SOLAR DECATHLON 2010

Jury Report

Architectural Brief Report

TONGJI UNIVERSITY

SHANGHAI, CHINA

Chen Xiaolong

Vice-President

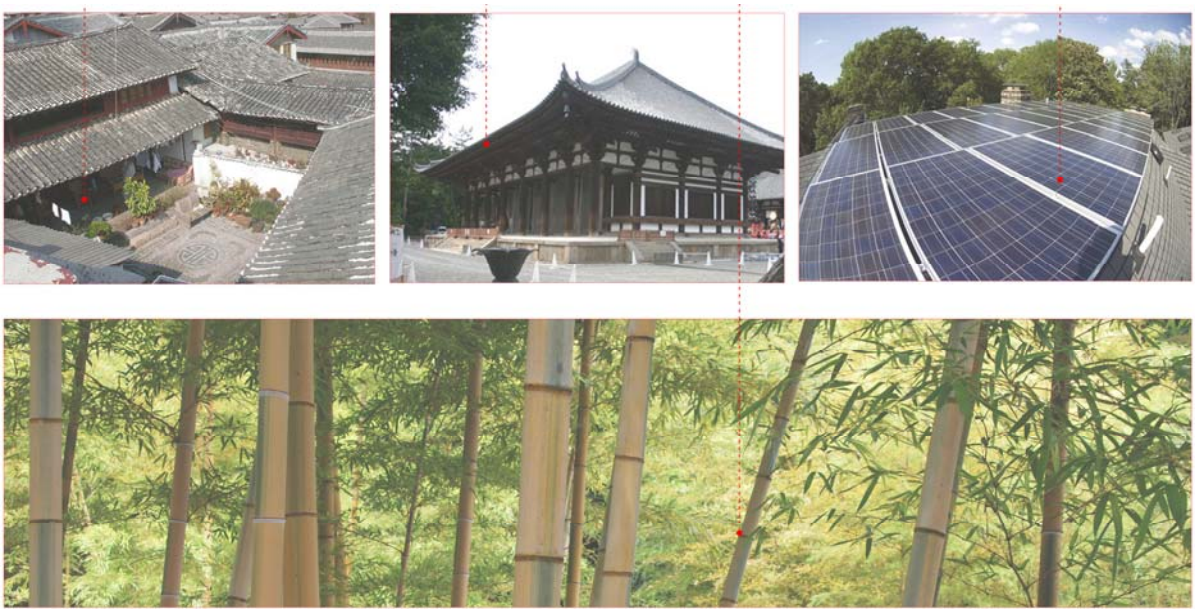
1.General

The bamboo house aims to create a wonderful and well-designed house facing the future which can generate enough thermal and electrical energy to meet the needs of daily life. This brand new house should be vernacular as well as being modern.

Energy-saving and emission reduction is the inevitable trend of human society. In architecture field, many experiment and effort have been spend on it, and this is also the main conception that guiding our design process.

1.1 Prototype

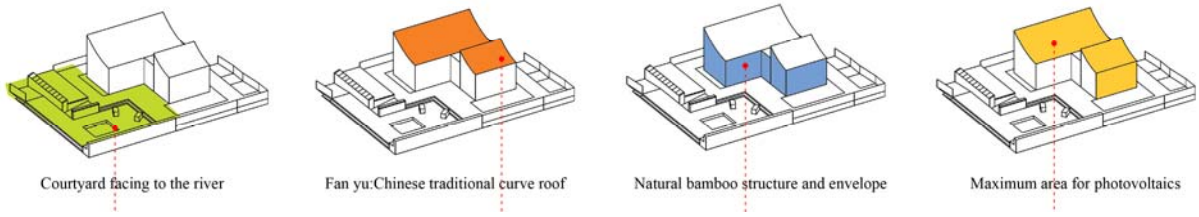
One of the most important conceptions of bamboo house is that the house should be organic; it absorbs the energy from the sunshine, it connects to the environment nearby and makes full use of soil, wind or plants in order to keep a comfortable living environment. This idea is extremely similar to the philosophy of traditional Chinese architecture that one building should be a vivid life standing in its environment. We choose the vernacular house in south china as the prototype. In this bamboo house project, we reflect the architecture prototype from several aspects such as the courtyard, the roof, the material, etc.



