TECHNOLOGIES FOR A REGENERATIVE FUTURE

A Natural Building Overview.

July 2021

Projects, writings & photographs

by

Andy Horn

BAS & B. Arch (UCT 1990 & 95), Pr. Arch (SACAP#7264), MSAIA, MCIfA #7348

ECO DESIGN
ARCHITECTS & CONSULTANTS

ECO DESIGN
(Pty) Ltd

A. R. HORN B.A.S. (UCT), B. Arch. (UCT), Pr. Arch (SACAP), MSAIA, CIfA
Telephone: 021 462 1614, Cell 082 676 110, 20 Alexandra Avenue, Fresnaye, Cape Town, 8005
andy@ecodesignarchitects.co.za www.ecodesignarchitects.co.za

Local Pole Harvesting for Framed Construction & Roof Structures & Ecological timber preservation methods

Background:

- Poles have been used in construction for millennia.
- Generally timber poles are a readily available renewable natural resource that can be found across the country.
- Timber poles are a very low embodied energy structural material and as with all timber, act as act tas a sequester carbon from the atmosphere.
- Poles can be coppiced and will re-grow in a few years, depending on the species.
- Most of the exotic "alien" tree species are highly suitable for construction purposes. Rather than being considered as a rapidly renewable resource, the use of which helps sequestrate carbon from the atmosphere, the Department of Water Affairs and Forestry through it's "Working for Water" programme treat this resource as unwanted pest to be cut down and poisoned with Glyphosate.

Benefits:

- There is a high level of skills available as pole technology is widely used, both in the informal and formal construction sectors.
- Pole harvesting and treatment not only creates local jobs but also assists in the attempt to get rid of invasive aliens. Therefore the resource is sustainable and assists in the local environment / community upliftment and empowerment.
- With boron treatment, poles can be treated and used while still wet, unlike sawn timbers.
- Non-toxic buildings interiors.
- Sparing environmental damage caused by common chemical insecticide based preservatives
- Can cure the timber with its bark on when moon phase harvesting.

Technical Information:

- Poles are 2½ times stronger than sawn timber per unit volume.
- Timber poles require a minimum of processing and can be treated on-site with non-toxic treatment methods using boron or otherwise zero cost bio-dynamic/moon-phase harvesting.
- Poles generally grow quickly and can be harvested in 2 – 5 years.

Company Track record/examples of work:

- House Olivier, Kromme Valley Farm Clan William, 2019
- Alterations & Additions to House Bezuidenhout - Pinelands, Cape Town, 2012– 2013
- House Ashmole – Stellenbosch 2009 - 2010
- Mamre Heritage Revitalization Project – Phase II & III, Mamre, Cape Province, 2008-2010
- House Morris, Barrydale, the Karoo, 2008
- House Alblas – McGreggor, Western Cape, 2007
- House Samner Ivey – Hout Bay, Cape Town, 2007
- House Sidler - Sunset Beach Cape Town, 2006
- Upgrade of Nieuwoudtville Caravan Park, Namaqualand 2004-2007– Won Silver 2005 in the Holcim Awards for Sustainable Construction in the Africa & Middle East region.
- House McConnel - Betty's Bay, Western Cape, 2005
- House Brodie – Scarbourgh, Cape Peninsular 2004
- Community Educare Centre for Flower Valley Conservation Trust, Gansbaai, Western Cape, 2002
- Mud Gallery - R62 Barrydale, the Karoo, 2001
- The Backpack & Africa Travel Centre – Tamboerskloof, Cape Town 2001
- House Patience – Greyton, Western Cape, 2002
- House Salters – Teslaarsdal, Western Cape, 1999.
- House Prinsloo - Elands Bay, West Coast,1998.
- Alliance Francaise Cultural Centre – Cape Town 1997 (Project Architect for ACG Architects)

ECO DESIGN
(Pty) Ltd
©
A. R. HORN B.A.S. (UCT), B. Arch. (UCT), Pr. Arch (SACAP), MSAIA, CIfA
Telephone: 021 462 1614, Cell 082 676 110, 20 Alexandra Avenue, Fresnaye, Cape Town, 8005
andy@ecodesignarchitects.co.za www.ecodesignarchitects.co.za

Rubble Trench Foundations

Background:

- Was used by famous American Architect Frank Lloyd Wright in the design of low cost earthquake proof foundations.
- Is commonly used for railway track construction.
- Gravel and Recycled brick / rubble is sourced from dumpsites, cleaned and sorted to use in rubble trench foundations.

Benefits:

- Is a use of local "free" material.
- Can contribute to environmental clean-ups, as building rubble is often dumped illegally.
- Helps to reduce landfill at municipal waste sites.
- Helps in creating addition work on site.
- This construction method eliminates min 75% of concrete typically used in foundation design. Note that:
  - Concrete production is harmful to the environment and is said to be responsible for between 5 -8% of greenhouse gases.
  - Concrete is a costly material.

Technical information:

- The rubble trench is filled with smaller rubble/gravel around a filtering drain pipe at the bottom of the foundation, followed with larger pieces packed firmly ready to form the base of the wall.
- Is suitable for a wide variety of soils including clay soils, but its use would still be subject to the specific design and on-site conditions.
- Once one has sourced and cleaned the rubble, it is a very fast way to construct ones foundations.

