

Gold Award Asia Pacific

Locally-manufactured cob and bamboo school building, Jar Maulwi, Pakistan

Project data

Project group Building and civil engineering works
Client Tipu Sultan Merkez
Project background Private commission
Estimated start of construction February 2011



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Further author(s)

Not applicable

Comment of the Holcim Awards jury Asia Pacific

The jury commended this project because it contributes to all of the competition's "target issues" in a convincing way. Through engineering and design, a traditional building technology has been upgraded with effective low-tech measures. Bamboo is used in an innovative way, demonstrating the potential in construction of this fast-growing and widely available material, which also counters deforestation. The propagation of the new construction methods amongst the local population aids the establishment of local businesses and improves the economic situation in this rural area. All materials are locally sourced and can be processed with low energy requirements. The new construction approach shows the rural population an affordable, high quality and durable alternative compared to widely-used, but higher-cost and less environmentally-compatible construction materials. The combined earth/bamboo structure allows two-level buildings which reduces land use. The low-tech but sophisticated approach creates the potential to develop a unique local architecture, and transfer the approach to many other regions, particularly in less-developed countries.

Project description by author

Tipu Sultan Merkez (TSM) is a privately-initiated school and development project in Jar Maulwi, a small village near Lahore, Pakistan. TSM has been assisting underprivileged rural girls for ten years now. Having won widespread acceptance in the region, the school requires seven additional classrooms to accommodate its growing student population. The new classrooms measure around 40m², making them about 10m² larger than the existing ones. The new structure will be two levels in height, both to minimize land use and to demonstrate the potential earth and bamboo have as building materials for load-bearing structures. Following earthquake design strategies, the building will be divided into two parts which are connected by a wide multipurpose veranda area.

Glassed windows to the south will collect solar energy to regulate building temperatures in wintertime. In the hot summers, the earth will naturally absorb humidity from night-time cross-ventilation and then release it into the air during the day. This process will cool the interior air to around 8°C below outside peak temperatures, providing a comfortable indoor environment.

The ground floor will be built out of massive 60cm-thick cob walls (a mixture of earth and straw). For this technique, earth is piled up on the brick foundation without using formwork. The walls are left to dry, and then the excess is trimmed off with a spade until the wall is of the desired thickness. This project will draw upon local earthen building traditions and resident artisan's abilities to update the existing method, resulting in a more solid, durable construction. Among other modifications, an underground brick foundation and a horizontal damp-proof course will protect the earthen walls against rising damp and splashing rainwater.

As deforestation is an important issue in the region, the simple construction method will incorporate bamboo in order to reduce wood consumption. The first-floor walls will be built using the wattle-and-daub method: light bamboo frame structures will be constructed and then in-filled with earth. The ceilings and roofs will be constructed using a system of triple-layer bamboo beams joined with simple knots and steel rods, then covered with a layer of earth. The bamboo will be treated with borax (sodium borate), a natural salt which protects against parasite infestations.

The main ideas of the project are to promote local traditions, reduce reliance on fossil fuels and expensive products from outside the region, and develop natural material and economic cycles. The school is a pilot project for a transformed building method, one which can be adapted for different uses. A private two-level house has also been designed and will be built as a parallel pilot project on the university campus in Lahore.

Relevance to target issues by author

Innovation and transferability – Progress

In the rural areas of Punjab, earth is a common building material, and earthen building techniques are still widely used. The new building system transforms the existing techniques, creating very durable structures with high load-bearing capacities. Numerous local artisans will be trained and certified in the new techniques during the building phases of the two pilot projects, equipping them to set up their own businesses in the future. TSM and other partners in Pakistan are considering forming an umbrella organization which would support and develop the system under its own trademark in the future.

Ethical standards and social equity – People

The school will be built by residents of surrounding villages, most of whom are directly involved with the center through their children. TSM is a regional social hub, and the new school will demonstrate the potential for future projects in other regions. By promoting local building traditions, the new system will help reinforce rural identity and work against migration to the cities. The method will support healthy living conditions by creating comfortable, safe and durable habitats.