1.2 Master Plan

Considering to the special exhibition site closed to the river and the limited footprint, we decide to arrange a courtyard in the southwest of the site. First of all, the bamboo house is connected with the river through gray space of courtyard. The living spaces indoor surround this courtyard and thus largely extend the limited living spaces. Secondly, connected with the prevailing wind direction of Madrid, a courtyard in the southwest of the site can greatly improve the outdoor wind environment.

The bedroom sits south to north in order to have sufficient sunshine, and the living room faces the main landscape in the west. This L shape building encloses the courtyard and enhances the feeling of belonging.



1.3 Roof Form

In traditional Chinese architecture philosophy, the roof is the most important element that should be considered about. In the bamboo house project, all the energy that daily life needs is collected by the PV panels on the roof, so the form of the roof is the most important element of the house. The curved roof is one of the most obvious features of traditional Chinese architecture for it reflects the philosophy of Dao. Contrary to the dome or spire in western architecture, a curved roof can make a soften silhouette and reflect the harmony relation between the building and the universe.

In the bamboo house project, besides the culture and philosophy reasons, a cured roof can not only improve the efficiency of PV panels, but also can improve the ventilation. Natural drainage is another important advantage of curved roof, considering to the max height limit, we decide to use a double curved roof form.

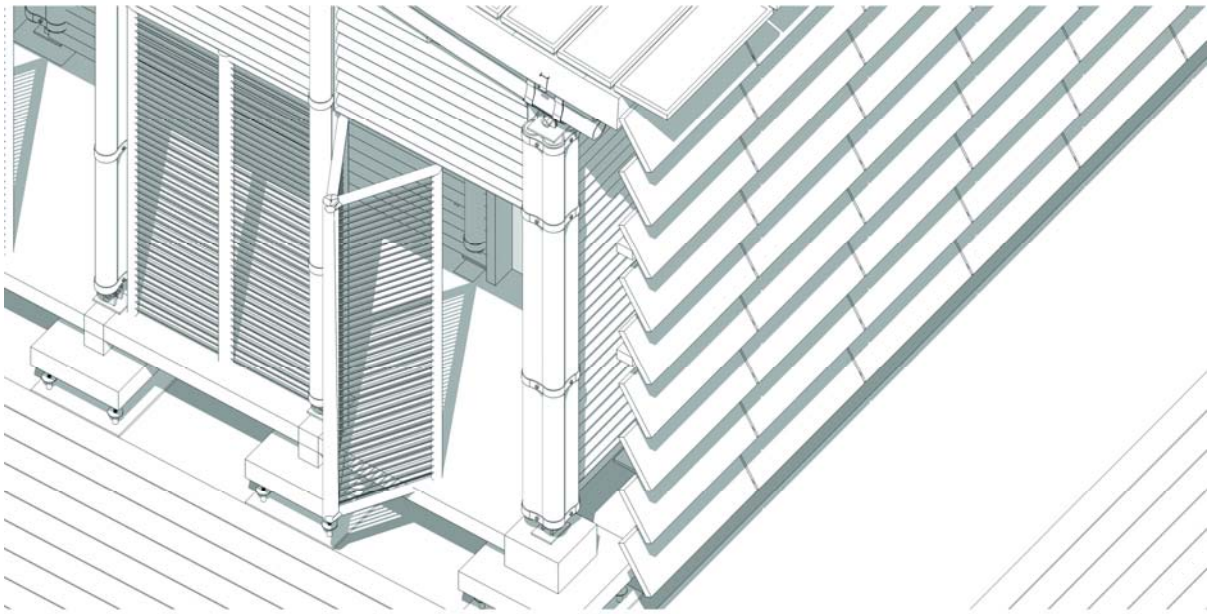
1.4 Grey Space

Grey space is another important conception of traditional Chinese architecture, the grey space such as porch and gallery is widely use in the traditional Chinese garden and buildings.