Company Track record/examples of work:

- House Mendel, Hout Bay, Cape Town, 2021
- Staff houses, Stanford Valley Farm, Western Cape, 2008
- Upgrade of Nieuwoudtville Caravan Park, Namaqualand, 2004-2007, which won Silver 2005 in the Holcim Awards for Sustainable Construction in the Africa Middle East region
- House Perry 2007 - in Masipumalele informal settlement, Cape Town

ECO DESIGN
(Pty) Ltd

A. R. HORN B.A.S. (UCT), B. Arch. (UCT), Pr. Arch (SACAP), MSAIA, CIfA
Telephone: 021 462 1614, Cell 082 676 110, 20 Alexandra Avenue, Fresnaye, Cape Town, 8005
andy@ecodesignarchitects.co.za www.ecodesignarchitects.co.za

Earth Floors

Background:

- Earth floors of various designs and applications can be found throughout history.
- Locally earth floors were used by early settlers where timber could not be sourced or afforded.
- Local vernacular architectures still use earth floors.

Benefits:

- If well-built can provide viable warmer alternative to concrete using local materials.
- Earth floors provide excellent thermal comfort to building interiors.
- Can be easily repaired.

Technical information:

Ground Slab construction:

- Adobe bricks or cast clay slabs are laid on a thick bed of gravel.
- Then various layers of earth, straw, dung and sometimes lime is used to screed over.
- Normally sealed by burnishing with mix of beeswax and linseed oil, casein.
- Good perimeter french drains are advised to divert all moisture.
- Vulnerable in floods.
- Easily damaged, but also easily and inexpensively repaired.

First Floor Construction:

- There are many variations of this construction.
- Typically a slab of clay straw is laid on criss-cross layers of reeds and bamboo or timber ceilings spanning between timber rafters.
- Earth bricks can be used forming mini vaults between rafter supports.

Company Track record/examples of work:

- OR Tambo Narrative & Enviro Centre – Leeupan, Johannesburg, 2010 - 2011
- Mamre Info Centre Project, Mamre Western Cape, 2010, first floor construction.
- House Davids, Zeekovlei, Cape Town, 2000

ECO DESIGN
(Pty) Ltd

A. R. HORN B.A.S. (UCT), B. Arch. (UCT), Pr. Arch (SACAP), MSAIA, CIfA
Telephone: 021 462 1614, Cell 082 676 110, 20 Alexandra Avenue, Fresnaye, Cape Town, 8005
andy@ecodesignarchitects.co.za www.ecodesignarchitects.co.za

Stone Construction

Background:

- Some of the earth's oldest structures are constructed of stone
- Local stone is collected and sourced from farms, road cuttings, quarries etc, stone is cut and sorted using local labour.
- This building technique supports skills transfers and entrepreneur initiatives.

Benefits:

- The material can often be sourced from one's local environment.
- It is usually extremely durable and a very low maintenance material.
- With the correct skills, it can be built without the use of cement.
- Aesthetically very pleasing and ages very well.

Technical Information:

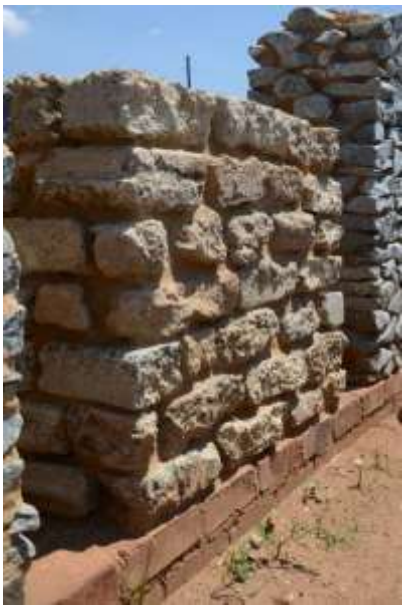
- Properly built stone is an extremely durable material.
- Stone has a high thermal mass, which can be used to buffer the extremes of temperature.

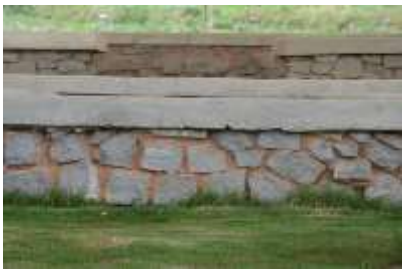
Company Track record/examples of work

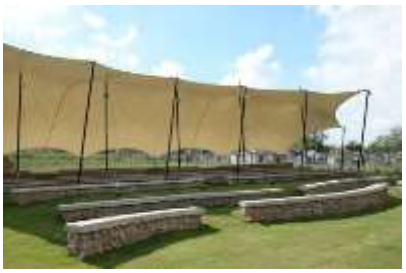
- House Olivier, Kromme Valley Farm Clan William, 2019
- OR Tambo Narrative & Enviro Centre – Leeupan, Johannesburg, 2010 - 2012
- House Eglin, 2009 – 2011, Gqnube Green Eco Village, East London
- Mamre Tourism Information Centre, Mamre, Western Cape, 2009 – 2010
- House Morris, Barrydale, the Karoo, 2008
- 7 Fountains Primary School, Shyamaya Township, Kokstad, Kwa-Zulu Natal, 2007
- Upgrade of Nieuwoudteville Caravan Park 2004-2007, Namaqualand – Won silver 2005 in the Holcim Awards for sustainable Construction in the Africa Middle East region.
- House McConnel - Betty's Bay, Western Cape, 2005
- House Brodie - Scarbourgh, Cape Peninsular, 2003
- Mud Gallery - R62 Barrydale, the Karoo, 2001
- House Patience - Greyton, cape Province, 2002
- House Salters – Teslaarsdal, Western Cape, 1999
- House Prinsloo - Elands Bay, Cape West Coast,1998

ECO DESIGN
(Pty) Ltd

A. R. HORN B.A.S. (UCT), B. Arch. (UCT), Pr. Arch (SACAP), MSAIA, CIfA
Telephone: 021 462 1614, Cell 082 676 110, 20 Alexandra Avenue, Fresnaye, Cape Town, 8005
andy@ecodesignarchitects.co.za www.ecodesignarchitects.co.za







Urbanite Construction

Background:

- Just like stone construction, except one uses chunks of old waste concrete
- Local urbanite is collected and sourced from demolition and dump sites. The urbanite can be broken up and sorted using locally sourced unskilled labour.
- This building technique supports skills transfers and entrepreneur initiatives.

