

VerSus International Student Competition

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1. Bahay Kawayan: A Post-disaster House for the Philippines

'The Philippines is one of the world's most disaster-prone countries. One third of its population of 94.9 million people live below the poverty line and are vulnerable to the typhoons, floods, earthquakes and volcanic eruptions that plague the country.'¹

The proposal is a starter house for the communities of the area of Roxas in the Philippines that were affected by Typhoon Haiyan in

- Environmental: Available local material and comfort.
- Natural Hazards: Earthquakes, typhoons, flooding and strong winds.
- Socio-Cultural: Traditional building method; and use of spaces.
- Socio-Economic: Modularity; flexibility; adaptability; durability and maintenance.

November 2013. This post-disaster low cost house -based on the traditional Filipino house, the Bahay Kubo -has been designed for improving the overall structure of typical transitional houses, and to explore a resilient solution for future hazards, following four dimensions:

2. Environmental

Available Local Material: Round bamboo and thatch roof

The project uses round bamboo in the design, a recognised sustainable construction material, because it grows rapidly, is readily available to use in the area without complex processes and machinery, contributing to reduced transportation costs and pollution. Moreover, whole round bamboo has been used in construction for centuries, and there is a long history of construction with the material in the Philippines. Thatch roof is chosen as roofing material, because is biodegradable and renewable; and it is an insulating waterproof layer.

Comfort: natural ventilation, shading and intermediate spaces

The design includes crossed ventilation to reduce the humidity of the house and the material, a feature found in most traditional Filipino houses. Natural shading is created through long eaves, which protect bamboo from the rain and direct sunlight, and create shaded intermediate spaces.

3. Protection from natural hazards

Earthquakes

Bamboo is not as durable as brick or stone, but its flexibility makes it a good choice for coping with earthquakes, a natural hazard in the Philippines. A well designed bamboo building, allows the structure to move with quakes without collapsing. In this project, seismic resistant elements include bracings in different planes, creating a system of triangulations, for preventing deformations.

Flood damage

Traditional houses in the Philippines are elevated from the ground for keeping the house dry in rainy seasons. This design feature, based on local knowledge, is adopted in this proposal.



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Typhoons and strong winds

Hip roof that helps to prevent uplifts is counteracted by long hanging for protecting the bamboo from the rain and sun. In this design, we created a system that connects the roof structure to the foundations, through diagonal bracings in order resist uplifts, a main issue during typhoons. These structural characteristics have an influence on the aesthetics of the house.

4. Socio Cultural

Traditional Building Method: Lashing

Vernacular construction methods in the Philippines include the use of lashing, instead of nailing the bamboos, in order to prevent the bamboo from splitting. The traditional knowledge has been adapted to available materials such as rattan, rope and fishing line. The latter is a strong material that improves the performance of the connections with greater durability; and it is also widely use in the area, therefore, fishing line has been selected for this project. The selection of this method has an influence on the design, because it defines 3D connections instead of in-plane joints, defining the geometry of the whole design.

Use of spaces

In traditional houses in the Philippines, it is frequent to find shaded intermediate areas between public and private spaces, usually as front porch. This concept of buffer is also used in this design.

5. Socio Economic

Modularity: Repetition

The dimensions of the house are defined by a minimum module. The unit is determined by bamboo mats used in the Philippines for walls (8x7 feet = 2,44x2,13 mts.). Therefore, a cube of 8'x8' (2,44m.x2,44m.) is the minimum unit, which can be repeated in order to create different house sizes, for example, 12m2 expandable to 24m2, or 18m2 expandable to 36m2.

Flexibility: Doors and windows position

The structure of the house is based on a framing system instead of load bearing walls, thus allowing for flexibility in the positioning of the doors and windows. Therefore, openings can be placed appropriately according to the orientation of the house and surrounding conditions of the settlement.

Adaptability: Progressive housing and extensions

The design considers the possibility of expansion and adaptation to families' needs without compromising the integrity of the structural system. This is defined by a roof structure under which families can decide to expand the floor and wall panels to create porches or terraces as desired.

Durability and Maintenance

The lifespan of a bamboo building depends on proper protection of the material from rain, termites and direct sunlight. Nevertheless, the cost of replacement is not relevant due to the fertility and rapidness of bamboo growth. Moreover, due to the construction method (lashing), single elements of the house can be replaced without compromising the structure.

6. Feasibility

A prototype of the house has been built in July this year, in order to test its structural performance and feasibility of construction. The approximate cost of the building is 1,000 USD, with an approximate construction time of 7 days by a team of 6 people.



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