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STRAINS ON CONCRETE AND REINFORCEMENT RESULTS FOR BEAMS OF SELF-COMPACTING CONCRETE (SCC) AND CONVENTIONAL CONCRETE FOR PERIOD t= 40 DAYS

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Abstract: ***Development trends for high rise constructions, modern skyscrapers are indicating that building of such constructions with normal concretes and low consistency is impossible, therefore there is a need for concrete with high processes because of great amount of reinforcement in cross section of concrete elements. Solution for such construction is self-compacted concrete because of ability to fill good formworks without compaction and vibration. In this line, we conducted an experimental research to determine the mechanical characteristics of concrete, cracks, strains, deflections, strains on long term process and strains at failure test. The experimentally-obtained results will be presented for both types of concrete for: compression strength, splitting tensile strength, strains on concrete and strains on reinforcement for duration failure testing time t = 40 days*.**

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***Keywords*: Self-Compacting Concrete, Conventional Concrete, splitting tensile strength, strains, modulus of elasticity**

PREFACE

Self compacted concrete lately has started to be used very often in construction buildings especially in high rise buildings also in retrofitting of existing buildings.

For this reason we believe that there is necessity to investigate and research deformable characteristics such as strains in concrete and strains in reinforcement, cracks, deflections, etc. during short-term or long-term load action.

To investigate such characteristics we have prepared a considerable number of laboratory specimens including 18 beams in three series:

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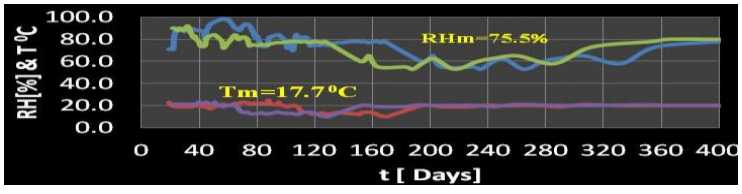
Series A - there are six beams with regul[illegible] concrete, Series B - there are six beams with se[illegible] compacted concrete and Series C - there are six beams with regular concrete in the core and self compacted concrete wrapping the core.

In this paper will be presented experimental results and their comparison for, compression strength, strains in concrete and those in reinforcement of beams with normal concrete, self compacted concrete and beams with normal concrete in core and wrapped with self compacted concrete, subjected to failure in the period of t=40 days.

AMBIENTAL CONDITIONS IN THE EXPERIMENT AREA

During the period of 400 days temperature and air humidity are measured and recorded. Recorded parameters are given in the diagram 1.

Diagram 1 . Relative humidity and temperature.



TESTING THE COMPRESSION STRENGTH

In the figure 1a is presented compression test of the samples and whereas in the diagram are

shown the results for regular concrete and self compacted concrete for compressions.

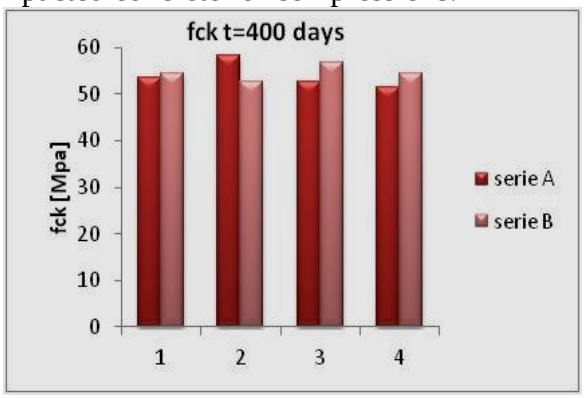


Fig.1. Testing process and testing results of compression strength

STATIC SCHEME OF THE BEAMS

The static scheme is basically a simple beam loaded with two centered forces. The cross-section dimensions of beams are 15x28 cm, length of the beam is l=3m and these are reinforced with two rebar's Φ 12 in the bottom zone and two rebar's Φ 8 in the upper zone. Static scheme and the cross sections are presented in the figure 2. In the figure 3 is presented testing process of the beams.

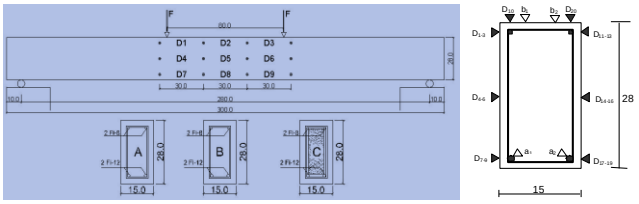
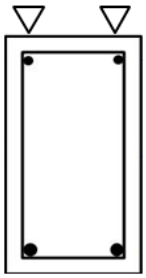


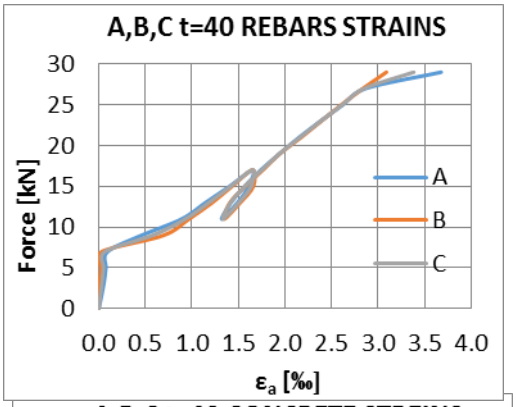
Fig. 2. Static scheme and cross-section of the beams

