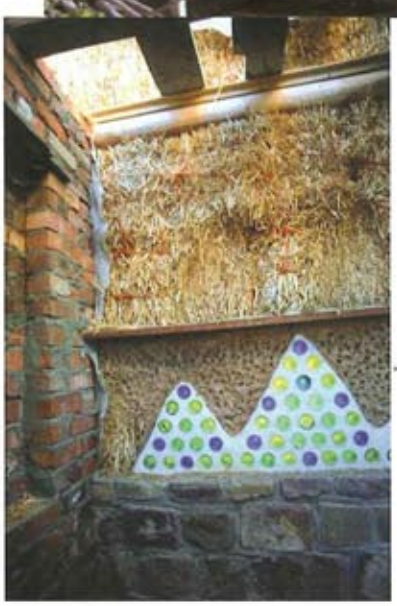
Straw bale in Scarborough



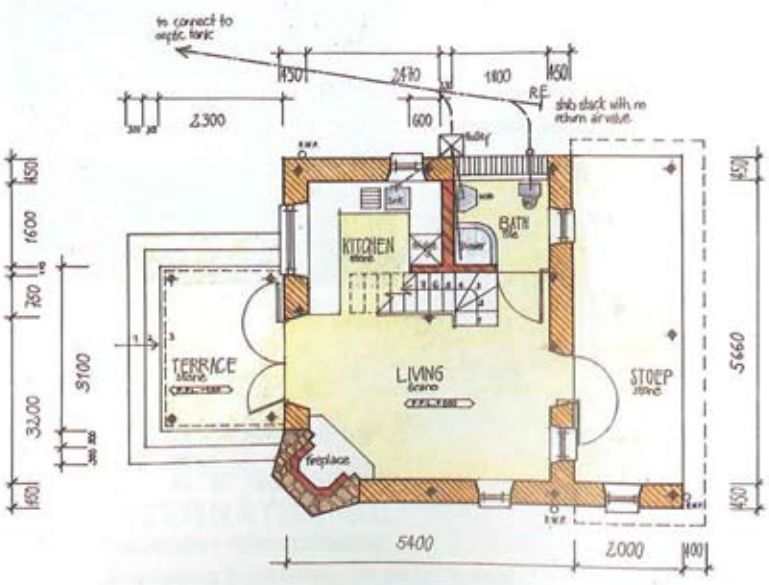
In the construction of this double-storey straw bale house in Scarborough, South Peninsular District, Cape Town, the client adopted a hands-on approach; from sourcing and even manufacturing some of the materials, to participating in the actual construction. Although a successful natural building, the overall sustainability of this project has been affected by the tight budget and differing perceptions of the client and the architect with regard to the environmental agenda and the technical differences associated with a natural building. ▸

The original brief was to build approximately 60m² of internal space and 26m² of external space for R120 000. Architect Andy Horn informed the client that this was unrealistic in an urban context, with current Cape Town building rates starting at around R3,500 per m². He also advised that the building could take longer to complete than the client had anticipated, and that he would attempt to build the entire outside envelope first, leaving the internal finishing to be completed in the future.

The client could not afford to have the architect involved throughout the building process. However, during the initial phase of construction, Red Hill Stonewall Builders, overseen by Dave Gaynor, kept in regular contact with the architect, which helped to avoid potential misunderstandings.

Having already approved a straw bale structure in the past, the South Peninsular municipality gave no resistance to plan approval. The architect wanted the services to be situated to the south side of the building, both for passive design reasons as well as to allow for future expansion of the house. However, the client wanted to keep the house as far away from the adjacent neighbour as possible. The compact nature of the house is a good model for higher density living, but is compromised by the difficulty of future expansion.

The foundations for this house have concrete footings with stone base walls. All of the stone was sourced from the leftovers of another project recently built in the area. A concrete slab was used for the ground floor and is to be finished with an oxide screed, with tiles handmade by the client. The first floor has a tongue and groove timber floor on poles, planed on one side for a flat edge. Both levels were done with straw bales, using the bale-on-edge



GROUND FLOOR PLAN

method. All reveals and corners around the poles have been done with cob. The clay used was leftover from road works about 10km away.

A deck and pergola above have been designed to provide shading to the glass double doors on the western façade. Given the extreme nature of the weather in the area, it was decided that the plaster be done with solid cob work followed by a lime sand plaster, and finished in a water resistant, breathable paint. The cob work was very time consuming but resulted in an extremely solid wall. Unfortunately, funds for the project ran low and the client chose to add cement and oxides to the lime mixture in an attempt to save on the cost of the paint. Technically, this could be a potentially disastrous course of action, if the breathability has been overly inhibited with the addition of too much cement, especially in such a harsh climatic environment.

A pole structure was used with the corner brickwork fireplace adding to the stability of the structure. All the poles used were trucked in from a timber supplier and are preserved with a non-toxic boron-based treatment. The poles rest on the stonework and are bolted to steel angle sections set in the stone and concrete base.

The roof structure is very economical and has three curved 'eco beams' spanned with thick 114 x 50mm purlins. The structure was designed to give additional bracing by cross-nailing on an edged timber off-cut ceiling. However, the client chose a reed roof instead.

Another interesting feature was that of a timber and cob ring beam at first floor level. This helped lift the first floor of bales above the level of first floor to give added moisture protection to the bales. The main roof is a curved corrugated iron sheet and is insulated with 75mm of 'Isotherm' polyester blanket.

The windows had not yet been prepared with lintels or pre-fixed to the structure, but the client chose to begin the baling process anyway. This led to inefficiencies in the baling process and difficulties in keeping the windows level. The architect was hired for three weeks as the straw bale sub-contractor to raise the bale walls and begin the plastering. The problem was ironed out by the time the first floor was built. The window sizes and placements were changed considerably by the client, which has affected the aesthetics and to some degree the energy efficiency, with the large sash window being shifted from the eastern to the south façade. While the big sash window is second hand, all the other doors and windows were made up from recycled Oregon pine. However, the client bought Zimbabwean Teak planks for the lintels (in all probability this timber is from an unsustainably managed source). All the timber has been treated using a non-toxic wood finish.

The client chose not to pursue the greywater option and thus a regular septic tank with a soak away bed was used, which is common to the area. A recycled-bottle wall creates a feature in the bathroom. A water efficient shower and multi-flush toilet system have been recommended. Due to a shortage of funds, a solar water heater could not be used and the client opted for an instantaneous gas heater.

The embodied energy of this house is very low. While the client's rearrangement of the windows has somewhat affected the passive thermal design, this is fairly slight, given the straw bale walls and well-insulated roof. The small footprint makes the house easy to heat and cool, and although irregular building practice complicated the process, the house stands as a good example of natural building.