

Improving the Concrete Mechanical and Structural Characteristics by Replacing Pet Bottles as Fine Aggregates

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1-Introduction

There are different environmental-friendly methods to recycle PET bottles while using them as fiber in concrete is commonly used in the world. These crushed fibers can be used as aggregates in reinforced concrete. Even though the compressive strengths of Pet concretes were less than those of regular concrete, the flexural strength and the energy absorption were increased and the brittleness was decreased. Besides, other studies indicated that several light concretes were produced by pet concrete by decreasing the total weight for calculating and forcing earthquake loads.

2-Experimental Program

The main purpose of this research was investigating the effects of using different volumetric percentages of Pet for recycling the waste aggregates (replaced with sand) into concrete mechanical properties. The specific weight of Pet was 464 kg/m^3 with size smaller than 4.75 mm. The amount of water to cement the ratio for the regular concrete was 0.54 with the cement amount of 389 kg/m^3 . Concretes with percentages of 5, 10, and 15 were made to

be tested and compared with those properties of regular concrete. Totally, 96 specimens as mono-reinforced compression, tension, flexural, impact strength tests, and slabs plus some reinforced slabs were casted and tested.

3- Test Setup and Instrumentation

The loading of compressive specimens was done according BS1881 and ASTM-C39 Standards. Also, the tensile strength of split specimens was measured based on ASTM-C496 standard and the impact was assessed based on ACI-544.2R, as shown in Figure 1.

4- Conclusions

The test results indicated that slump, density, and special weight of concrete containing Pet decreased. As shown in Fig 2, increasing Pet percentage led to the decrease in all strengths; however, the flexural strengths decreased less than other strengths. Moreover, compared to the regular concrete, the strength increased when 5% of pet was added.

The flexural capacity of reinforced concrete slabs containing up to 10% of pet increased up to 13.3 %. The results of the impact resistant tests in Fig 3 indicated that the initial and the final impact resistant of concretes containing 5% Pet were increased up to 10 and 5.26%; respectively. The both impact strengths of concrete were decreased by increasing the pet percentage.

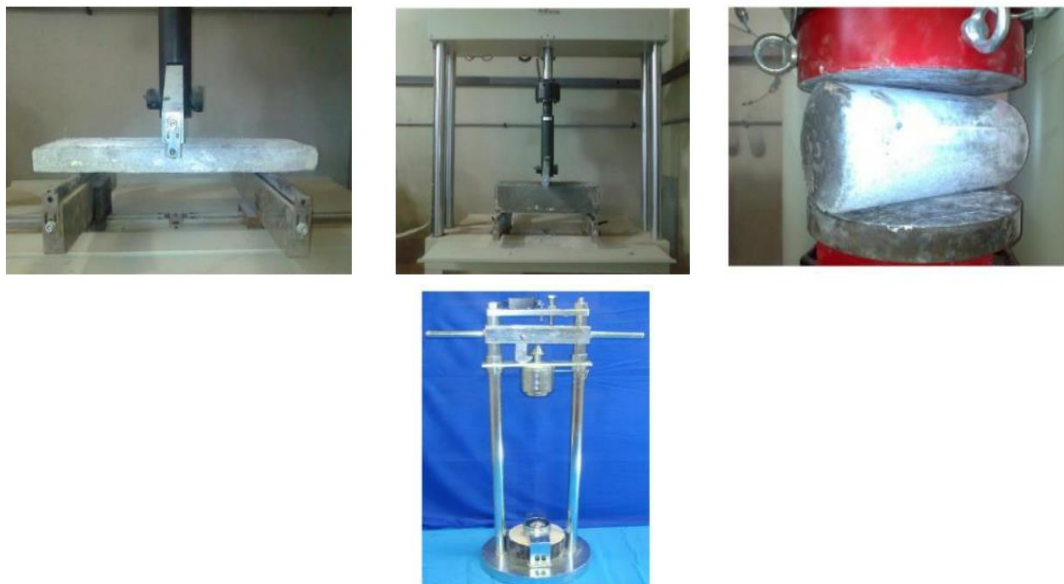


Fig. 1. Different strength test specimens

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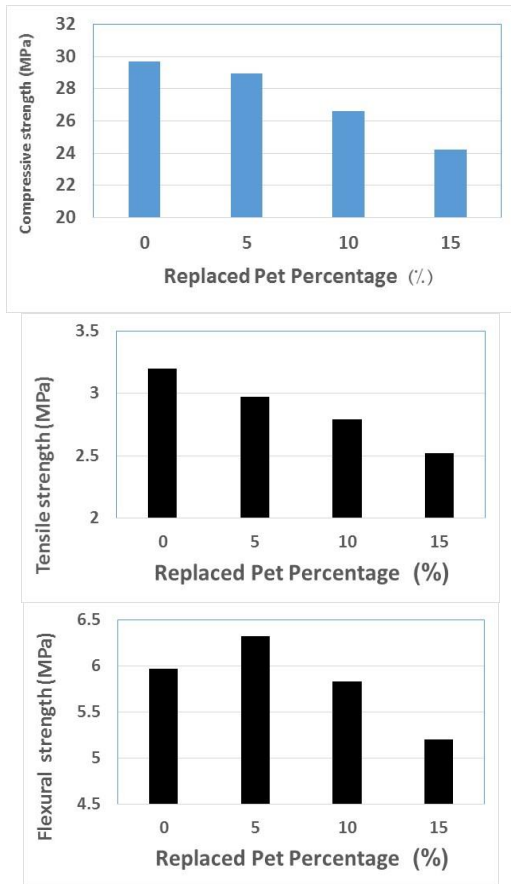


Fig. 2. Different strength test results.

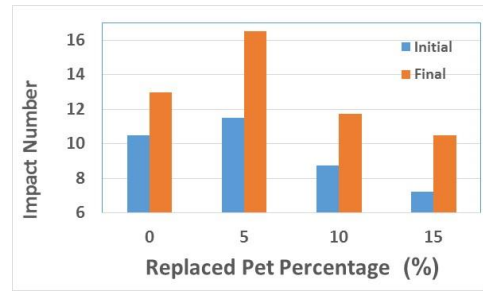


Fig. 3. Impact strength test result.