Benefits:

- Minimizes the use of new concrete.
- Is a very low maintenance material.
- Aesthetically pleasing and ages very well, looking like stone of first appearance.
- Can be used to clean up the environment, by harvesting urbanite from illegal dumps.
- Reduces the amount of waste going into landfill sites and reduces and can help to clean up illegal dumping in the environment
- Turns waste into a resource.
- Similarly to stone, it will have a high thermal mass, which can be used to buffer the extremes of temperature.
- Can be used to create extra jobs at a local level.

Technical Information:

- Properly built urbanite is an extremely durable material.
- Urbanite has a high thermal mass, which can be used to buffer the extremes of temperature.

Company Track record/examples of work:

- Alterations & Additions to House Bezuidenhout - Pinelands, Cape Town, 2012– 2013
- OR Tambo Narrative & Enviro Centre – consulting, Leeupan, Johannesburg, 2011 - 2012

ECO DESIGN
(Pty) Ltd
©
A. R. HORN B.A.S. (UCT), B. Arch. (UCT), Pr. Arch (SACAP), MSAIA, CIfA
Telephone: 021 462 1614, Cell 082 676 110, 20 Alexandra Avenue, Fresnaye, Cape Town, 8005
andy@ecodesignarchitects.co.za www.ecodesignarchitects.co.za

Adobe Construction / Sun Dried Mud Brick

Background:

- This method has been used for thousands of years with parts of the Great Wall of China as well as some of the pyramids in Egypt being made of adobe brick.
- Most of South Africa's oldest National Building Monuments are made with adobe bricks.
- Adobe bricks are still widely used in many rural parts of the country, i.e. Eastern Cape, Transkei, Zululand, Mpumalanga etc. However their use without proper masonry foundations or damp proofing and the practice of cement plastering, typically compromises their durability.

Benefits:

- This method can be used to increase the job creation and community skills development on site.
- The raw materials are normally readily available and simple tools are needed.
- These walls offer much better thermal comfort performance. The combination of the high thermal mass of the material which offers great thermal stability to structures together with the ability of clay to moderate humidity levels to indoor climates creates a greatly improved level of thermal comfort when compared to standard concrete & brick buildings.
- Unlike cob for instance the adobe brick making process allows for the division of labour, such that one can create additional work with brick production being separate to the actual project construction itself.

Technical information:

- Strengths are typically good for double storey construction.
- This method can be very durable provided good detailing
- with proper damp proofing as well as natural plasters
- (earth and lime) and paints that breath are used.
- The Adobe brick mix is carefully prepared by mixing clay-rich soil/ sand/ straw with the correct proportions.
- The adobe mix is placed in the moulds and the bricks are left out to dry in the sun for one month. The longer it dries the stronger it gets.
- Earth brick building codes have been established in many parts of Central, South and North America. many countries, as well as in New Zealand.

Company track record/examples of work:

- Technical consultant & ECD Centre for CNNIA Architects & VPUU in Delft, Cape Town, 2021
- TWK Resource Centre Training Rooms for CNNIA Architects & VPUU in VilliersDorp, Western Cape. 2017- 2018
- Adobe building & making workshop for CPUT at Rocklands Primary School,, Mitchell's Plain, Cape Town 2015
- Training workshop for Keiskammerhoek Resource Centre, in the Eastern Cape, for a local NGO Ntinga Ntaba kaNdoda, 2014
- OR Tambo Narrative & Enviro Centre – Leeupan, Johannesburg, 2010 – 2012
- House Eglin, 2009 – 2011, Gqnube Green Eco Village,, East London
- Mamre Heritage Revitalization Project for City of Cape Town, Mamre Western Cape, 2010-2011
- Block B of Seven Fountains Primary School for Oprah's Angel Network & East Coast Architects, in Kokstad, KZN, 2006-2007
- Alterations & Additions to House Albla, in McGreggor, Western Cape, 2007.

ECO DESIGN
(Pty) Ltd

A. R. HORN B.A.S. (UCT), B. Arch. (UCT), Pr. Arch (SACAP), MSAIA, CIfA
Telephone: 021 462 1614, Cell 082 676 110, 20 Alexandra Avenue, Fresnaye, Cape Town, 8005
andy@ecodesignarchitects.co.za www.ecodesignarchitects.co.za

Straw Bale Construction

Background:

- Straw bale building has been around for about 100 years, originating in Nebraska in the USA.
- Straw bale building is easy to construct and suitable to use with unskilled labour of all ages and genders.
- Straw bales are an annually renewable agricultural waste product that is often wasted or burnt by farmers.

Technical information:

- Straw bales are dry packed either as in-fill between structural frames or as load bearing walls where a ring beam plate is tied to the foundations.
- Straw bales are stabilized with horizontal & vertical timber saplings and finished with clay and lime plasters.

