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TecEco Eco-Cement Mud Bricks

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Our objective was to produce a stabilised pressed earth brick that would satisfy my building inspector in order to issue a building permit for our load bearing mud brick walled dwelling. The bricks should be easy and consistent to make keeping costs reasonable (below \$0.30 a brick in materials as opposed to \$2-3 to purchase). Research suggested that OPC be used as a stabiliser. Discussions with local mud brick manufacturers suggested a 2.5% by volume of OPC be mixed with local subsoil should be adequate. Our subsoil on site was class M and contained a 15-20% clay, which necessitated good handling and processing in order to make good pressed bricks. (The recommended that clay content is more like 10%).

I was about to start making bricks after purchasing a share in a hydraulic ram operated brick press (brick size 300x220x140mm) when I read in the 13 July 2002 issue of New Scientist an article on John Harrison's Eco-cement. After contacting John he suggested a formula of 2 parts MgO to 1 part OPC with the possibility of adding a small amount of fly ash if needed. I purchased the MgO from Causmag in Young NSW and made test bricks from the press (without fly ash) and after substantial curing, over 6 months I sent 2 test batches of bricks to the Brick and Mortar Research Laboratory (BMRL) in Hoppers Crossing Victoria for compressive strength testing.



Figure 1 - Whittlesea Mud Bricks Out in the Weather 17/03/05

The results were as follows: Batch No. 6523 OPC only to 2.5% of brick by uncompressed volume
Batch size: 6 Mean unconfined compressive strength: 0.4 MPa Unbiased standard deviation 0.1MPa
Batch No. 6524 OPC: MgO mix 2:1 ratio to 2.5% of brick by uncompressed

volume Batch size 6 Mean unconfined compressive strength: 1.0MPa Unbiased standard deviation: 0.2Mpa

Other mixes were used (no stabiliser at all and a batch with another OPC additive) but were not tested, as funds were limited. The TecEco bricks had a mean strength of 1.0Mpa and therefore passed requirements for load bearing houses according to BMRL. Qualitative tests indicate that the bricks also have very good water erosion resistance and the remainder of the bricks have been exposed to the elements over a 6-month period without problems. Mud bricks are generally however recommended to be protected by eaves and verandas, as will be the case in our building.

As can be seen by the results above the replacement of OPC by MgO increases the compressive strength by 150%. This was an unexpected result. Traditionally stabilisers for pressed bricks have centred around additives such as OPC, Lime, Pozzolanas, Bitumen emulsion and straw (for "puddled" mud bricks). The ability of MgO to greatly improve strength in mud bricks for me has a two fold effect when considering not only MgO's effect in strength for a small volume of stabiliser but also in sequestering CO₂ which is an important advantage for those with an interest in sustainable (alternative) building. There is a great interest in this topic by owner builders and suppliers in the alternative building and sustainable building product market. OPC use is seen as problematic because of its high-embodied energy and CO₂ created, but necessary due to its strength characteristics. I think there would also be many commercial mud brick suppliers that would be interested in replacing OPC product. Perhaps similar results could have been achieved by increasing the percentage of OPC in OPC only stabilised bricks the added advantage of less CO₂ involved in production and its ability to sequester CO₂ is still an advantage over the higher cost of MgO over OPC. While a lot more testing on different batches could build a better picture including soil tests it is clear that MgO combined with OPC can produce stabilised earth bricks that can be used to build load bearing walls by meeting compression strength requirements, which was my goal in the beginning.

I would now like to know how I could incorporate eco-cements and concrete into the rest of our building project including the floor slab, concrete blocks and mortar etc. I would like to thank John Harrison for the time he gave to help kick start my interest and subsequent use of eco-type cement for our house building project and subsequent projects. I am happy to provide further information such as test result if interested.

References: "Building with Earth, a handbook." John Norton, IT Publications, 1986.

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