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CRACKS WIDTH AND SPACING FOR BEAMS OF SELF-COMPACTING CONCRETE AFTER T=28DAYS

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ABSTRACT

Concrete is a material, which has found wide usage in engineering especially in construction engineering and road infrastructure facilities. Development trends for high-rise constructions, modern skyscrapers indicate that building 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-compacting concrete because of its ability to fill good formworks without compaction and vibration. Considering this fact, researches for cracks, mechanical characteristics of concrete and deformations have been conducted worldwide. In this line, we conducted an experimental research to determine the cracks on beams of self-compacting concrete and compared it with conventional concrete. The experimentally obtained results will be presented for both types of concrete for: module of elasticity, compression strength, crack width and cracks spacing for duration failure testing time t = 40 days.

Key words: Self-Compacting Concrete, Conventional Concrete, Compression Strength, Cracks, Modulus of Elasticity.

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1. INTRODUCTION

Self-compacting concrete like anywhere else in the world, as well as in Kosovo has been used widely in building construction, especially in high buildings and rehabilitation of existing facilities. For the illustration purposes of this publication, we have conducted a thorough research for different beams in order to measure their deformities characteristics (cracks, deformations, cuts, etc…) under both short-term as well as long-term loads. To achieve this objective, we have prepared a number of test samples and the 18 beams used have been categorized in three series: A Series – 6 beams of conventional concrete; B Series – 6 beams of self-compacting concrete and C Series – other 6 beams of conventional concrete core and coils of self-compacting concrete. This publication aims to discuss the experimental findings for both types of conventional concrete and self-compacting concrete by comparing their performances for modules of elasticity, compression strength and the size of cracks for both types of beams during the duration testing time t = 40 days. Below shows temperature measuring and porosity as well as cubical, cylindrical and prismatic sample for the two types of concrete, Fig.1.

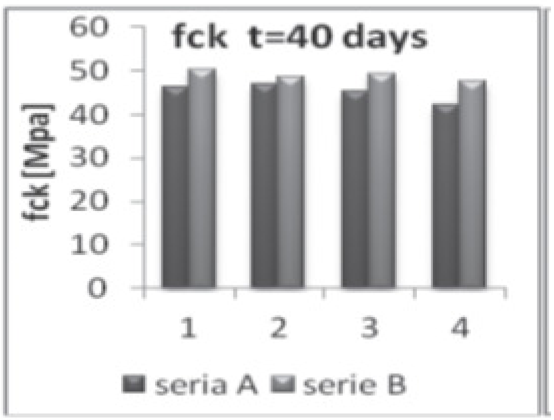
Figure 1 Measuring the temperature and porosity on concrete

2. TESTING THE MODULUS OF ELASTICITY ASTM 469

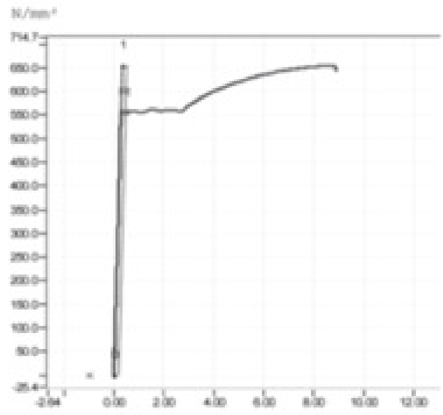
Figure 2. Below presents the testing of modulus of elasticity and compression stress on concrete.

Figure 2 Testing of modulus of elasticity.