Benefits:

- Straw bales walls have phenomenal acoustic and thermal properties, resulting in a very high level of human comfort, way superior to any other building material available.
- As the straw is too tightly packed to support combustion and due to its high insulation properties (R value = R6 to R7), a plastered straw bale wall is exceptionally fire-proof.
- Straw bales are an abundant agricultural bi-product and South Africa currently grows enough straw to provide enough material for 1 million homes every year – more than double the countries present capacity!
- Straw bales are inexpensive to buy as well as dispose of as all waste can be mulched for landscaping purposes.
- Building with bales is relatively easy to learn and lends itself to self-builders and community involvement.

Company track record/examples of work:

- House Mendel – Hout Bay, Cape Town, Cape Town, 2021
- House Patience - Greyton, Workshop, Western Cape, 2019
- House Larsen – Workshop, Hilton, KZN, 2014 and 2019
- House Botes, Agte Paarl, Western Cape, 2014
- Smith's Guest House - Workshop, Napier 2013
- Green Kruger Lodge - Workshop, Marloth Park, Crocodile Bridge, Mpumalanga 2013
- Orphanage at Village of Hope - workshop, Grabou, Western Cape, 2013
- Starflower Project house & conference/training facility – consulting and workshops, Midrand, Gauteng, 2012
- OR Tambo Narrative & Environmental Centre - Consulting, Leeupan, Johannesburg, 2010 – 2012
- House Morris - Barrydale, the Karoo, 2008
- House Lula - consulting, Gauteng, 2008
- Upgrade of Nieuwoudtville Caravan Park, Namaqualand, 2004-2007 (Won Silver 2005 in the *Holcim Awards for Sustainable Construction in* the Africa Middle East region)
- Wolvekloof Academy consulting & workshop, Ceres, Western Cape, 2006
- Stanford Valley Conference Centre - workshop, Western Cape, 2006
- House McConnel - Betty's Bay, Western Cape, 2005
- Gary's Barn -Oude Molen Village, Cape Town, 2005
- House Brodie - Scarbourgh, Western Cape, 2003
- House Patience - Greyton, Western Cape, 2002
- House Salters - Teslaarsdal, Western Cape, 1999
- House Prinsloo - Elands Bay, Cape West Coast,1998

ECO DESIGN
(Pty) Ltd
©
A. R. HORN B.A.S. (UCT), B. Arch. (UCT), Pr. Arch (SACAP), MSAIA, CIfA
Telephone: 021 462 1614, Cell 082 676 110, 20 Alexandra Avenue, Fresnaye, Cape Town, 8005
andy@ecodesignarchitects.co.za www.ecodesignarchitects.co.za

Cob Buildings

Background:

- Numerous cob buildings found in Devon and Cornwall are well over 500 years old.
- Locally Tuinhuis at the houses of parliament in Cape Town is over 300 years old.
- No complicated machines or tools are required, simply lots of labour and only very basic skills.

Benefits:

- This material is a very durable form of earth construction.
- Cob has higher tensile strength than other types of earth construction, which in general is weak in tension.
- Offering relatively good levels of thermal comfort with a high level of thermal mass and humidity exchange.
- Mixing and building with cob is very simple and easy to work with.
- It requires no specialist tools.
- Is well suited to community participation.
- Materials can often be sourced from the site itself saving on transport costs.
- It is also extremely versatile due to its sculptural qualities and is often used in combination with other natural building methods, like straw bale and sand bag wattle and daub etc.

Technical information:

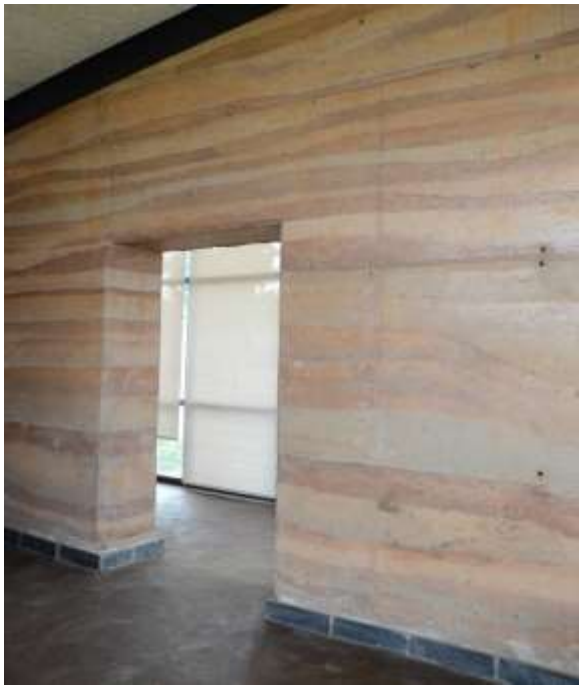
- A mixture of clay, straw and sand is mixed together into a stiff consistency and packed directly onto a masonry plinth wall.
- The straw acts as reinforcing and while the compacted earth and sand mix create the compressive strength.
- While cob can be mixed manually this process is very slow. Various forms of mechanization can be employed to greatly speed up the mixing process.
- The walls need to dry sufficiently as they are built to avoid slumping, so generally one can only built about 300mm a day.

