

The Use of Eco-Cements for Building Earthship Brighton

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Figure 1 - Front View - Earthship Brighton, UK

The Low Carbon Network (www.lowcarbon.co.uk) was established to raise awareness of the links between buildings, the working and living patterns they create, and global warming and aims to initiate change through the application of innovative ideas and approaches to construction. England's first Earthship is currently under construction in southern England outside Brighton at Stanmer Park.

Earthships are exemplars of low-carbon design, construction and living and were invented and developed in the USA by Mike Reynolds over 20 years of practical building exploration.

Earthships are autonomous earth-sheltered buildings independent from mains electricity, water and waste systems. Earthship homes or offices are off-the-grid with little or no utility costs.

We contacted John Harrison from TecEco Pty. Ltd. over a year and a half ago via email, and he explained the basic concept of magnesium oxide eco-cements and we became keen to investigate and utilise some of his mixes in order to reduce our dependence on OPC.

We have mainly been using the 1 OPC, 2 MgO, 9 Ballast mix as a mortar for bottle walls and other minor works. It was a pleasing mix to work with, stiff yet pliable and workable.



Figure 2 - Shovelling Reactive Magnesia into the Mixer



As the eco-cement 28 day test gave a compressive strength of 19.6 N/mm² for 1 OPC, 2 MgO, 9 Ballast, compared with a PC concrete test block (1-OPC: 3-Ballast) of 36.2 N/mm² and was sufficient for structural works, we decided to use eco-cement formulations for our floor slabs from then on. This may have been a risk, but at least a calculated one.

We have since poured all our floors (totalling approximately 90m²) with the above 1 OPC, 2 MgO, 9 Ballast eco-cement mix, observing no problems of cracking or shrinkage whilst using only 8-9% OPC. (Ed. note: Evidence that carbonation is occurring include a continuous hardening and strengthening). We are currently resuming our tests, taking on board further advice from John.

Figure 3 - Interior Eco-Cement Floor, Earthship Brighton, UK

We have acquired a brick dust pozzolan and plan to try a 40-60 Mpa tec-cement, taking greater care in sourcing specific aggregates. Hopefully this will result in slabs of comparable or superior strength and durability, with a fraction of the OPC and associated carbon emissions.

In the future we aim to replace all our mortars and concretes with a combination of tec-cements, eco-cements and carbonating lime mortars in our next build.

For information about the Earthship Brighton and other projects please go to the TecEco web site.



Figure 4 (left) - Earthship Brighton Front Greenhouse.

Thanks to Taus Larsen, Darren Howarth, Mischa Hewitt and the people at the Low Carbon Network for their assistance.

See <http://www.lowcarbon.co.uk/eb.html> for more information.