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Fire drives our industrialised world to the detriment of the air, water, and earth; however, its weight needs to shift. Concern about our air and water is giving new importance to the old technology of rammed earth construction. Stratified rammed earth walls have a primal beauty that speaks of time and place. They are solid, acoustically sound, tactile, healthy, and very locally sourced.

Not only the Great Wall of China. The Hakka people of the Southern Chinese province of Fjian have been building communal rammed earth dwellings for centuries. About fifteen percent of homes in France are made of earth. Australia is heavy with rammed earth. And in North America, some architects and builders in Arizona and British Columbia are casting it as a 'normal' construction material.

According to the Cement Association of Canada, typical concrete contains 7 to 15% of cement and 16% water. Stabilised rammed earth walls have a cement content that ranges from 3 to 10% and an approximate water content of 8%. Nonetheless, reinforced rammed earth walls can be more than two-times thicker than their concrete counterparts, ranging from 300 to 600 mm (12" – 24"). Time has shown that the world's oldest earth walls are roughly composed of 70% sand and 30% clay (Easton, pg. 91). Structurally, rammed earth walls can be considered to share the same characteristics as unreinforced masonry. Today, reinforced rammed earth walls can be engineered to be earthquake resistant, multiple storeys, and durable for centuries.

Rammed earth walls also share the same thermal characteristics as concrete and brick. In Northern climates such as Canada, these thick walls still have to be insulated. A British Columbia company, Terra Firma Builders Ltd., has developed an insulated wall system where 100 mm (4") of rigid insulation is built into the centre of the wall. Fully insulated, the walls then offer an interior thermal mass that can maximise passive solar gains and better regulate household temperatures.

Similar to straw bale construction, rammed earth walls are built upon reinforced concrete foundations; they are capped with a steel, concrete, or timber ledger; and also have wide roof overhangs to help protect them from driven rain and snow. Clear, non-toxic water-based sealants can be applied to interior or exterior walls to keep them dry. Another aspect of this natural building is the probability of shrinkage cracks, honeycombing, voids, and efflorescence. These imperfections are part of the expected finish of earth walls and their appearance varies with local soil conditions. Unlike air-entrained concrete, wet rammed earth will spall when subjected to freeze-thaw cycles.

Constructed in forms similar to concrete formwork, these walls are literally rammed. Earth lifts of 150 to 200 mm (6" - 8") are placed in the forms and then either physically or mechanically rammed solid. The repeated application of these lifts, is what gives the walls their stratified effect, similar to sedimentary rock. The strata can be further enhanced with coloured sands, oxides, etc. Electrical conduits, niches, windows, and door frames are also incorporated into the formwork. The process is labour intensive and although human labour is an environmentally neutral activity, this can add to construction costs. And no, the walls won't crumble if you kick them.

The natural inherent appearance of the rammed earth requires little finishing. Contrary to the cold look of concrete, rammed earth walls provide a warm healthy environment that replaces the manufactured and chemical components of typical framed buildings. Naturally fire resistant, rammed earth technology is as old as human dwelling and as relevant as our next breath.

Resources

Texts

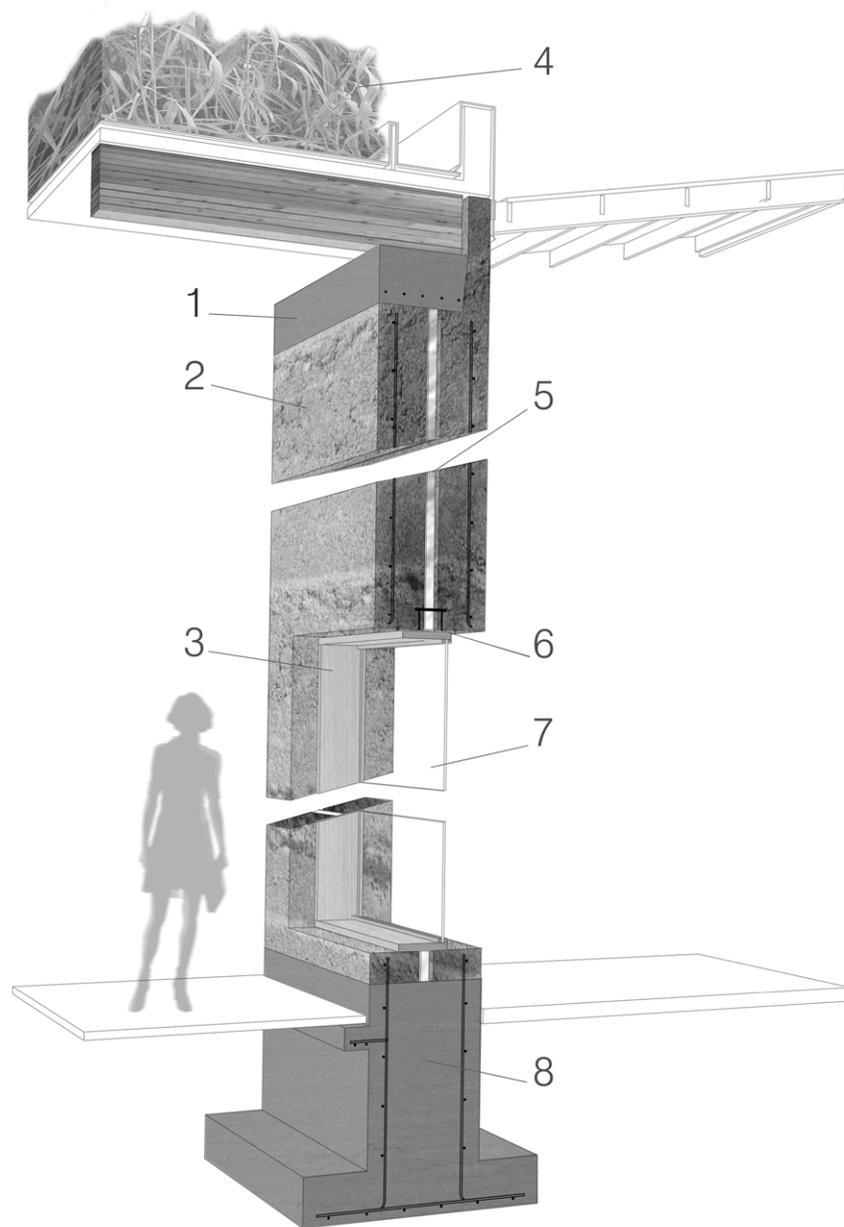
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<http://www.earthhomes.com/>
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<http://www.ramscl.com/>
<http://www.bedrosians.com/glznscal.htm>
<http://www.cemont.ca/cemont.nsf>



Schematic Rammed Earth Wall Section

- 1 concrete ledger capping wall
- 2 reinforced rammed earth cavity wall
- 3 wood framed casement window
- 4 vegetated roof
- 5 ecosourced 100 mm (4") rigid insulation
- 6 hidden steel lintel
- 7 triple-glazed thermal glass
- 8 reinforced concrete foundation wall