



Axial Compression Testing of Eco-Bricks

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Introduction / Background

- Ecobricks are plastic bottles packed with used plastics, serving as eco-friendly building blocks.
- The Global Ecobrick Alliance (GEA) was founded in the green valley of the Chico River in the land of the Igorot people (Northern Philippines).
- The attempt to reuse “useless” material was driven by their cultural virtue known as ayyew, which strives to live in harmony with ecological cycles.
- Tightly compressing plastic into bottles reduces the surface area of plastic exposed to the atmosphere, thereby minimizing the release of harmful toxins.
- Ecobricking compacts, secures, and isolates plastics (carbon) similarly to the way Earth sequesters carbon deep into secure geologic storage to cultivate and green the biosphere.
- Ecobricks have various uses, from decorative furniture to small storage to even habitable structures.
- Limitations: It is recommended to limit Ecobrick building projects to low-risk structures until more extensive and reputable research is conducted.

<https://ecobricks.org/en/>

Methodology

Ecobrick Samples

Three Ecobricks were prepared using 16.9 fl oz (500 mL) plastic water bottles filled with compacted non-biodegradable plastic.

Testing Setup

Axial compression tests were conducted using a Humboldt concrete compression machine. All three bottles were tested vertically with the water bottle cap facing up.

Data Collection

Water bottle weight (g), failure load (lb), and displacement (in). Stress was calculated using:

$$\text{Stress (psi)} = \frac{\text{Failure Load (lb)}}{\text{Bottle Cap Surface Area (in}^2\text{)}}$$



Jabung Mandala Park
2000 eco bricks
Java, Indonesia



Findings / Results

Eco Brick	Weight (g)	Density (g/mL)	Failure Load (lb)	Stress (psi)	Displacement (in)
1	333.90	0.67	540	687.55	1.0
2	209.77	0.42	480	611.15	1.0
3	264.17	0.53	460	585.69	1.5

- Higher mass = Higher compressive strength
- Compared to conventional bricks and concrete, Ecobricks are weaker, but lightweight and capable of being repurposed.

Conclusion

While Ecobricks are not suitable as a primary load-bearing element, they are promising for non-structural applications. This lab experiment highlights eco bricks as a sustainable construction option that addresses both environmental waste management and low-cost building needs.

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