

UNIVERSITI TEKNOLOGI MARA

**STRENGTH PERFORMANCE OF GREEN
LIGHTWEIGHT CONCRETE MADE OF
WASTE PAPER SLUDGE ASH AND
RECYCLED AGGREGATE**

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of the requirements for the degree of
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any academic institution or non-academic institution for any degree or qualification.

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ABSTRACT

In view of the escalating environmental issues with consideration to the rapid depletion of natural resources, the use of waste materials from different industries are highly desirable in the manufacture of foamed concrete. Many researchers had found that waste materials could improve the quality of foamed concrete produced. However, there is limited study available on using waste paper sludge ash (WPSA) and fine recycled concrete aggregate (FRCA) as cement and sand replacement materials respectively in concrete. The present study aims the strength response to the contribution of these materials in the manufacturing of foamed concrete. The densities of the foamed concrete used were 1400, 1600 and 1800 kg/m³. The different levels of WPSA and FRCA which are 0%, 5%, 10%, 15%, 20% and 30% to cement and sand weight respectively were adopted. A total of one thousand nine hundred forty-four (1944) cube specimens were tested for compressive strength at the ages of 3, 7, 28, 60, 90 and 180 days. The results indicated that concrete made of WPSA had reduced the 28 days strength with the highest reduction ratio with respect to plain concrete were 0.63, 0.71 and 0.79 for density 1400, 1600 and 1800 kg/m³ accordingly. The foamed concrete with FRCA attained favourable strength at the optimum replacement of 5, 10 and 15% for density 1400, 1600 and 1800 kg/m³ respectively. Concrete mix with 15% FRCA of 1800 kg/m³ exhibited superior strength than other series. It also showed that 1800 kg/m³ concrete that contained a combined 20% WPSA and 30% FRCA recorded higher strength than other densities. The results of the statistical analysis confirmed that the density and different replacement level of WPSA and FRCA have influenced in the strength of foamed concrete.

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