EFFECT OF WASTE CONSTRUCTION AGGREGATES ON THE MECHANICAL PROPERTIES OF STEEL FIBER REINFORCED CONCRETE

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1. INTRODUCTION

Concrete is one of the most useful materials used in construction industry ascribable to good advantages of strength to cost ratio by comparing of other construction materials such as steel, composites and wood products. A durable concrete need to be both strong and ductile performance but due to disadvantages of brittle behavior and low tensile strength in structural application, fibers have been turned into considerable solution to strengthen the concrete matrix. As the times change, advanced technologies are improving rapidly and also many types of fibers are emerged into commercial market [1]. Attribute to the superior performance on the interruption of micro crack propagation and the improvement of mechanical, durability and serviceability properties, hooked-end (5D) steel fibers play as a refinement-materials in strengthening of concrete [2]. Recycling of construction waste prevails nowadays in economic and preservation of environment from sustainability point of view [3]. Demolition of existing buildings produce brick and concrete waste to be treated for structural and non-structural applications before disposal. The proper size of aggregates is extracted by crushing in jaw machine and sieved by mechanical sieves [4].

2. METHODOLOGY

This research investigates that the mechanisms effects of plain concrete and steel fiber reinforced concrete; made of 2 different replacement ratio of coarse aggregate 50% and 100%, and the 3 different types of coarse aggregates: natural aggregate, recycle concrete aggregate and recycle brick aggregate. The influence of steel fiber volume fractions are 0%, 0.5%, 1% and 1.5%. The experimental tests are carried out according to 28 days strength of 15MPa mix design concrete in cube, prisms and cylinder specimens for water absorption, flexural strength, compressive strength and split tensile strength.

3. CONCLUSION

The comparative experimental results indicate that the behavior of steel fiber reinforced concrete regard to fiber content attain the fluctuation of mechanical properties on directly proportional as an increase in volume fraction leads to increase in concrete strength.

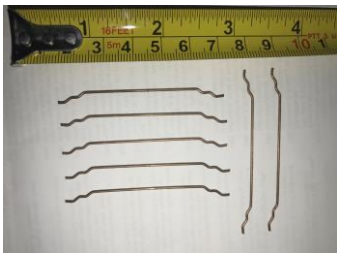

Figure 1. Hooked-end steel fibers (5D)

(a) (b) (c)

Figure 2. (a) Natural aggregate (b) Recycle concrete aggregate (c) Recycle brick aggregate

4. REFERENCES

[1] Chandrathilaka, E. R. K., Baduge, S. K., Mendis, P., & Thilakarathna, P. S. M. (2021). Structural applications of synthetic fibre reinforced cementitious composites: A review on material properties, fire behaviour, durability and structural performance. In Structures (Vol. 34, pp. 550-574).

[2] Abbass, W., Khan, M. I., & Mourad, S. (2018). Evaluation of mechanical properties of steel fiber reinforced concrete with different strengths of concrete. Construction and building materials, 168, 556-569.

[3] Anike, E. E., Saidani, M., Olubanwo, A. O., Tyrer, M., & Ganjian, E. (2020, October). Effect of mix design methods on the mechanical properties of steel fibre-reinforced concrete prepared with recycled aggregates from precast waste. In Structures (Vol. 27, pp. 664-672).

[4] Parichatprecha, R., Rodsin, K., Chaiyasarn, K., Ali, N., Suthasupradit, S., Hussain, Q., & Khan, K. (2022). Structural Behavior of LC-GFRP Confined Waste Aggregate Concrete Square Columns with Sharp and Round Corners. Sustainability, 14(18), 11221.