Fig. 3. Testing of beam in failure on the time t = 40 days- measuring of strains with mechanical and electronically strain gauges

STRAINS RESULTS

In the figure 4 there are presented the results of the strains through the diagrams for the beams Series A, B, and C and tested in fracture for period of t=40 days. In figure 5 are presented the results of concrete strains and reinforcement strains through the diagrams for various levels of applied load for these beams.





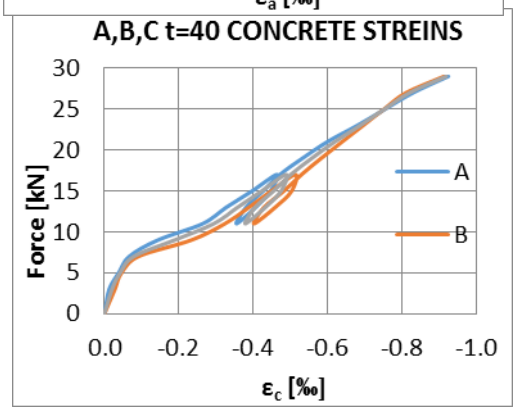


Fig. 4. Comparing the diagrams of strains in concrete and reinforcement – Series: A, B, C, t=40 days

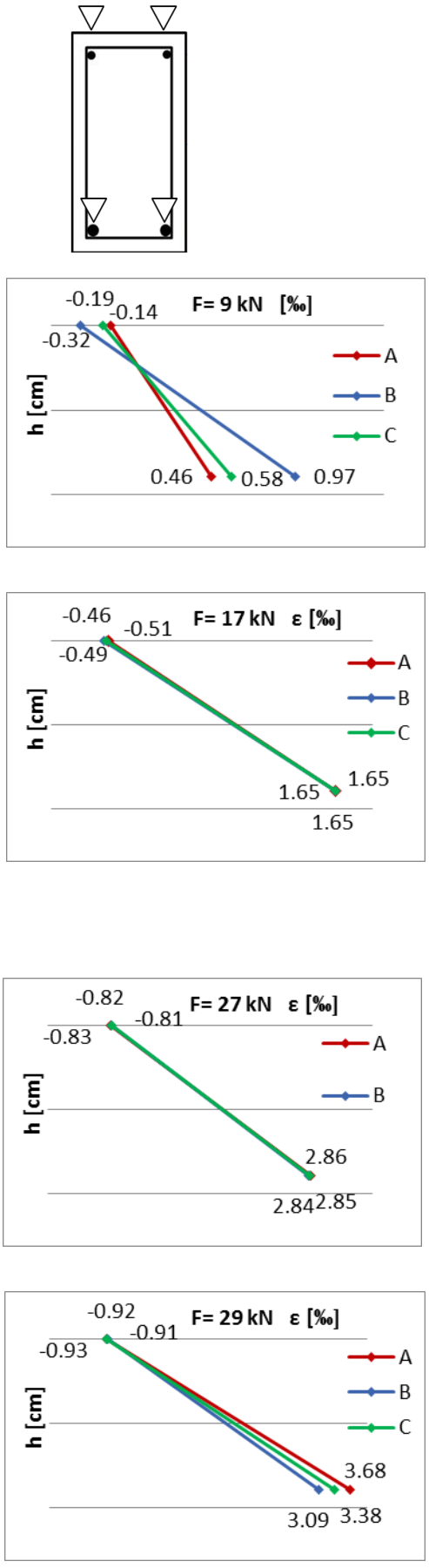


Fig. 5. Strains in concrete and reinforcement for different cases of force action- Beams series A, B, C

CONCLUSIONS

Based on the presented results we can give the following conclusions:

Self compacted concrete in its content has more amounts of small grains size aggregate compared with normal concrete, thereby smaller module of elasticity, hence the strains in concrete are higher.

Higher strains of reinforcement and concrete are registered in the beams made with self compacted concrete (Series B) whereas lower results are obtained in the beams with regular concrete (Series A).

- Small difference is registered in the strains results on reinforcement obtained for the beams of series B and C, differ is 0.8%, then the biggest difference is registered in the strains results on concrete obtained for the beams of series A and B (9.2%).
- After loading level of ~10kN (dead load), we can notice that results for concrete such as for reinforcement are harmonized.
- Strains of Reinforcement in the self compacted concrete beams after 23kN load levels are smaller than those of normal concrete beams, it means that the cooperation between the concrete and reinforcement is better to self compacted concrete beams.

Reference

[1] EN 1992, Euro code 2: Design of Concrete Structures
[2] EN 206-9:2010, Concrete, Part 9: Additional Rules for Self-compacting Concrete (SCC)
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