SUSTAINABLE HOUSING IN BAMBOO LAND

The site (marked by the black arrow) is located in the city of Yuyang of the Fujian province, covering from 116°56' to 117°42' east longitudes and from 25°33' to 25°12' north latitudes, 82 kilometers in west-east direction and 71 kilometers in north-south direction.

Environment

The following diagram shows the solar radiation and temperature situation of Yuyang.

Winter time Summer time

(Note: The forces are indicated on an average clear winter and summer days. The air temperature variation is indicated by the outside concentric circles. Each additional line represents a 1°C difference from the lowest daily temperature. The direction of the impact is indicated according to the sun’s direction as temperature occurs. The total direct and diffuse radiation impact on the various sides of the building is indicated with arrows. Each arrow represents 200 Wh/m²/day radiation.)

Yuyang is characterized by a typical subtropical monsoon climate type. The summer temperature is much higher than the winter and the climate it mild with an average yearly temperature of 19.1°C. The rainfall is abundant with an average yearly precipitation of 1580 mm.

Scheme

PRIMARY CHALLENGE

Environmental cost resulting from the excessive cooling load in response to the humid and over-heated climate during summer.

ULTIMATE GOAL

A sustainable residence that features resource efficiency and lessens the impact on natural environment

Sustainable Construction—"The creation and responsible management of a healthy built environment based on resource efficient and ecological principles".
"Agenda 21 on Sustainable Construction" (CIB Report Publication 237, 1999)

OBJECTIVES

1. Minimizing the cooling load and the related non-renewable resource consumption
2. Maximizing the use of renewable resources and ecologically benign materials

STRATEGY

Making the best of the local climatic and vegetation resources to reduce the use of conventional resources for building cooling

SOLUTIONS

Architectural Means

A double living unit constitutes the basic unit of the residential area. Each has a courtyard for living. The continuous plan of the duplex and the use of open spaces are conducive to building material efficiency.

The plan and section design of the single duplex takes the best advantage of natural ventilation to minimize cooling load.

The layout of the rooms is carefully adjusted to correlate coolness with the natural airflow. The main corridor is oriented in a north-south direction to facilitate continuous cross ventilation. The lighting well over the kitchen also serves as a solar chimney and the entries through the kitchen and bedroom can therefore be enhanced.

Constructional Means

The stems of Moso bamboo or Giang bambusa, two most dominant types in local vegetation, are used as important building materials in the construction of walls and roofs.

The height of the bamboo stems are 30-40 meters and have a trunk diameter of about 10 cm. Moso bamboo is mostly used for building construction while Giang bamboo, with a more robust stem, is used as a primary material for wooden furniture.

The bamboo per se are low environmental impact, resource-efficient materials. Furthermore, in view of the prosperous local bamboo industries and the facilities in recycling processing and transportation, the energy use and environmental impacts occurring before installation can be minimized.

The bamboo are mainly used to constitute radiation barriers to enhance the performance of walls and roofs and additionally, give rise to a distinctive facade appearance.

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