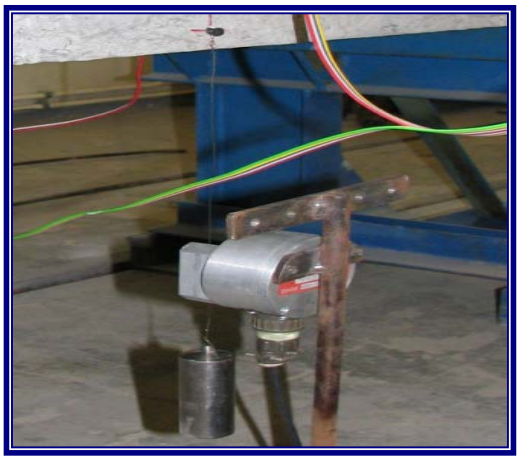
Fig. 2 Chart rigging out element sensor

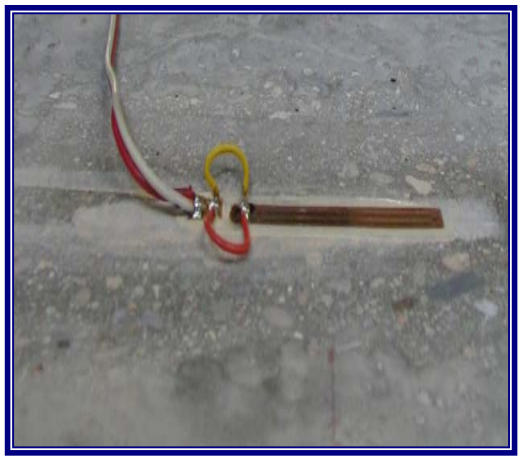


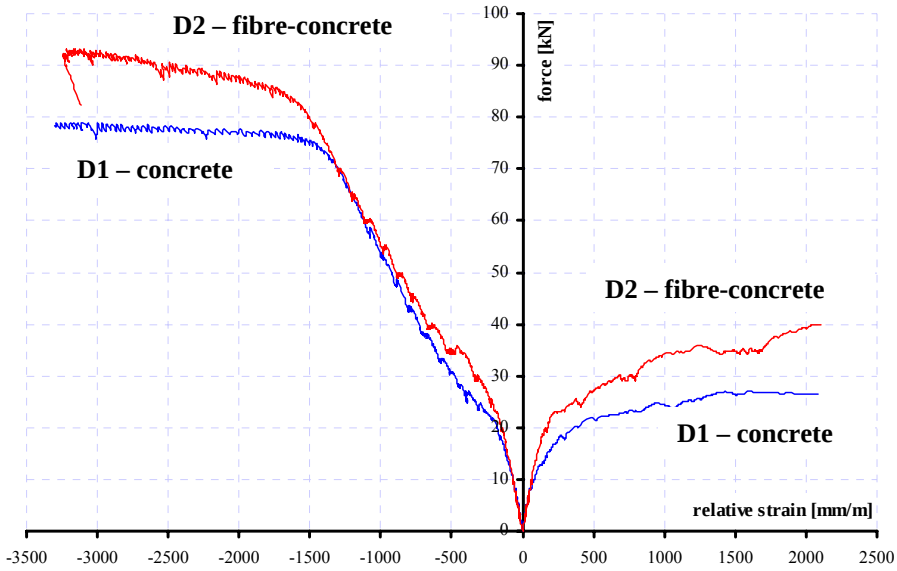
Graph. 2 L-D diagrams from loading tests of RC slabs



Graph. 2a,b L-D diagrams from loading tests of RC slabs – details







Graph. 3 tensile strain and compressive strain

3 Conclusions

From introduced graphs is perceptible improvement force as far as in post-critical areas of examinational element. From aspects the deformation, inception and progress first cracks is fibre-concrete non-effective, all tension power sort reinforcing bars. Ultimate forces are shown in tab.3

slab	material	Ultimate force
D1	concrete	80,90 kN
D2	fibre-concrete	92,90 kN

Tab. 3 Ultimate force from loading tests of RC slabs

Aknowledgements

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