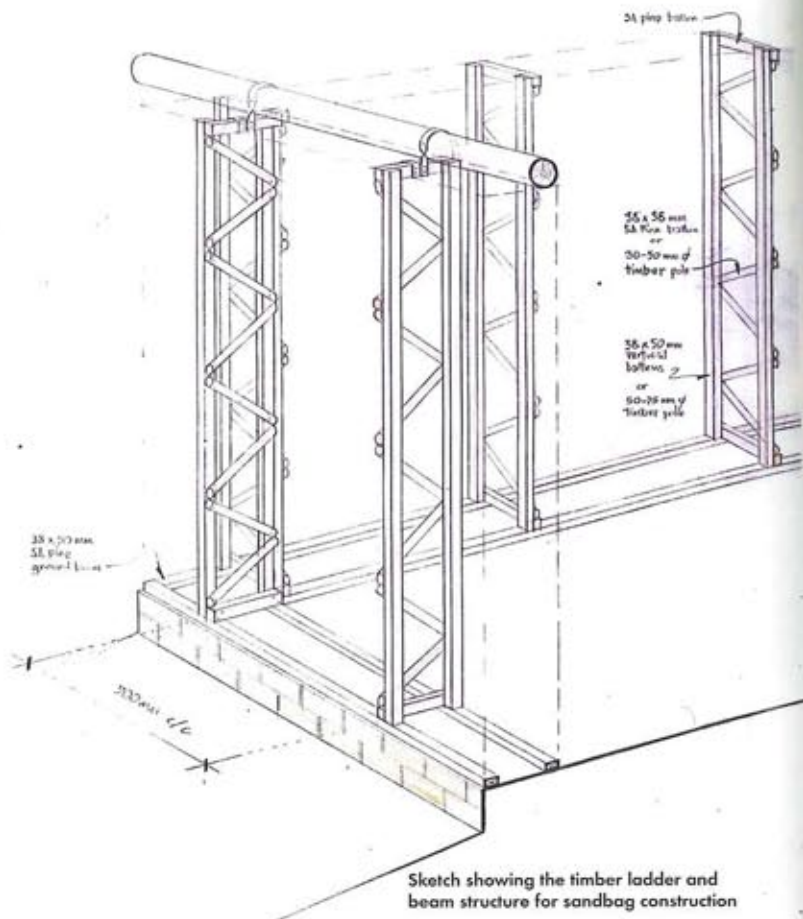


Floor plan



Sketch showing the timber ladder and beam structure for sandbag construction

THE MTUNZINI ECO-HOUSE

Staff housing at the Twinstreams Environmental Education Centre in Mtunzini, KwaZulu-Natal won the Sustainable Buildings Best Practice Award (Africa region) in the category for residential projects.

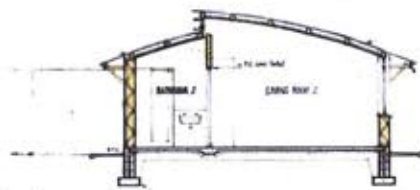
The awards were presented at the SB '04 Conference in September last year (see *Urban Green File* Nov/Dec 2004).

Leigh Darroll spoke to architect Andy Horn of Eco Design Architects & Consultants about the project and visited the site.

A need for staff housing at the Twinstreams Environmental Education Centre led to the brief from WESSA (Wildlife and Environment Society of South Africa), which manages the centre, for two semi-detached residential units to provide comfortable bachelor apartments with bathrooms and kitchenettes. The units were to house two to four people, and were also to function as an education tool to demonstrate sustainable living. The project was funded by Mondi, which owns Twinstreams, and was to be developed in partnership with the Macambini Tribal Community which lives on Mondi forest land to the south.

Design approach

Taking account of these requirements and the location of the site in coastal dune forest in northern KwaZulu-Natal, the design team developed a series of project objectives that formed the framework for the design response.