In one aspect, the grey space is a transition space between the indoor and outdoor space, it mixture the boundary between human and nature. This is similar to the doctrine of the Mean in traditional Chinese philosophy.

In ecological aspect, the grey space between the indoor living space and the outdoor environment can substantially reduced the solar radiation and heat exchange.

In the bamboo house project, we arrange two grey spaces in this building, one porch locates in the north-east corner of the building as the symbol of entrance, another is the gallery which connecting the courtyard which facing the river in the west.

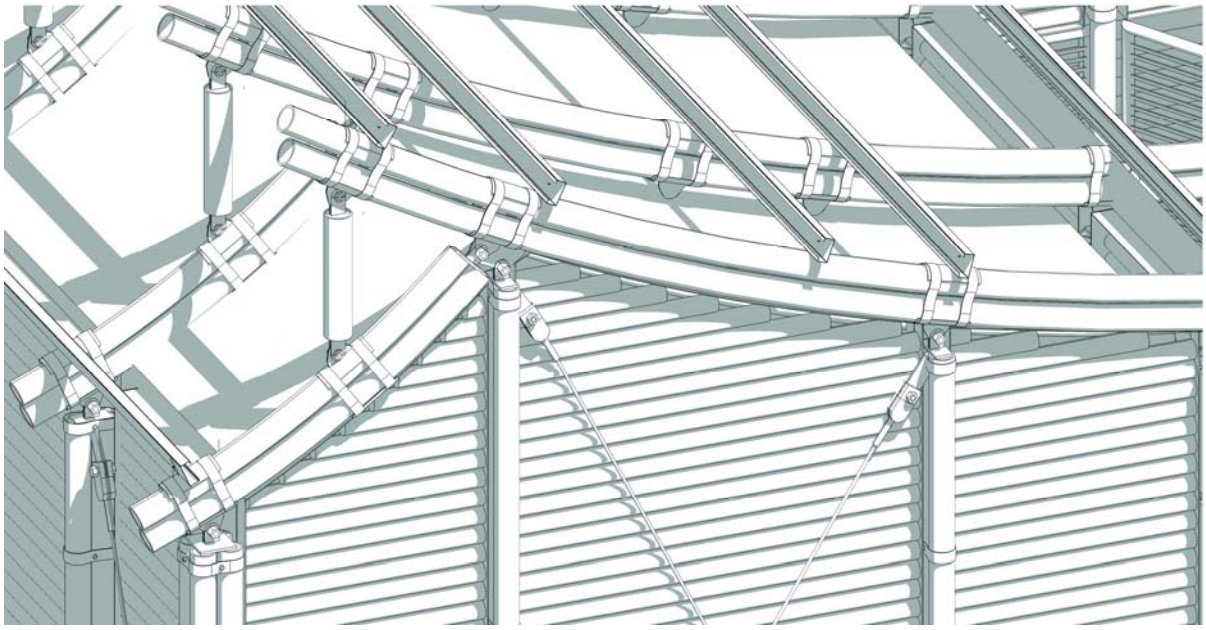


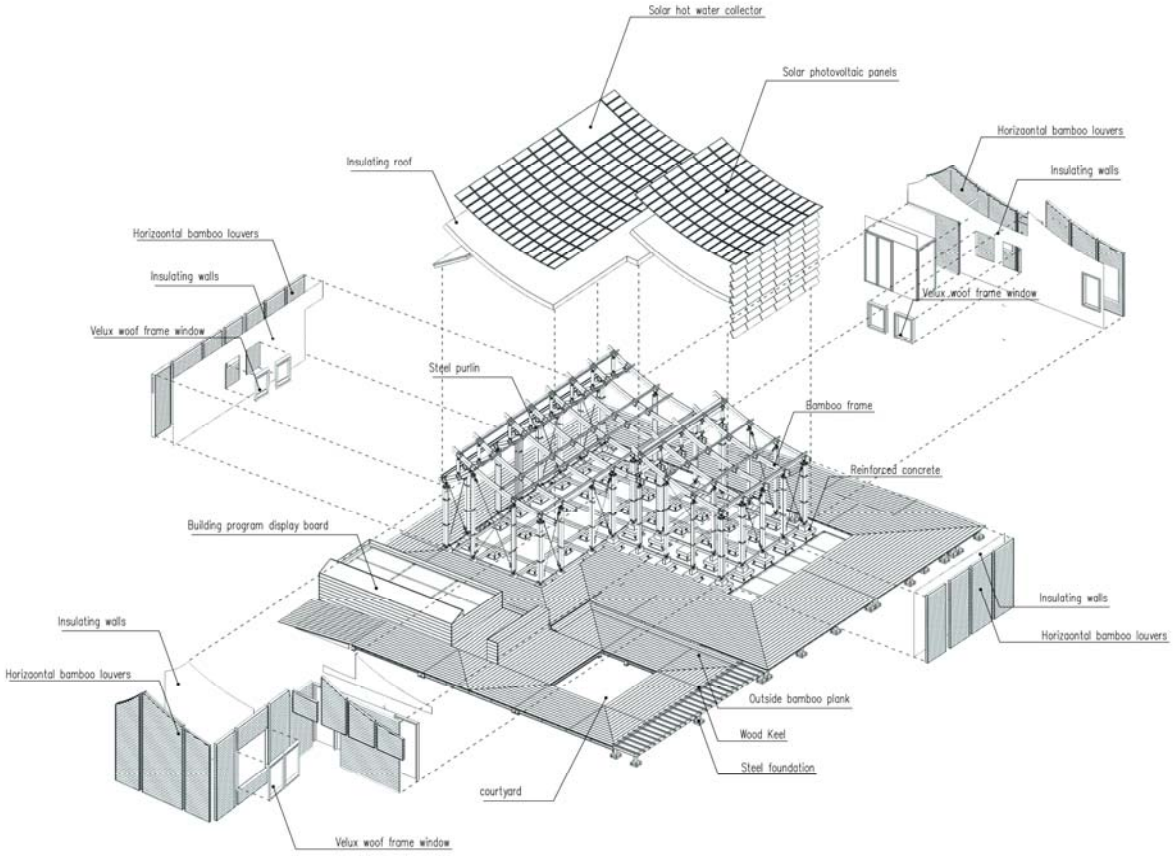
1.5 Bamboo

Bamboo is well known as the fastest-growing plants on earth, and it is widely spread all over the world. The price of bamboo in china is only 1/10 that of the same amount of wood, and is used in many ways such as for diet or for making tools.

Through structural calculation, we get even surprising result that the structural performance of bamboo structure is no less than that of wood structure, so the idea comes to us that if we could construct an organic house with bamboo, and we did it.

Lacking of accuracy is the only disadvantage of bamboo, and this is the main limitation that restricts the usage of bamboo in architecture field. In order to overcome this challenge, we design an independent structural system which is disengaged to the maintenance structure. All the structural components are industrial productions. Though this hanging system is not perfect yet, but the potential of marketlization has already attracted the social emphasis.





1.6 Façade

In order to realize high lever building thermal performance, we input the digital model into computer and analyze the ventilation effects with special software and thus decide the position and the size of the windows on the facades.

The prefabricated bamboo surface panel is another creation in this bamboo house project. We connect a row of small bamboos with steels piercing through, and with another several steel keels behind a big piece of bamboo panel can be fixed on the loading structure accurately. The nature convex-concave surface of bamboo panel can make better lighting effect and is more approachable.

To conclusion, we Tongji team have made great efforts in this design process in order to create a brand new organic house which is not only rooted in Chinese culture but also facing the whole world. We absorb the soul of Chinese architecture philosophy, we connect the vernacular form with high-tech, we instill the conception of energy saving, we made breakthrough in the many fields such as structure and material. All these effects could be seen from the final exhibition production, the bamboo house.

Better architecture, better life!