

# **NATURAL BUILDING AS A MEANS FOR SUPPORTING COMMUNITY INVOLVEMENT – *Challenges & Innovation***

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## **INTRODUCTION:**

This paper sets out to examine 2 of the author's projects, where the use of natural building materials has helped support local community involvement. Innovations and improvements as well as some of the challenges and obstacles are discussed. The paper looks at a straw bale, owner builder scenario and the use of adobe for a privately funded community school.

## **HOUSE McCONNELL: Straw Bale Construction**

### **LOCATION:**

Betty's Bay South Western Cape. The site is located half a kilometre from the sea front.

### **CLIENT:**

Mrs. Sally McConnell an owner builder

### **FUNDER:**

Self financed.

### **AUTHOR'S INVOLVEMENT**

The author was employed as architect for the design, approval and construction drawing phases of the project. However the author was not involved in the construction phases of the project, other than for the 2 participatory workshops and the odd phone call.

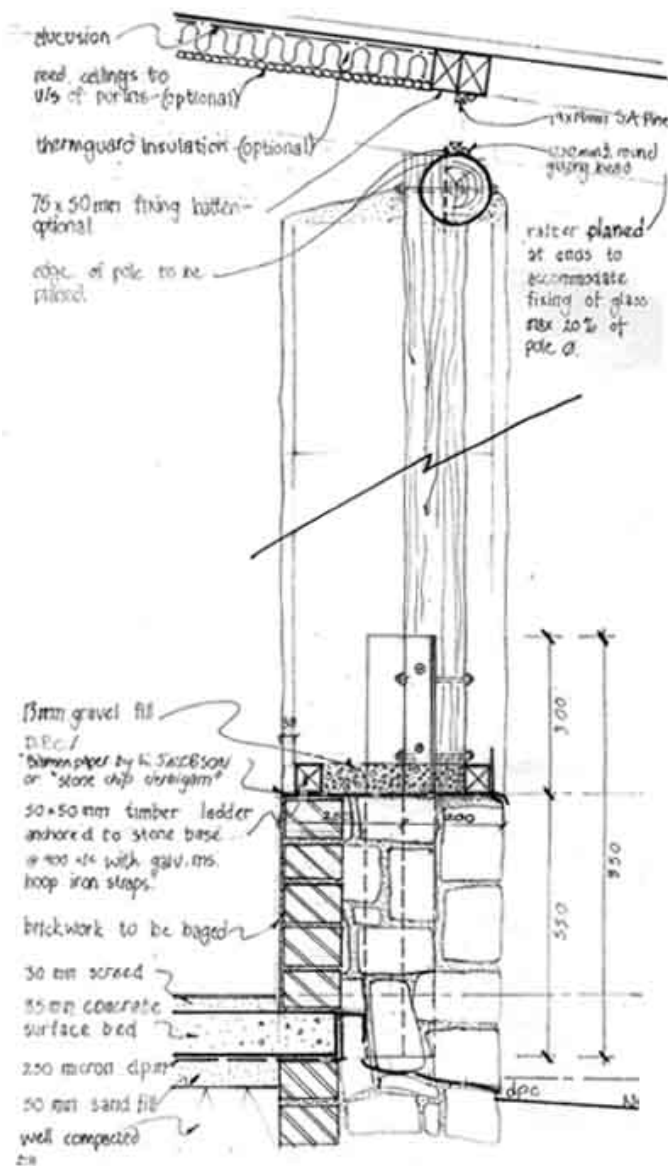
### **DESCRIPTION:**

This modest 6x5 meter sized workroom / garage also served as a temporary dwelling while the client built her main house.

### **CONSTRUCTION:**

#### Masonry Base:

The building has a conventional concrete foundation with stone and brick stem walls. The brickwork provides for ease of construction and setting out, while the lime cement mortared stone allows for the use of a locally available natural resource. The floor is a regular concrete slab for hard wear and tear. The foundation wall is taken well above the internal floor level following the "good boots" principle. The top of the wall is then layered with a sheet of plastic to serve as a damp proof course. This is then overlaid with a layer geo fabric (bidim) to interface with the timberwork.



Cross Section of wall showing ladder plate & framing



Pole brackets & garage door frame attachment

Timber Pole Structural Frame:

The structure used was a timber pole frame. The client located some old telephone poles, which were used for the columns while the beams and rafters were boron treated eucalyptus timber poles.. Corner pole columns on a star configuration of galvanised steel angle brackets provides for sturdy corner bracing. The stem wall is capped with a timber gravel filled “ladder plate” to act as a drainage layer as well as an attachment point for window and door frame “vertical nailers”.

Straw bale Infill Walling – using a pre-dipping method:

This technique has evolved over a series of similar such projects and has been driven by the need to speed up the plastering process. Typically the plastering part of the construction is extremely labour intensive and has even been known to lead to owner builder “burn out.”

This technique greatly speeds up the construction process and results in an immediate protection from the elements.

Pre-dipping Process:



*Soils were tested* to obtain a good mix between sand and clay particles for building purposes. This involved blending two local clay bearing soils with a small proportion of well graded sand.



A slip of the soil mix was prepared in an old bath tub, with a consistency similar to yogurt.



Wall panels were stacked with straw bales laid on their edge. Initially this is done without pinning or fixing so as to obtain a tight fit between the structural frames.



Wall panels were then unstacked sequentially course by course, with each course laid out row by row. Gaps were left in the rows around all openings for easy orientation and to leave room for wheel barrow access.



Course by course, the exposed faces of the bales were then dipped in the slip and left to dry off somewhat. Care was taken to maintain the bale stacking order. As each bath of slip was used up, the bottom became heavy with straw falling off the bales. This mix was emptied from the bath and laid out in the sun to dry to a cob like consistency and then use as a wall filler around eaves and openings.