Company Track record/examples of work:

- House Ashmole - 2009-2010, Stellenbosch
- House Perry - Masepumalela informal settlement, Kommetjie, Cape Peninsular, 2007
- House Brodie - Scarbourgh, 2003
- Community Edu-care for Flower Valley Conservation Trust - Gansbaai, Western Cape, 2002
- Note that all straw bale projects undertaken 1998 – 2019, have incorporated elements of cob construction

ECO DESIGN
(Pty) Ltd

A. R. HORN B.A.S. (UCT), B. Arch. (UCT), Pr. Arch (SACAP), MSAIA, CIfA
Telephone: 021 462 1614, Cell 082 676 110, 20 Alexandra Avenue, Fresnaye, Cape Town, 8005
andy@ecodesignarchitects.co.za www.ecodesignarchitects.co.za



Rammed Earth

Background:

- Rammed earth dates back as far as 5000 BC where it was used commonly in China.
- Rammed earth is still a common building material in parts of North Africa, like Yemen and Morocco.
- This technology became very popular in parts of France in the 1700's where it became known as Pisé de Terre as well as in the USA in the early 1800's.
- Rammed earth was widespread in Zimbabwe after the 2nd world war.
- In 2012 the SADC Bureau for the Harmonization of Standards adopted the Zimbabwe code for rammed earth Construction for all SADC countries.
- Many buildings exist nowadays in all climatic regions of the world.

Benefits:

- This material is very durable.
- Offering very good levels of thermal comfort.
- Materials can often be sourced from the site itself saving on transport costs.
- A raw off-shuttered wall gives a smooth beautiful finish itself and these days is typically left without further plastering or painting.

Technical information:

- A formwork is first built, usually out of wood or plywood, to act as a mold for the desired shape.
- A moist mixture of clay, sand & gravel is poured into the formwork in layers of 10-15cm & is compacted by ramming.
- Rammed earth using re-bar, wood or bamboo reinforcement can prevent failure caused by earthquakes or heavy storms.
- Without mechanical tools rammed earth construction can be very time consuming.
- This method of construction lends itself to high levels of mechanization and can be done very speedily, however it requires extensive testing at the beginning.

Company Track record/examples of work:

- House Klipspringer, Wild Rivers Estate, Hoedspruit, Mpumalanga, 2020-2021
- House Botes, Agte Paarl, Western Cape 2014.
- OR Tambo Narrative & Enviro Centre – Leeupan, Johannesburg, for Oddessy Architects and the Ekurhuleni Municipality, 2010 – 2012

ECO DESIGN
(Pty) Ltd

A. R. HORN B.A.S. (UCT), B. Arch. (UCT), Pr. Arch (SACAP), MSAIA, CIfA
Telephone: 021 462 1614, Cell 082 676 110, 20 Alexandra Avenue, Fresnaye, Cape Town, 8005
andy@ecodesignarchitects.co.za www.ecodesignarchitects.co.za

Light clay construction / Leichleim

Background:

- Used for many 100's of years in Germany & medieval northern Europe
- The 300 year old double storey town museum in Genadendal near Greyton in the Western Cape is made of clay straw roles.
- It can be used for both internal and external walls as well as for ceilings, and is commonly compressed between a frame.

Benefits:

- Materials can be sourced from the site itself and is easy to work with.
- Simple tools are required.
- Offers very high levels of insulation for relatively thin walls.

Technical Information:

- The timber framing structure, Shutter work is constructed and fixed in position.
- A mixture of clay, straw and sand is mixed together and placed between a shutter framework and compressed.
- 2 layers of shuttering are compressed and then the shutters are successively leapfrogged over each other panel by panel.

Track record/examples of work

- Production of light clay straw panels & clay straw panel repair work for restoration Guga S'thebe Theatre (after fire damage), in Langa, Cape Town 2021
- Technical feasibility study for CNNIA archiects for the TWK Resource Centre for VPUU Villiersdorp, Western Cape, 2016
- Staff housing for Organic Farm Shehaan, outside Lusaka, 2008
- Stanford Valley Conference Centre workshop 2006 made partial use of light clay straw panels.
- Eco Design held a light-clay construction workshop at the Cob Colloquium in December 2006 for the McGreggor's Centre for Alternative Technology.

ECO DESIGN
(Pty) Ltd

A. R. HORN B.A.S. (UCT), B. Arch. (UCT), Pr. Arch (SACAP), MSAIA, CIfA
Telephone: 021 462 1614, Cell 082 676 110, 20 Alexandra Avenue, Fresnaye, Cape Town, 8005
andy@ecodesignarchitects.co.za www.ecodesignarchitects.co.za

Wattle Daub Construction

Background:

- Wattle and daub can be found in many parts of the world, with some structures many hundreds of years old.
- This method is already in widespread use around the country.
- However due to the lack of timber treating and poor or lack of proper damp proofing and the absence of a masonry base wall, this method is not nearly as durable as it should be when these simple improvements are incorporated.

Benefits:

- With simple improvements this system can be made much more durable and socially acceptable.
- The existing skills and resources are commonly available to the informal sector, and just need education and supply of lime.
- Allow for the use of readily available building rubble and alien vegetation, favouring labour cost over material cost.

Technical information:

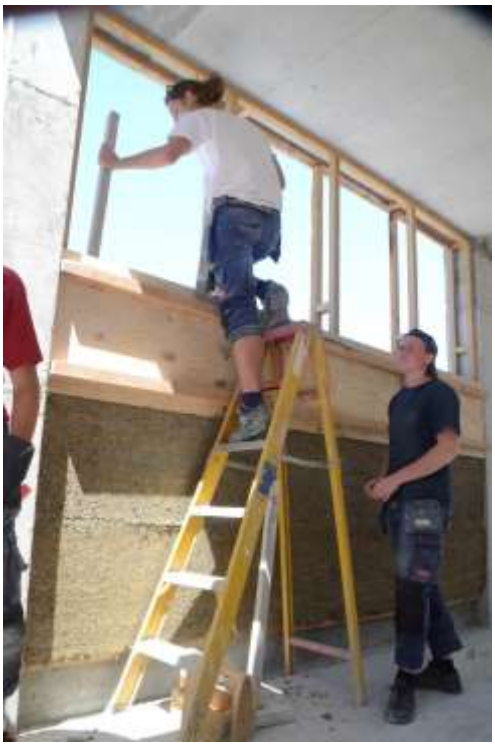
- Stone, earth clumps or rubble is sourced from recycling dumps and placed in a timber frame work.
- The walls are plastered using clay and lime based plasters.
- A good foundation & footing i.e. stone, brick etc is used.
- Boron treated or bio-dynamically harvested timbers are used.
- Local saplings are nailed or bound to upright poles forming frame work for the wall structure.