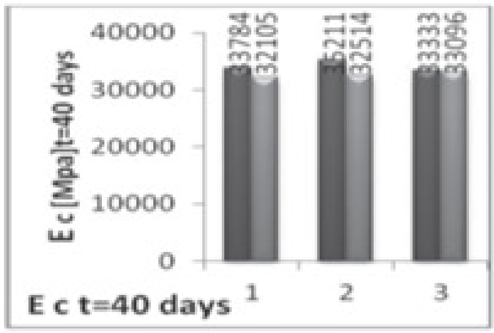
Diagram 2. Lists testing a) compression strength results for both conventional and self-compacting concrete, b) tensile strength for reinforcement and c) Modulus of elasticity.



a) Compression strength results for both conventional and self-compacting concrete



b) Tensile strength for reinforcement and



c) Modulus of elasticity

Diagram 2 Testing of Modulus of elasticity and compression strength and Reinforcement

3. STATIC SCHEME OF DHE BEAMS

The static scheme is a simple beam loaded with two centered forces. The cross-section dimensions of beams were 15x28 cm, their length 3m, reinforced with two fi-12 bars on the bottom (static bars) and other two fi-8 bars on the top (constructive bars) as show on Figure 3.[1]

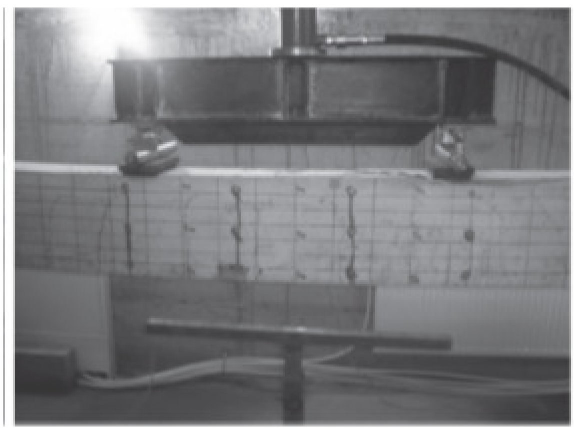


Figure 4 Testing of beam for the duration failure testing time t = 40 days

4. RESULTS OF CRACKS AFTER TESTING ON DEFLECTED BEAMS

Diagram 3 below presents the results of diagrams listing the development of cracks for beams of series A, B and C for the duration testing time = 40 days.

