



REEECAP 1.8 ENERGY EFFICIENCY DESIGN COMPETITION ENTRY

Executive Summary

Objectives:

The holistic approach to Energy Efficiency not only looks at direct energy consumption, but at the use of other resources that indirectly take up forms of energy. At the same time costs are kept to a minimum, while ingrained social preferences are negotiated.

It was decided not to use Photo Voltaic panels due to cost of manufacture currently being higher than the amount of energy provided. Instead the aim is to keep the energy demands of the dwelling low, and the carbon footprint small.

Site:

For the purpose of the competition, the chosen site is situated at the southern boundary of the HRDC in Lafrenz Township, Windhoek. The design caters for a family of 5.

Construction Decisions:

For the load bearing walls, 300mm thick Adobe brick - this massive outer skin serves as thermal mass, regulating the rise and fall of outside temperatures on the inside of the house. For protection from rain, the outside walls are cladded up to 1m high with stone masonry using earth-lime mortar, and above 1m earth-lime plaster is applied. Lime hardens and waterproofs with time, and is more user friendly than cement. Foundation walls are of local stone. Stone aprons help to keep the clay walls dry. Concrete, high in embodied energy, is kept to a minimum, used only as a floor slab. The 12m² sleeping (and/or storage) platform is a cheap way of creating an extra room. The suspended timber floor with plywood partition is accessed by means of a timber ladder.

The roof structure is of steel. Ceilings in the living areas are sloped and are provided with sisalation - proven the best low-cost radiation insulation. Concrete roof tiles, as produced

by the *Clay House Project*, are cost effective and provide much better thermal insulation than steel sheets. Opening the clear storey windows over the living area makes it possible to cool down the house using the stack effect. 1m wide roof overhangs protect the walls from rain and keep the summer sun from heating the house. Windows are mainly on the North and South elevations.

The narrower sides of the building faces East and West to reduce the amount of solar radiation absorbed. The big windows are initially expensive, but reduce the need for switching on lights during the day, even though CFL's are used. When a carport is constructed in a later phase, the best position would be on the western wall of the house where it will help to screen the surface in the afternoon glare.

Wet Services:

The 200L solar water heater adds Approx. N\$20 000 to the cost of the dwelling, but low interest loans are available and the life cycle cost has proven it a definite energy saver. Considering the cost of energy spent on water purification, water is a resource to be used sparingly. The dry composting Otji Toilet requires the bathroom to face North. Dry toilets are not always seen as socially acceptable, as flushing toilets represent middleclass comfort. However, the use of a standard ceramic WC pan with seat and cover, in addition to a low municipal water account and the absence of unpleasant odours, should help to bridge this expectation gap. Furthermore, the use of grey water for gardening eliminates the need for a municipal sewer connection, thus saving approx. N\$25 000 on the cost of servicing the erf.

The smaller bath with a low-flow showerhead above gives versatility and caters for the care of young children. The extra water usage is traded off against the re-use of the waste water.

Cooking Technologies:

An LPG stove in the kitchen is provided for, with an outdoor cage for safely housing the gas cylinder. The outside cooking area has a conventional braai and a clay oven (used for bread baking), as well as space for the solar box cooker. Charcoal (more efficiently transported than wood) from invader bush is recommended for fuelling the oven and the braai. The greenhouse gas produced by wood burning is relatively small and is traded off against the benefits of biodiversity, job creation, and the fact that wood is a renewable resource.

Outdoor cooking reduces the heat load on the house, and it is traditional in homesteads where outdoor living spaces are social places, part of the home. At N\$7000 each, energy efficient box fridges are not accessible to low income households. The success rate of an evaporative cooling room or box will depend on the users. At least a freezer is still expected to be a major energy consumer.

Urban Agriculture:

The fruit trees around the house have a cooling and shading effect on the air. Together with the vegetable garden and free range chickens, the frequency of trips to the grocery store is reduced, thus saving on fuel.

The pergola at the front door provides a convenient place for growing grapes. In the summer this will produce welcome additional shade, while in winter when the leaves have fallen, the sun is allowed through.

A composting hole for all vegetable matter will be helpful in fertilisation of the garden.

Conclusion:

At N\$2000 per m², this 62.5m² house with its solar geyser amounts to N\$145 000. The sourcing of local clay, stone and other second hand materials can greatly reduce the construction costs. The materialism trap and the human need to acquire luxuries and status can seem to stand in direct opposition with sustainability. When one considers that the benefits to the environment also benefit us and our pockets, a new mindset can start to develop.

Energy Efficient Low Cost Housing

REEDCAP DESIGN COMPETITION



Objectives
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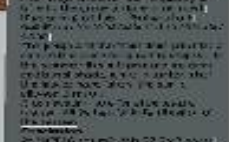
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