Company Track Record of Work:

- Stanford, Valley Farm workshop building, Stanford Valley, Western Cape.

ECO DESIGN
(Pty) Ltd

A. R. HORN B.A.S. (UCT), B. Arch. (UCT), Pr. Arch (SACAP), MSAIA, CIfA
Telephone: 021 462 1614, Cell 082 676 110, 20 Alexandra Avenue, Fresnaye, Cape Town, 8005
andy@ecodesignarchitects.co.za www.ecodesignarchitects.co.za



Hempcrete – Hemp lime construction

Background:

- First used in France since the early 1990's and developed around repair work to old medieval timber frame wattle and daub structures.
- A mixture of the woody inner part of hemp stalks know as shiv and an hydraulic or fast setting lime is mixed with water and used as a non-load bearing in-fill material and can be used for the construction of walls, ceilings and roofs
- It can be used for both internal and external walls as well as for ceilings, and is commonly compressed between lightweight timber frames.
- Historically Japan has a century's old tradition of using the finer hemp fibres in the recipes of their traditional lime and clay plaster finishes.

Benefits:

- Hempcrete can be used to make pre-fab blocks, as an insulating base plaster or sprayed-on material, but is most typically poured manually into a wooden construction for a high performance plastered masonry wall effect with a seamless result.
- While the material sourcing currently has challenges, it is a simple building process requiring fairly basic skills and tools.
- Creates high levels of thermal and sound insulation.
- The material is lightweight so good for alteration works.
- The material offers a healthy indoor environment as being vapour open it works as a phase change material helping balance out indoor humidity levels.
- It is also fire, wind, rot and fungi-proof.
- The timber and hemp that is trapped in the walls along with the lime as it carbonates, effectively become a form of carbon sink and so helping he construction be more carbon neutral.

Technical Information:

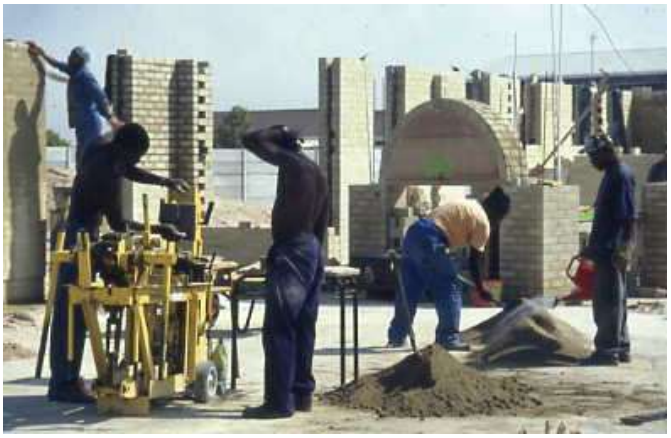
- Typically used non-structurally as a fill material, it is mixed on site, poured between shutters and then lightly tamped around a lightweight timber framing structure.
- Shutter work is temporarily fixed in position to the timber framing.
- In Europe hemp shiv is mixed with a fast setting Hydraulic lime.
- However, South Africa does not have sources of hydraulic lime. As such a small amount of cement or mix of furnace slag and metakaolin or other pozzolanic admixtures are needed in the mixture to facilitate a faster setting process.
- Officially most hemp is still imported, with a limited number of temporary growing licences having been issued to date, with only rudimentary processing methods being employed.

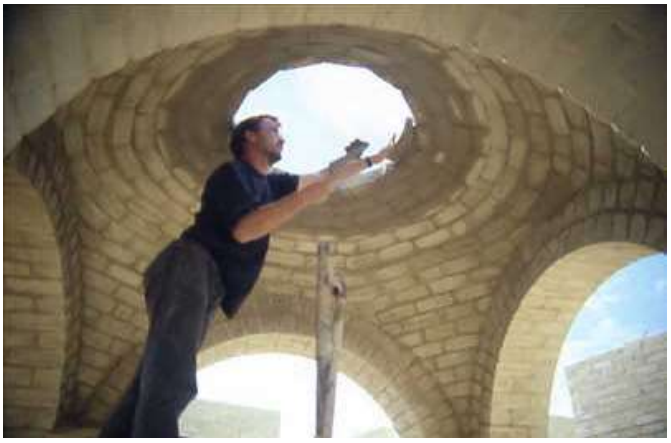
Track record/examples of work

- Voluntary building participation at Yiza Ekhaya Soup Kitchen, Kuyasa, Cape Town 2015
- Council plans for Wol & Wolf Architects for House Wolf, Bokaap, Cape Town 2014
- Alts & Adds to House Louw, Rondebosch, 2014

ECO DESIGN
(Pty) Ltd

A. R. HORN B.A.S. (UCT), B. Arch. (UCT), Pr. Arch (SACAP), MSAIA, CIfA
Telephone: 021 462 1614, Cell 082 676 110, 20 Alexandra Avenue, Fresnaye, Cape Town, 8005
andy@ecodesignarchitects.co.za www.ecodesignarchitects.co.za





Compressed Earth Block

Background:

- The first compressed earth block press was a manual press and was developed in Colombia in 1956.
- Bricks can be made on site using local earth with a small addition of cement or lime stabilizer.
- The soil is highly compressed using hydraulic pressure, resulting in a very dense stabilized earth brick.

