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INFLUENCE OF THE SPECIMEN MOLD IN THE CONCRETE COMPRESSIVE STRENGTH TEST

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ABSTRACT

This work aims to contribute to the clarification of the influence of the mold in the result of the concrete compressive strength test. As the main goal, the influence of the specimen geometry in the value of the concrete compressive strength test is investigated: (i) the relationship between the values obtained of the compressive strength test made in cubic and cylindrical specimens is compared with the relationship established by the Eurocode 2; (ii) the influence of the height of the specimen is evaluated by analysing the ratio of the compressive strength tests held in cubic versus prismatic specimens and held in cylindrical versus prismatic specimens. Additionally, it is investigated if the material in which the molds are fabricated (cast iron and polyurethane) influence the value of the concrete compressive strength. The concrete compressive strength test was performed in accordance with the standards EN 12350 and EN 12390 which describe the methodology to be applied from the collection of a specimen to the execution of the test. Concrete specimens were collected from three different concrete mix compositions (belonging to the compressive strength classes C20/25; C25/30 and C30/37) supplied by a ready-mixed concrete company from the Autonomous Region of Madeira (Portugal). All compressive strength tests were performed at the age of 28 days in the Regional Laboratory of Civil Engineering (LREC).

Keywords: compressive strength, concrete, molds.

PRELIMINARY RESULTS

Analysing the results obtained (see Fig. 1) in cubic specimens and cylindrical specimens ('CC') the relationship between the various sets is markedly above relationship the traditionally assumed ($f_{c,cylinder} = 80\% \times f_{c,cubes}$). In fact, a direct comparison with the results of tests carried out in specimens molded in cubic molds of polyurethane ('CP') shows that the ratio was 98% for specimens from the concrete C20/25, 99% for specimens from the concrete C25/30 and 96% for specimens from the concrete C30/37.

Note that, if the concretes studied are classified based on the results of tests performed with concrete cubic specimens molded using polyurethane molds, then applying the Criterion 3 of the EN 206-1, they should be classified as C16/20, C25/30 and C30/37. However, based on the concrete compressive strength of the cylindrical specimens, the classification is higher for all the concrete mix compositions studied.

Comparing the prismatic test specimens ('P') with the cubic ones it seems that the press might produce some effect of confinement, thus the value ‘0.80’ seems to be adequate for the relation between the concrete compressive strength tests carried out in cubic and prismatic

specimens. In contrast, it was found that test results carried out in cylindrical specimens were higher than the ones carried out in prismatic specimens. Therefore, the section has influence.

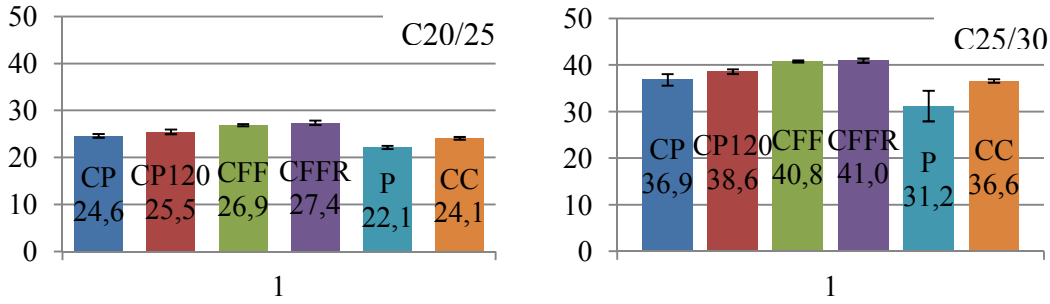

Fig. 1 - Compressive strength (MPa) obtained from concrete specimens C20/25 and C25/30

The results of the compressive strength of cubic specimens molded in molds made from cast iron (CFF) were (~10%) higher than the ones molded in molds made from polyurethane (CP). Finally, it was observed that when surfaces of concrete cubic specimens were smoothed no expressive changes were found in regarding to the no smoothed ones.

CONCLUSIONS

1. The use of cylindrical specimens leads to values of concrete compressive strength almost equal to those of cubic specimens, i.e. much higher than the ratio used in the Eurocode 2.

2. The height of the specimen has an influence on the value obtained for the concrete compressive strength. For the relationship between prismatic versus cubic the relationship seems to be close to 0.8;

3. The material in which the mold is made influences the value of the concrete compressive strength of the specimen. In this work the molds produced from cast iron leads to concrete specimens with higher compressive strengths than the molds made with polyurethane.

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