

EarthBag Building System

Benefits of using the EarthBag Building System



School Project, Cibitoke Province, Burundi, 2010 (phase one 700m²)
Client: Engen Petroleum International and the Government of Burundi

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Benefits of building with the EarthBag System

The advantages of this construction system as detailed below have been embraced by a multinational corporation such as Engen Petroleum International, with whom we are developing a new sustainable model for service stations in central and east Africa.

Engen has recognised that the 'triple bottom line' is squarely addressed by the EarthBag system, through it being environmentally, economically and socially sustainable - lower impact, lower cost and job-creating.

Economic considerations

The EarthBag system is a very cost-effective method of construction.

EarthBag structures are inexpensive – when compared to standard materials, and on large projects, economies of scale will mean major cost reductions. Costs per plastered square metre of wall area are similar to block construction (R400/m²) and substantially less than plastered cavity walls (R600/m²). This includes a pro-rata lower cost for the very simple foundations that are often possible.

Skilled Labour - the level of skilled labour required is small as the method, once demonstrated, is very simple. It also means that local job creation is a major benefit. Projects often employ women as well as men.

Local material – site-sourced local fill material is often available at no cost.

Speed of Construction – is rapid, as there is no skilled bricklaying to be done and the method is easily learned.

Environmental

What makes the EarthBag System so environmentally friendly and sustainable?

Transport – the walls for two hundred and fifty 40m² houses or other structures can be built from a single 12m container-load of EarthBags.

Embedded Energy - the carbon footprint of this system is lower than when conventional materials (cement, clay bricks and steel) are used, which have enormous embedded energy and hence carbon footprint. This may allow projects built with EarthBags to qualify for carbon funding.

Fill Material - local site-sourced fill material is used in the EarthBags. This dramatically reduces fossil fuel use and transport costs to site. It also means environmental damage from quarrying is eliminated. Almost any fill material can be used.

Water Requirements – are minimal, as the main construction process uses no mortar.

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Timber - the EarthBag wall system uses little or no timber. Though theoretically a sustainable resource, wood is becoming increasingly scarce and expensive, and carbon is locked in *growing* trees only.

Waste production - on-site waste generation is almost eliminated – such as timber-offcuts and other precious resources. Landfills are not a part of the EarthBag building system requirements.

Insulation - the excellent thermal insulation of an EarthBag wall results in drastically reduced heating and cooling costs over the life of the building, especially when combined with appropriate passive thermal design. Even in hot climates, air-conditioning can often be eliminated. The life-cycle carbon footprint will therefore be a fraction of that of a standard house.

Longevity - appropriately designed buildings constructed with EarthBags should stand for decades if not centuries. This makes them highly sustainable, as the longer any usable item lasts, the less often it has to be replaced, thus saving resources and reducing waste.

Reduce, Reuse, Recycle - the EarthBag system epitomises a low environmental impact system. Not only is the use of resources reduced, but the full EarthBags can easily be reused locally or emptied and used elsewhere, and the material from which the bags are made is easily recyclable. And the raw material from which the EarthBag is made, is a by-product of the refining of crude oil or coal into petroleum.

Structural and site

Easy to learn and User-friendly - EarthBag building is easy to learn, and can therefore be mastered by unskilled people or a community in a very short time, with minimal supervision. EarthBags have no sharp edges and are not heavy.

Strength - an EarthBag wall is extremely strong, owing to its thickness and weight, thus it is unaffected by high winds or other destructive forces. Similar structures have surpassed all seismic tests in California, USA. Tests done at the Cape University of Technology in 2008 to the International Agreement Construction Certification System, demonstrated results well in excess of the required standards.

Foundations – extremely simple and inexpensive foundations can be used when the substrate is appropriately stable, using cement stabilised earth in the lowest few rows of bags. Big cost savings can therefore be made.

Versatility – the EarthBag system can use a variety of fill materials, often obtained from the site itself. The fill can be stabilised with cement or lime if necessary, as in the construction of foundations.

Posts, Beams and Lintels – both posts and beams can be built into the wall structure with ease, allowing for multi-level construction. Window and door lintels can be formed within the EarthBags themselves, resulting in superior strength through integration.

Adaptable – it is easy to alter the position of wall openings during construction, or even to dismantle an incorrectly placed wall and rebuild it with the very same materials.

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Services – plumbing, electrical and other services are very easy to incorporate into the EarthBag wall as it is built, which can significantly reduce plumbing and electrical contractor input and hence cost. Conduits and piping can also be added later, as it is simple to run these through the wall or vertically and horizontally under the plaster – no chasing.

Security – there are no piles of bricks on site that may be subject to theft, just the bags which are easily secured and a pile of earth which has no value.

Remote locations – as only the bags need to be transported to the site to build with the EarthBag system, it allows for easier construction in remote locations. Bales of bags could even be carried on foot or by mule!

Thermal, acoustic and climate control qualities – health benefits

Soundproof - The EarthBag wall is a superb insulator of sound – a peaceful interior even with very high-level noise nearby. When used as an interior wall, EarthBag construction will allow for privacy between rooms.

Climate Control - an EarthBag system can also regulate humidity, as moisture will be absorbed and released from such a wall and the interior humidity is therefore maintained at an steady and healthy level. Together with the great insulation levels, this eliminates the condensation and mould that can occur with brick and especially concrete block walls, reducing the dangers from respiratory conditions such as asthma, pneumonia and TB.

Other vital qualities

Fire Resistance – excellent.

Bullet-proof and Mortar-proof – used so often in warfare, the bullet-stopping characteristic of sandbags has long been recognised. A high-velocity bullet that will penetrate a concrete or brick wall will be stopped by an EarthBag wall, and the blast of a mortar will be absorbed by the elastic mass of the earth fill.

Flood proof – sandbags are often used in flood protection, and the EarthBag system therefore provides the same benefits, especially as the bags interlock.

Temporary Housing, Warehouses or Military Barracks - can easily be constructed using EarthBags. The necessary protection of the bags from ultra-violet light can be achieved by painting the exterior of the structure, desirable if camouflage is required. Temporary roofing can be formed using a waterproof tarpaulin which can be firmly attached to the extremely strong walls, resulting in a very sturdy, completely weatherproof and well insulated structure, all of the components of which would be completely and easily reusable.