Benefits:

- Avoids wastage with packaging (Saves landfill costs).
- Costs 20% less than a conventional brick.
- 80% of the cost of the bricks goes toward creating work onsite.
- Durability - Stabilized bricks can be used as face bricks.

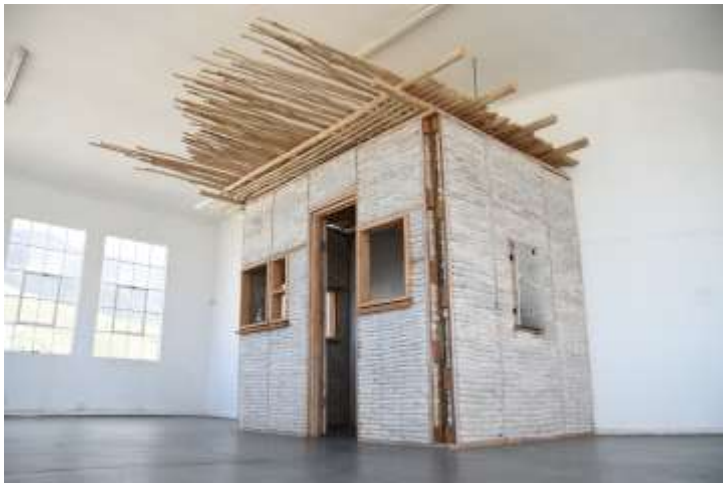
Technical information:

- Building blocks made of clay soils with 3-5% of lime or cement stabilizer.
- The mixture is then mixed with a minimal amount of water and then compressed using a Hydraulic press.
- The bricks are then cured before use.
- Bricks can be used for dome & vault construction (Avoiding use of conventional structural materials for roofs)
- Attachments can be purchased to manufacture different shaped brick as well as various roof-tiles.

Company Track record/examples of work:

- Alliance Francaise Cultural Centre – Cape Town, 1997 (Project Architect for ACG Architects)

ECO DESIGN
(Pty) Ltd
©
A. R. HORN B.A.S. (UCT), B. Arch. (UCT), Pr. Arch (SACAP), MSAIA, CIfA
Telephone: 021 462 1614, Cell 082 676 110, 20 Alexandra Avenue, Fresnaye, Cape Town, 8005
andy@ecodesignarchitects.co.za www.ecodesignarchitects.co.za



Sandbag Building Technology

Background:

- Various sandbag building systems have been used over the last 100 years or so, originating in the military.
- In 2003 Eco Design Architects developed their own generic design for using sand bags in conjunction with timber ladder frames for use in the Twin Streams Staff housing project.

Benefits:

- Allows for use of freely available local and scrap material.
- Is a very solid durable construction
- Has excellent thermal and acoustic properties
- Involving Community: Allows for the settir up of a series of Micro-enterprises with use of local material, i.e.
  - Harvesting timber poles
  - Treating timber with non-toxic timber preservative
  - Collecting sand/rubble and salvaging small dimensioned timbers
  - Timber ladder manufacture
  - Bag manufacture.

  Cost effective as the simplicity of construction means one can used unskille labour to build the walls.

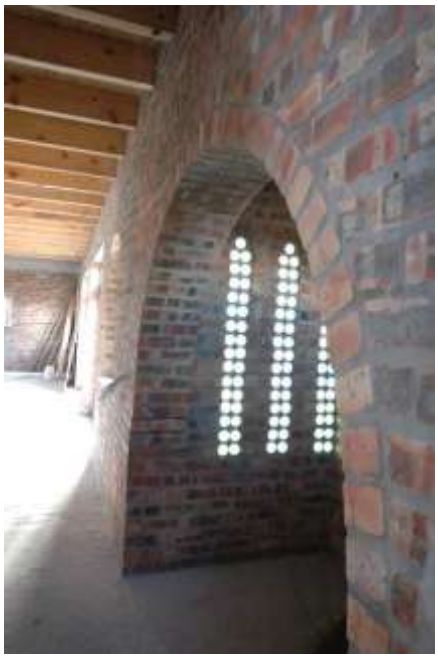
Technical information:

- Aside from the foundations, this system requires no cement or binder, and besides sand, the bags can be filled with clay, rubble or gravel.
- Bags are dry-packed between timber ladd frames, which are positioned vertically at approx 1,0m centres and reinforced with a timber ring beam plate at 2,4m height.
- The clay and lime plastered walls provide superior insulation when compared to regular concrete block construction.

Company Track record/examples of work:

- House Olivier, Kromme Valley Farm Clan William, 2019
- Office Renovations – Eco Design Offices 2014 and 2018
- House by Marion Whiteman, Bathurst, Eastern Cape 2012.
- Jozini Lodge, Swaziland, 2010
- Building system design used for 8 chalets for West Coast National Park by Studio 4 2008
- Twinstreams Environmental Centre Staff Housing – Mtunzini, KZN, 2004. This project was awarded the *Sustainable Building Best Practice Award for Africa* at the Africa regional Sustainable Building Conference held at Speer 2004.

