

## **2011/12 Undergraduate Research Grant Scheme – Executive Summary**

**Project title:**

Flexural behaviour of reinforced concrete beams containing sustainable novel lightweight aggregates

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**Project summary:**

Previous research into the use of expanded polystyrene (EPS) in concrete has focused on high technology treatment of particles to prevent segregation in mixing. The aim of this research is to investigate the flexural properties of concrete containing a novel aggregate produced using a low technology solution to prevent segregation. The proposed use of the concrete is for the production of lintels, for low cost house building.

The novel aggregate called Stabilite is produced from crushed waste EPS, mixed with clay and cement. Utilising waste EPS in concrete reduces land fill, helps conserve natural resources and can reduce the dead load of a structure.

Eight reinforced concrete beams were tested with varying Stabilite and reinforcement content. Flexural behaviour such as mid-span deflection, shear strength and strain were investigated. Concrete cubes were produced to investigate concrete compressive strength, density, Ultrasonic Pulse Velocity and capillary water absorption.

Beams containing higher Stabilite contents were observed to deflect more before failure than normal concrete. The most common failure mode was a sudden, brittle shear, due to no shear links being provided in the shear zone. As the reinforcement content increased, the deflection reduced. The load at failure did not vary significantly between beams containing two and four bars. This was due to the beams containing 4 bars failing in shear, before the full tensile strength of the steel was utilised.

As Stabilite content increased, concrete compressive strength and density reduced. This was comparable to the results of previous research and can be attributed to a reduction in aggregate stiffness and density.

The mix proportions used for this research are acceptable for the production of concrete lintels and structural use. However, further research using higher EPS contents to utilise more of its lightweight nature for a different application would require further investigation into mix proportions to produce concrete of sufficient strength.