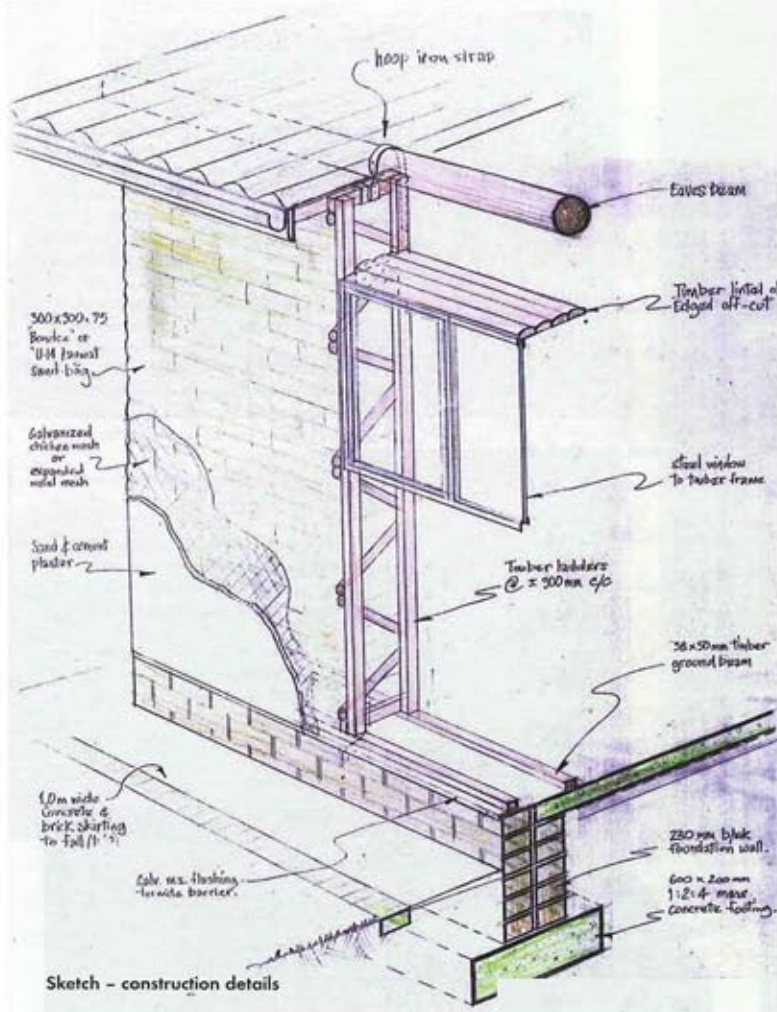
Section

In the hot humid climate of the KZN north coast, the building is designed to be naturally thermally efficient and to ensure good cross ventilation. The concept is simple, using relatively low technology, easily replicable within the community.

The building methodology was chosen to be appropriate to the area and adaptable to suit different site conditions. One of the objectives was to maximise the use of natural, locally sourced materials – so reducing the environmental impact of long distance transport and high levels of embodied energy in 'imported' materials and, at the same time, supporting the local economy. A further aim was to provide for employment of local unskilled labour and for monies going into the development to be spent within the local community as much as possible.

The emphasis was on labour-based rather than machine-based building practices, the creation of business development opportunities for local micro-enterprises, and skills transfer to local builders – offering them an opportunity to learn alternative building practices to provide safer, more durable housing.

Thus the building system would be educational, both in the process of building and in the finished product, to demonstrate – not only to the builders and labourers on-site or visitors to



During construction

Twinstreams

Twinstreams Environmental Education Centre is owned by Mondi and managed by the Wildlife and Environment Society of South Africa (WESSA). It is one of four environmental education centres run by WESSA in KwaZulu-Natal.

The rehabilitation of the dune forest at Twinstreams was begun by Dr Ian Garland in 1952, to re-establish the natural coastal habitat that had been destroyed by cultivated forest plantations extending right down to the coast. When the land was later bought by Mondi, it was with the condition from Dr Garland that the rehabilitated area should remain protected. The Twinstreams Environmental Education Centre was established in 1996 as a joint project between Mondi and WESSA and was developed under the mentorship of Dr Garland.

The centre has two dormitory buildings, with kitchen, dining and ablution facilities, separate teachers' cottages and a teaching centre. Every year about 6 000 learners visit Twinstreams to learn about the rich biodiversity of coastal dune forests, estuarine mud flats, tropical beaches and mangroves, as well as other environmental issues.

Twinstreams is situated in the larger Siyayi Coastal Reserve run by KZN Ezemvelo Wildlife. The Siyayi Reserve stretches from the Umlalazi River in the north – which enters the Indian Ocean near the town of Mtunzini – in a narrow band along the coast almost as far south as the Thukela River.

Mtunzini itself is a declared conservancy (since 1995) and maintains a firm policy and practice of promoting environmental conservation in the area. In 1999 the town received a Conservation Award from KZN Ezemvelo Wildlife in recognition of its outstanding commitment to preserving the natural environment in KwaZulu-Natal.

– best practice?

Twinstreams but also to the wider community – alternative methods of construction that produce housing of good quality and support a healthier community.

Sandbag building

A sandbag building system was chosen for the staff housing project as it answered to the design objectives. Sand is locally abundant and eucalyptus poles and battens could be sourced from the nearby Mondi plantation. The system also presented opportunities for local employment, skills transfer and micro-enterprise development.

Horn says that the construction system developed for the housing at Twinstreams is an adaptation of an existing sandbag building system – the Eco-Beam system developed by engineer Mike Tremeer. The modified system used does away with the prefabricated metal and timber 'ladders' and beams of the Eco-Beam system, replacing them with timber-only ladders and timber poles for the roof structure. The structural ladders form the framework for the sandbag walls. The system makes use of saplings – that could be harvested locally from the eucalyptus plantations – for the uprights and some bracing battens, with salvaged timber off-cuts also used as battens.

Working with structural engineers GR Bold & Associates, the Eco Design team built a test wall structure in their Cape Town studio. "We built a corner wall about 2,4m high," says Horn. "This enabled us to get to grips with the building system at a practical level – the cutting and nailing of timbers, for example, and sizing the bags correctly for the width of the walls. We could then prepare a template defining the size to which the geofabric used for the bags should be cut. Building the test wall also gave us insights into how best to pack the sandbags. We actually tried packing them the wrong way and learned that even if this were done it wouldn't compromise the system's structural stability.

"The engineers were careful in detailing the specifications for how the timbers should be nailed together, at what centres, to what depth, and so on."

From drawing board to building site

As Eco Design is based in Cape Town and the client's budget did not allow for regular site visits by the architect, all the design work and instructions on building processes had to be