Low-cost low-maintenance school extension, Bangalore, India

Project data

Type of project: Architecture (education)
Estimated start of construction: December 2007

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Comment of the Holcim Awards jury Asia Pacific

This small school extension project in Tanisandra, Bengaluru/Bangalore, India, shows in a convincing manner how local and robust materials and technologies can lead to an outstanding result, i.e.: a cost effective, durable, functionally sound and aesthetically rewarding school. The project was initiated by the local population and then managed by the community officials. Such initiatives are of vital importance because public buildings in emerging countries are particularly prone to suffer from a lack of care and poor maintenance, and are therefore amongst the most neglected buildings. Fast deterioration of such structures does not only cause economic threats but leads also to severe institutional and social damages. The easily transferable and innovative strengths of this project are the convincing demonstration of low embodied (grey) energy, carefully engineered natural stone foundations and rammed earth walls for the building. A systematic integration of a closed water and waste cycles and in addition generating a new visual identity to the previously rather dull school compound.

Project description by author

Government schools are amongst the most numerous and most neglected buildings in India. Construction and maintenance are poor, vandalism and encroachment are rampant and the facilities do not keep pace with the pressure of the population growth through migration to urban areas. With an absence of planning, expansions happen randomly on available terraces or new ground as available.

At the Tanisandra School a philanthropic couple became aware of the plight of the energetic principal and her team of enthusiastic teachers who dealt with classes of up to 160 students/room! They decided to initiate and fund the construction of the classrooms so urgently needed. As passionate engineers we asked for professional help. A team was assembled to ensure exemplary design and construction with regard to better environmental compatibility for this project we must adopt only simple and robust materials and technologies to ensure a cost-effective building with good functioning for years to come in the face of intense wear and tear, vandalism, effects of weather and almost complete absence of maintenance.

The principal, the sponsors and the local Member of the Legislative Assembly worked together to ensure the building permit and approval from the Department of Education were secured within so days! We chose earth construction technology for its very low embodied energy and the readily available suitable raw material from the site. The technology is supported by 50 years of research and building field trials by Department of Civil Engineering of the Indian Institute of Science to ensure the structural safety for the first public building of this size in Bangalore. To save time the foundations were executed in local stone masonry while preparations for earth ramming tools and formwork are under way.

The project includes service installations besides toilets with piped water and electrical wiring for few light and computing points. All focus is on the earth construction with its piped water and electrical wiring for few light and computing points. The project has no service installations besides toilets with grey water treatment for recycling within the compound.

The new stage was secured within 10 days! We chose earth construction means high manual labor inputs without machine benefiting the local community.

Quantum change and transferability

A school is the best stage to sensitize children of all backgrounds to responsible management of natural resources. The project hopes to create this very awareness amongst the children while providing a better environment for study. The sole aim of the project is to establish a new standard that showcases sustainable design practices and construction for public buildings like schools, institutions and housing that can be easily replicated in large numbers both urban and rural centers. It will demonstrate the economic and technical feasibility of earth technology for the mainstream design and construction industry through the building process with seminars for architects, engineers, decision makers from government, the local media and the internet, ensuring far reach for the campaign.

Ethical standards and social equity

The project sponsors formed a professional consultancy team who worked with the school staff, education department and local politicians to create the brief, obtain building permits and monitor progress with total transparency. The contractor follows high ethical standards and practices; earth construction means high manual labor inputs without machinery benefiting the local community.

Economic and energy conservation

As the project is devoid of building services, the positive effect of construction with low embodied energy (EE) is all-important. The rammed earth walls save 50% of EE compared to burnt brick masonry. Floor slabs with vaulted earth block panels on roller-compacted concrete justify reduce concrete volume by 40% as compared to conventional slabs with similar reinforcement content. The raw material is mostly from within the site; imported earth is project waste from nearby basement excavations. All finishing materials are kept simple and simple; hot rolled steel sections, galvanized iron sheets and local un-machined slates for flooring. The sewage treatment plant treats sewage based on gravity flow and bacterial action while generating biogas for the kitchen. Rainwater harvesting will supply water to school toilets and replenish the ground water.

Economic performance and compatibility

The works contract is a pilot venture and is input-cost based and must lead to an understanding of the market factors for disseminating earth technology in mainstream construction. The authors will monitor the building after hand over to ensure long term performance. Earth construction for walls is the least costly construction essentially for its low embodied energy, high manual labor and low diesel input.

Contextual and aesthetic impact

So far the dull compound lacks identity. The project builds on the established typology of classrooms with verandah corridors. The different columns and balustrades with fl i-grain weather shades provide play of light and shade against the stark beauty of the raw earthen walls and lend an air of quality and quiet harmony to this children’s building that strives to connect with the basic and natural.