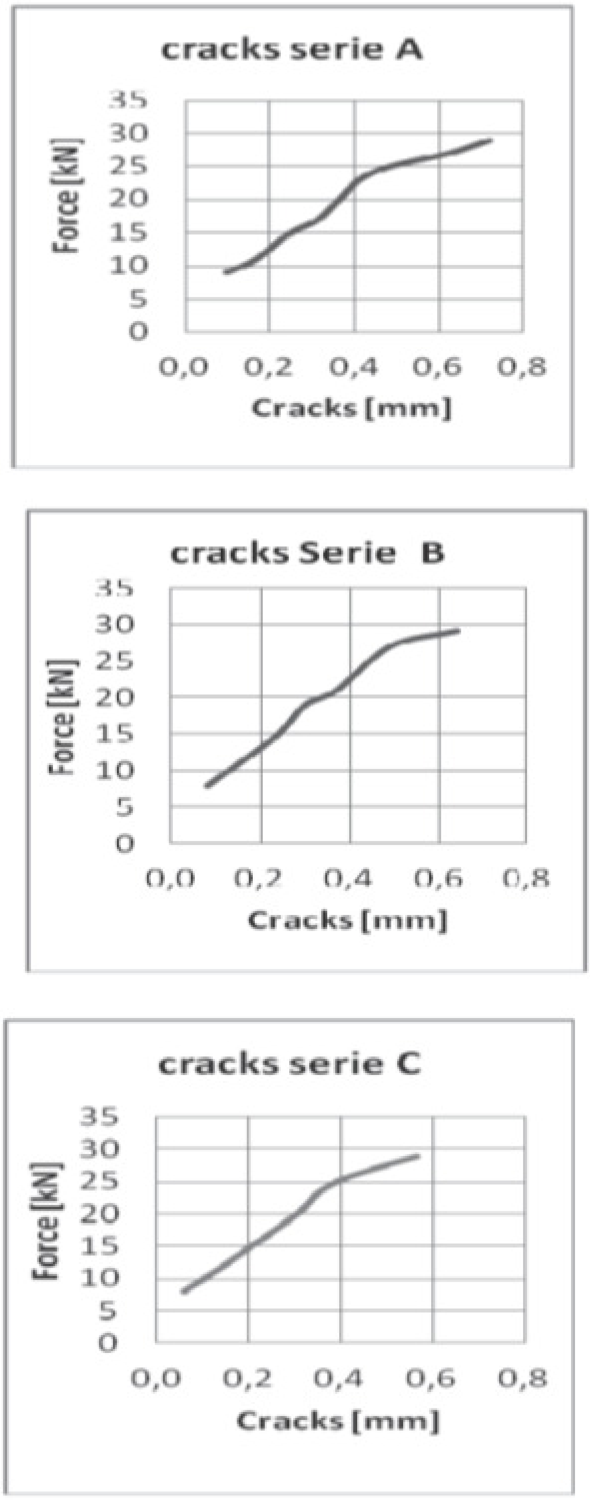


Diagram 3 Increasing size for different level of loads acting on beams

The development of cracks on beams has been measured for every force incremented during the testing period (the maximal burst) by using a special microscope. The development of fresh cracks along the entire length of the beams has also been evidenced and marked for every force values that have caused those crack spacing. The size of the crack spacings is shown in Figure 6. [2], [3]

In order to identify the developed cracked area on beams, the beams are split in areas of 10 cm horizontally