Environmental quality and resource efficiency – Planet

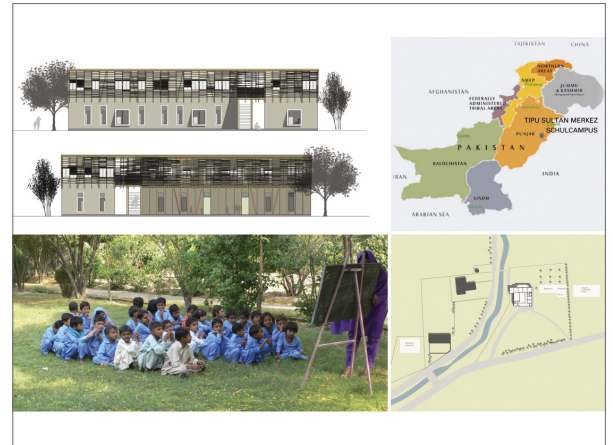
People in Jar Maulwi have ecologically compatible lifestyles: they build using natural resources, grow their own food, etc.. This project is designed to promote the area's traditional, ecologically-friendly construction culture by keeping the benefits of the traditional methods while making buildings more durable. The system can be used to construct rooms spanning up to 6 meters, making it suitable for many modern purposes. The land saved by building two-level residences can be used for village gardens. Earth and bamboo are natural, adaptable materials which can be returned to nature at the end of the building's lifespan, creating a closed natural cycle. Earth's natural humidity activity provides climate control and thus a healthy indoor environment. The use of fast-growing bamboo instead of wood counters deforestation, an important topic in this area.

Economic performance and compatibility – Prosperity

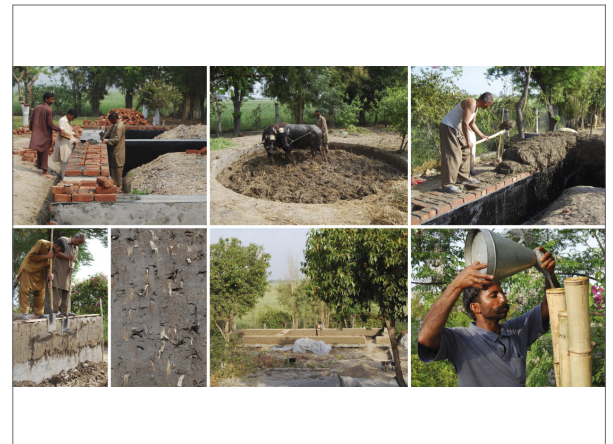
Using natural local materials is very economical and saves residents money. More durable buildings provide two advantages: they require less intensive maintenance than traditional buildings, but they last a long time with proper upkeep. Trained craftsmen can start businesses using the new system, and farmers can earn money through bamboo cultivation. Economic cycles are small and locally-based, and rural residents can generate local income by selling their products and services to the cities.

Contextual and aesthetic impact – Proficiency

The design is based on local building typologies which meet residents' specific needs, and it uses local materials in construction. The school is an example of modern Punjabi architecture integrated into the TSM campus. The usage of local materials and the modified building methods connect the project to the region. Modern elements like climate-adapting glassed windows or modern earthen finishes link the project to contemporary green architectural culture.



Location of the earthen school on the existing TSM campus.



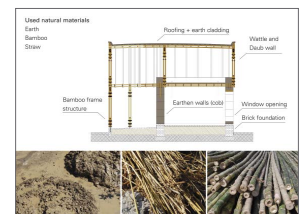
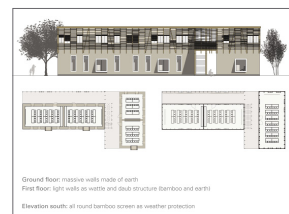
Ongoing construction works of cob walls: March 2011.



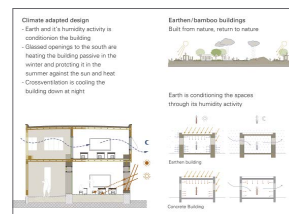
Research on traditional local building culture.



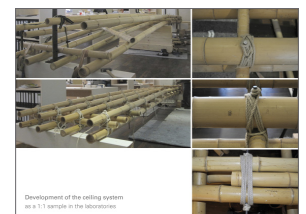
Adaptation to existing.



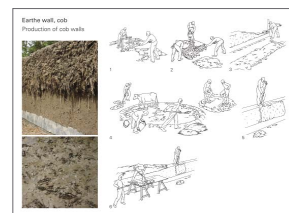
Earth and bamboo.



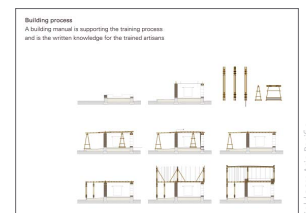
Heavy-light constructions.



The ceiling was developed 1:1.



Cob: a basic building technique.



Detailed building descriptions.