After an hour or so, once the bales have dried to the point that they become more firm, but still tacky, much like a stiff cob like consistency, the bales are re-stacked and pinned with timber stakes.



Horizontal stiffeners (timber latte) were also fixed in place every 2 courses. This was done by sawing a slot into the top of the course of bales into, which the stiffeners are pressed into before being nailed to the timber frames on each end of the panel.



Once the wall panel is stacked, the earth coating can immediately be worked with the aid of a cobbing stick helping to “knit” each bale together. A piece of timber is also used to compact the earth coating.

With all the walls pre-coated in earth, the final stages of plastering are greatly simplified. Once the last gaps, dips and hollows were filled with further layers of cob and/or earth plaster and left to cure, the walls were given a final 2 coats of lime sand plaster. The walls were then finished with “breathecoat” paint, a non-toxic breathable paint that creates a membrane skin, preventing water ingress, while allowing for evapotranspiration.

#### CONTRACTOR LABOUR/TENDER PROCESS:

Owner Built. The client was a 60 year old lady who with the help of just one labourer, put up the entire structural frame, including foundations and slab. Some help was given once by a neighbour with getting the pole structure in position. Once the ladder frame and window and door frames were secured, the author arrived to lead an informal workshop returning the following weekend to assist the client with a whole community of friends in raising the bale walls. From there the client finished the baling and pre-plastering work, before hiring some plasterers to help with the final coats of lime plastering.

#### LOCAL AUTHORITY & OTHER LEGAL RECEPTABILITY:

The local authorities initially gave some resistance, but were persuaded after examining the author’s self published “*Straw Bale Information Document*”.

Currently the legal status requires all newly built houses to be registered with the NHBRC (National Housing Building Regulatory Council). However all natural building methods, like straw bale and even including structural stonework, is precluded from the NHBRC stamp of approval. This is despite any local authority approval or professional involvement. All local financial institutions require the NHBRC’s registration before issuing a loan for new houses or homes less than 5 years old. Furthermore all NHBRC registered builders are required to register all the buildings they construct with the NHBRC council..

Fortunately with this project, the NHBRC “approvals” and fees were avoided as the client had retired with sufficient funds so as to avoid borrowing money from the banks.

## CONCLUSION:

Within the formal construction industry, the NHBRC is presently the greatest hurdle facing natural home building and needs to be addressed, if natural materials are to play any significant role in addressing the housing needs of this country.

A further major challenge confronting straw bale and other such home builders is getting contractors to price for buildings of such a nature, who typically have no prior experience with the material. As such, local capacity building is a further key to mainstreaming a natural building approach for home builders, who are often given little choice than to go the owner builder route.

## **7 FOUNTAINS PRIMARY SCHOOL – Adobe Construction**

**LOCATION:** Kokstad Northern Kwa-Zulu Natal Located in an RDP Township on the Outskirts of Kokstad.

**CLIENT/FUNDER:** 7 Fountains Primary School Trust with funds from a USA private charity fund. The funder saw the value of local capacity building and as such was prepared to pay for the training from a separate educational fund. This meant that the cost of the training was not factored into the cost of the brick, which would have doubled their price and made them economically unviable.

**AUTHOR’S INVOLVEMENT:** Provision of on-site training and consultant to East Coast Architects for technical detailing.

**DESCRIPTION:** This project involves the building of a 2 storey adobe brick (sun dried earth brick) classroom. The earth brick oval shaped building sits at the corner of a courtyard and forms a prominent visual landmark in the local community.

Significantly there is a strong local tradition of adobe earth block building in the area. Except for a few exceptions all additions and alterations within the township have been built using adobe.

However, most buildings are of a fairly poor standard. The soils are a bit too clay rich and save for the addition of some local grass, there is nothing added to improve the strength of the brick. In addition construction detailing is very poor. The “good hat and boots” principle is generally not being applied, and poor attention to detail with window sills, lintels and roof anchorage is apparent.



*Example of local earth brick home in the area.*



## CONSTRUCTION:

### Brick Production – training course & Jobs

10 local unemployed women with prior earth building skills or interest were sourced. The women were taught how to test their soil and improve its qualities for earth building with the addition of sand and wheat straw. Additional quality measures like sieving, good mixing, pre-soaking, proper curing and storage were also introduced.

The end result was a markedly improved quality adobe brick. The local masons were visibly impressed, commenting on the bricks improved strength. In addition to the 10 women being empowered with improved skills, they gained 4 months worth of gainful employment.

### Brick Technology – training course & technical design assistance

The original 10 women plus an additional 4 women and 4 brick masons joined the second workshop. Good construction detailing were taught and demonstrated through the building process. A further plastering workshop is envisaged.

## CONTRACTOR/TENDER PROCESS:

The women making the bricks were paid per brick and all worked on a co-operative basis. This enabled the women to work at their own pace, as many had families to look after and avoided complicating the contractor's labour relations, which did not make provision for flexi-time. The further trainees worked under the main contractor – Owen Hendersen on a daily wage basis.

## LOCAL AUTHORITY/LEGAL RECEPTABILITY:

Little capacity exists at local authority level and with a full team of professional aboard, were happy to leave the responsibility of the building within the hands of the appointed professions.

## CONCLUSION:

The public sector has a great part to play in shaping aspirations and as such high profile buildings, built of locally appropriate materials like adobe, can help raise the status of what is typically perceived as a poor persons building material. Within this equation, it is critical to set high or improved construction standards.

Understanding funders who appreciate the value of education and local capacity building, plays a key part in the likely success and viability of an appropriate building approach.

Training and capacity building is as important as setting a new precedent with the actual building itself, if earth building is to have any chance of becoming more readily accepted or aspired to as a material of preference within local communities.