by 4cm vertically. Cracks spacing and their distribution samples along the beams are presented in Figure 5.

The initial crack on beam B-1 occurs when we acting upon it with force of F=8kN thus causing the cracks width of w=0.08mm whereas the crack on beam B-2 occurs after acting upon it with F=7kN in which case, the cracks width will be w=0.06mm Similarly, for C-1 and C-2 beams, the cracks width will be the same w=0.06mm when acting upon them with forces of F=8kN (on C-1) and F=7kN (on C-2) respectively.[4]

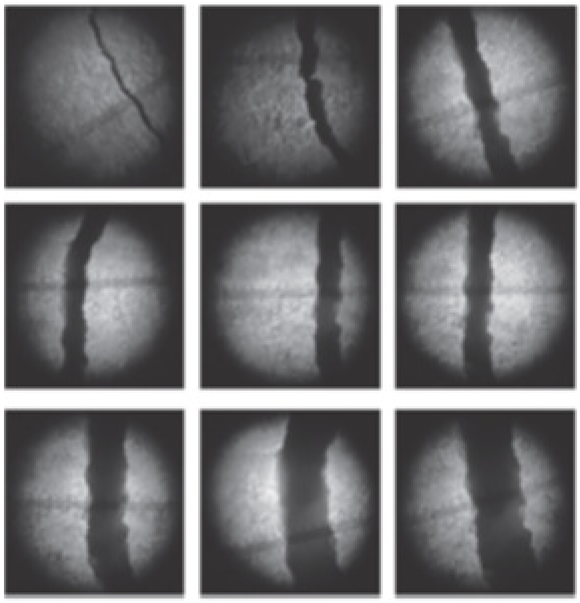
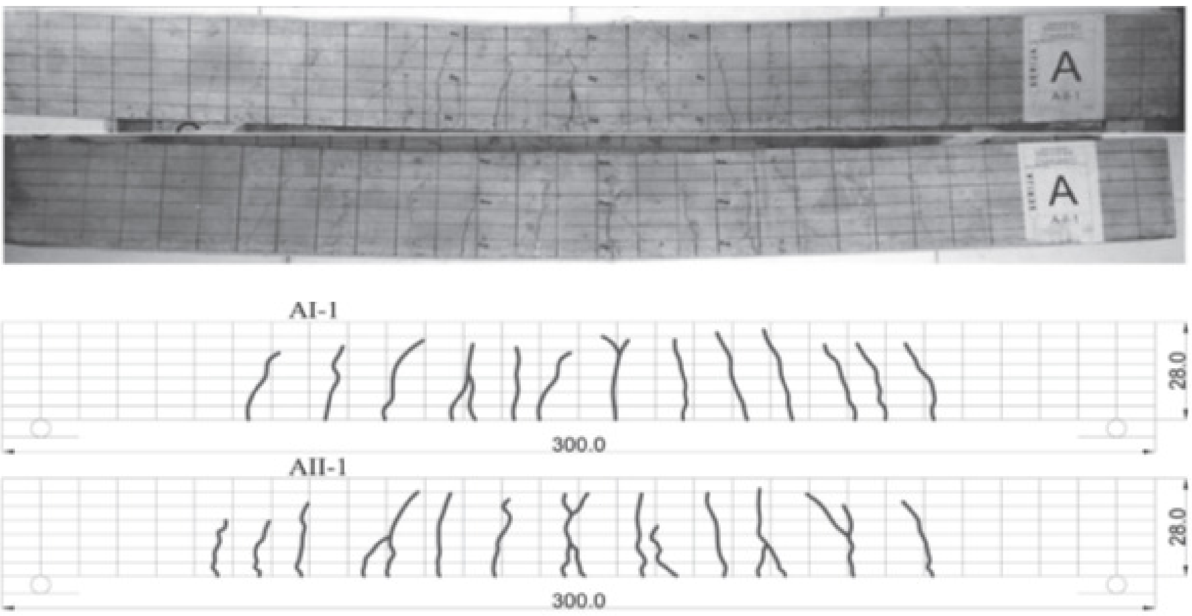


