

**REF: 03 DESIGN FEATURES**

**FEATURE 1: EARTH, AS A BUILDING MATERIAL**



Earth buildings have been with us for over 10,000 years and they have not changed much in that time. They are warm in winter and cool in summer. They are laid out to take advantage of the sun, need little attention and pay off in clean air and low maintenance. Earth is a sound, sustainable building material that has proven its durability and viability in every climate. Nowadays, there are about 3 billion people living in earthen structures, which underscores the significance of earthen construction around the world. For instance, about 15% of the French population lives in earthen buildings, some of which are over 500 years old.

Our designs make use of stabilised soil, enhanced by bitumen, cement and lime, to improve the strength and resistance to water of the earthen walls. The walls can be built of sun-dried bricks, wattle and daub, lumps of ill-formed clay, rammed earth or building blocks, accordingly.

The term most commonly applied to earth building is "Adobe construction" but there are many different names for various uses of earth in building. Different societies have used earth in different ways, and have given the technique many names:

Word	Used in...
Adobe	Mexico, southwest USA, Spain
Bauge	France
Cajon	Spain
Chika	Ethiopia
Cob	England, Gambia
Čerpić	Serbia and Montenegro
Jalous	Sudan
Kacha	India
Nogging	England
Pisé	Israel, USA, Zimbabwe, France
Sod/Soddys	USA (Nebraska, Kansas)
Swish	Ghana
Tapia	Africa, Australia, Zimbabwe
Teroni	Mexico
Torchis	France
Tubali	Nigeria, West Africa
Wattle and Daub	England

Of the various traditional building materials available, earth is the most widely used, and will remain so long into the foreseeable future.

Earth is cheap, plentiful, an excellent insulator, and strong in compression. Its plasticity makes it quite a sculptural material, that can be shaped and carved using many an aesthetic expression.

In regions that have hot, dry summers and cold winters, earth buildings can be built without insulation, since its mass provides a "thermal flywheel" that moderates temperature swings and ensures a comfortable home.

In less sunny areas, it is advisable to provide insulation, such as foam board applied to the exterior of the walls, then plastered over with stucco cement or mud plaster.

Building with earth requires a lot of hands-on work. However, if the EcoHouse is owner-built, using materials found on site, it can be inexpensive.

The major concern with earth is seismic resistance. Classic earth buildings have withstood centuries of earthquakes as their buttressed walls are relatively thick as compared to their height, and are topped with sturdy wood beams.

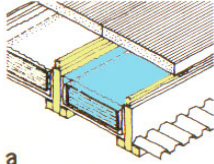
The mix for the walls (sand/clay content and waterproofing compounds used to keep the blocks from deteriorating in the rain), the careful detailing at the foundation and roof, and the integration of reinforcing frames are all quite important to the home's solidity and longevity, and form the fundamentals of our designs.

All things considered, it is, therefore, crucial for housing planners to stop paying lip service to traditional building materials and start using them!

**FEATURE 2: SKYTHERM® ROOF POND**

Roof ponds, such as the Harold Hay's SKYTHERM® system, have been designed and used in the hot dry climates of Arizona and New Mexico in the USA, but also in the moderate temperatures such as that of the California coast.

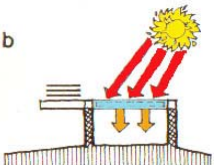
The roof pond, or SKYTHERM®, places the thermal mass in the roof structure. It depends on a switchable, exterior insulation scheme, to make it effective for both heating and cooling. In the heating mode, the insulation is deployed by night, while in the cooling mode, the insulation is deployed by day. The thermal mass, such as the water in containers, must remain in direct thermal contact with the interior of the building. A structural steel deck is a typical thermal connector for the system.



a

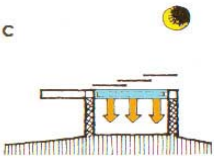
**LEGEND:**

a) Water-filled polythene bags on a steel-deck roofing, covered with polyurethane panels that can slide, bifold or roll, either manually or mechanically, to cover or expose the bags;



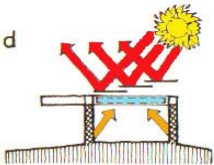
b

b) Winter heating by day;



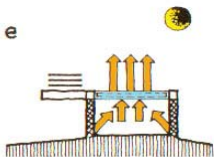
c

c) Winter heating by night;



d

d) Summer cooling by day;



e

e) Summer cooling by night.

Effectiveness of the SKYTHERM® system has been well displayed in a 140.55m<sup>2</sup> single-storey house in Shiraz, Iran, where it reduced the heating demands by 86% and cooling loads by 52%.

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