ECO DESIGN
(Pty) Ltd
©
A. R. HORN B.A.S. (UCT), B. Arch. (UCT), Pr. Arch (SACAP), MSAIA, CIfA
Telephone: 021 462 1614, Cell 082 676 110, 20 Alexandra Avenue, Fresnaye, Cape Town, 8005
andy@ecodesignarchitects.co.za www.ecodesignarchitects.co.za



Bottled Walls / Windows

Background:

- The most famous local bottle wall constructions can be found at the owl house in New Bethesda and were built over 60 years ago.

Benefits:

- Recycling waste reduces landfill.
- Additional jobs can be created on site.
- Bottles can be used to create beautiful patterns of light.
- The walls create good insulation.

Technical information:

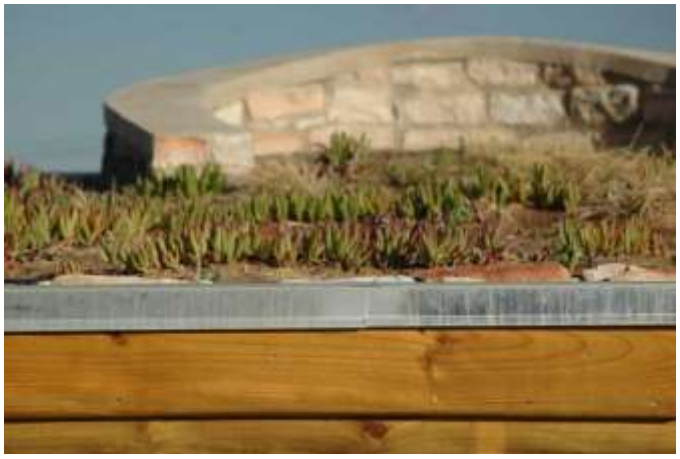
- The tapered ends of bottles are cut off and taped end to end so as form a sealed tube of glass.
- The tubes are stacked in a pattern and either set in cob, lime or cement.
- Lime and white cement are more effective at reflecting light through the glass. Tinfoil or waste material with a reflective surface can be wrapped around to further enhance the quality of light.

Company Track record/examples of work:

- House Olivier, Kromme Valley Farm, Clan William, 2019
- Yiza Ekhaya Soup Kitchen – Kuyasa, 2015
- House Ndumiso Dlamini, Lyndock Eco Village, Stellenbosch, Western Cape 2013
- House Eglin, 2009 – 2011, Gqnube Green Eco Village, East London
- House Sidler - Milnerton Cape Town, 2006
- House Brodie - Scarborough, Cape Peninsular, 2003
- House Patience – Greyton, Cape Province, 2002
- House Lijnes - Noordhoek Cape Peninsular, 2001

ECO DESIGN
(Pty) Ltd

A. R. HORN B.A.S. (UCT), B. Arch. (UCT), Pr. Arch (SACAP), MSAIA, CIfA
Telephone: 021 462 1614, Cell 082 676 110, 20 Alexandra Avenue, Fresnaye, Cape Town, 8005
andy@ecodesignarchitects.co.za www.ecodesignarchitects.co.za



Planted Roof Construction

Background:

- Historically planted roof structures were common in the extreme climates of Scandanavia, where the thermal stability of these roofs helped insulate their structures.
- Recently they have become very fashionable with environmentally conscious design and in countries like Germany it is now compulsory for all public buildings to either have solar or otherwise planted roofs.

Technical information:

- Planted roofs are either supported on waterproofed concrete or timber roof decking. Pitches are generally quite shallow.
- They can be made thinner and hence less heavy by using hardy shallow rooted local species of bulbs and succulents.

Benefits

- Planted roofs are visually unobtrusive. Helping to integrate buildings with their landscapes.
- They help reduce the carbon footprint construction by maintaining the carbon sink of the site.
- Planted roof improve the insulation of the roof structure
- Planted roofs reduce the maintenance of roofs as they help maintain a stable
- Reduced temperature extremes of the building structure, reducing its continual movement and protecting the waterproof flayer from harmful u-v rays.
- Absorb pollutants and reduce the urban heat island
- effect of developments helps reduce the air conditioning loads on buildings.
- Slows nd reduces the loading on storm water systems.

Company Track record/examples of work:

- House Klipspringr, Hoedspruit, Mpumalanga 2021
- House Olivier, Krom Valley farm, Clan William, 2019
- Alts & Adds to House Hobbs in Rondebosch, Cape Town, 2018
- House Botes, Agte Paarl, Western Cape 2014.
- Alterations & Additions to House Bezuidenhout
- Pinelands Cape Town, 2012 – 2013
- 2009 – 2011 House Eglin, Gqunube Green eco Village, East London
- Upgrade of Nieuwoudtville Caravan Park, Namaqualand, 2004-2007 (Won Silver 2005 in the *Holcim Awards for Sustainable Construction in the Africa Middle East Region*)
- House Cohen, Noordhoek, Cape Peninsular, 2004 (unbuilt)
- House Doumen – Jakalsfontein, Cape West Coast 2003 (unbuilt)
- Muslim Women's Foundation's cultural center, Phillipi, Cape Town, 1993 (unbuilt).

ECO DESIGN
(Pty) Ltd

A. R. HORN B.A.S. (UCT), B. Arch. (UCT), Pr. Arch (SACAP), MSAIA, CIfA
Telephone: 021 462 1614, Cell 082 676 110, 20 Alexandra Avenue, Fresnaye, Cape Town, 8005
andy@ecodesignarchitects.co.za www.ecodesignarchitects.co.za