Figure 5 Increasing the size of the cracks for different levels of loads acting on the beams



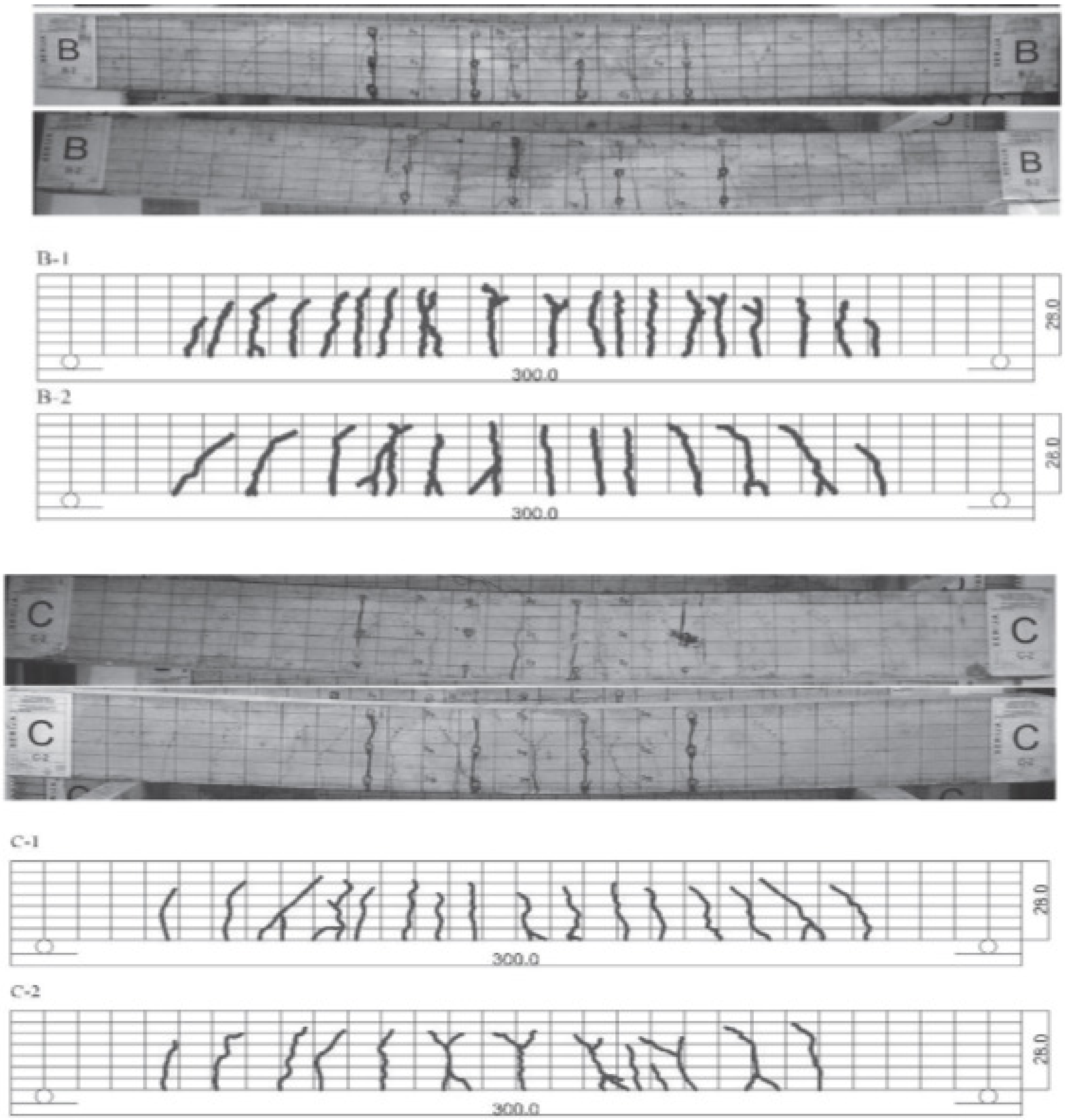


Figure 6 Development of cracks along the length of beams

5. COMPARING CRACK RESULTS

Table 1 below presents results of cracks width for beams of series A, B and C for duration testing time t=40 days.

Table 1 Results of cracks width for beams of series A, B and C

	A-B	**A-C**	**B-C**
Differ on %	6.89	19.80	13.66

Diagram 4 below presents crack with test results for beams of series A, B and C, for duration testing time of concrete age of t=40 days.

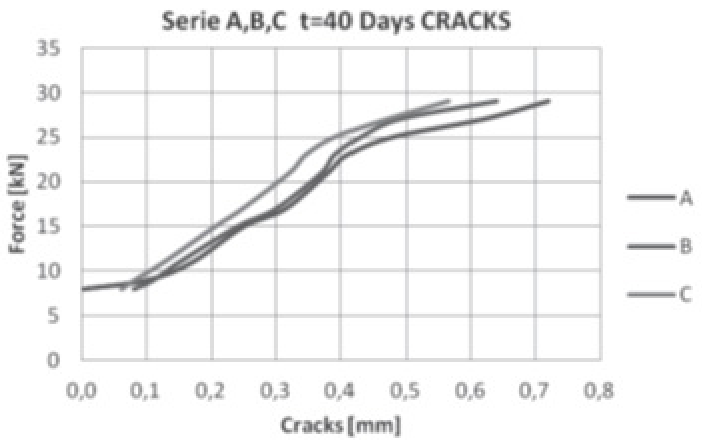


Diagram 4 Comparing diagrams for beams of series A, B and C

6. CONCLUSIONS

Based on the results obtained during the experiment, the following conclusions can be drawn:

- Self-compacting concrete has smaller modulus of elasticity than conventional concrete.
- The smallest difference is encountered in beams of series C when comparing the results.
- It is noted that, after deflection, the distance between the cracks and their development on the beams is more regular and denser on beams of self-compacting concrete indicating more homogeneous work in the entire length of these beams.
- Greater deflective force is required on beams of self-compacting concrete.

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