

Affordable shelter using bamboo and bamboo composites

The potential for the use of bamboo in construction has been demonstrated through a collaborative project between the Indian Plywood Industries Research and Training Institute (IPIRTI), Bangalore, India, and TRADA Technology, a UK based organisation, under funding from the UK Department for International Development (DFID). The project has resulted in a cost-effective bamboo-based building system, aimed at the poorer communities, which is affordable and secure, with a projected life to match that of conventional technologies, and which can be built using traditional skills.

Few demonstration buildings, using Bamboo Mat Corrugated Sheet (BMCS) roofing, developed by IPIRTI in collaboration with Building Material and Technology Promotion Council have been built. Ministry of Environment and Forests, Govt. of India has sponsored a project to carry out improvements in the BMCS technology, establishment of a production facility and construction of demonstration houses in North Eastern region of the Country. The project is being implemented by IPIRTI in collaboration with BMTPC.



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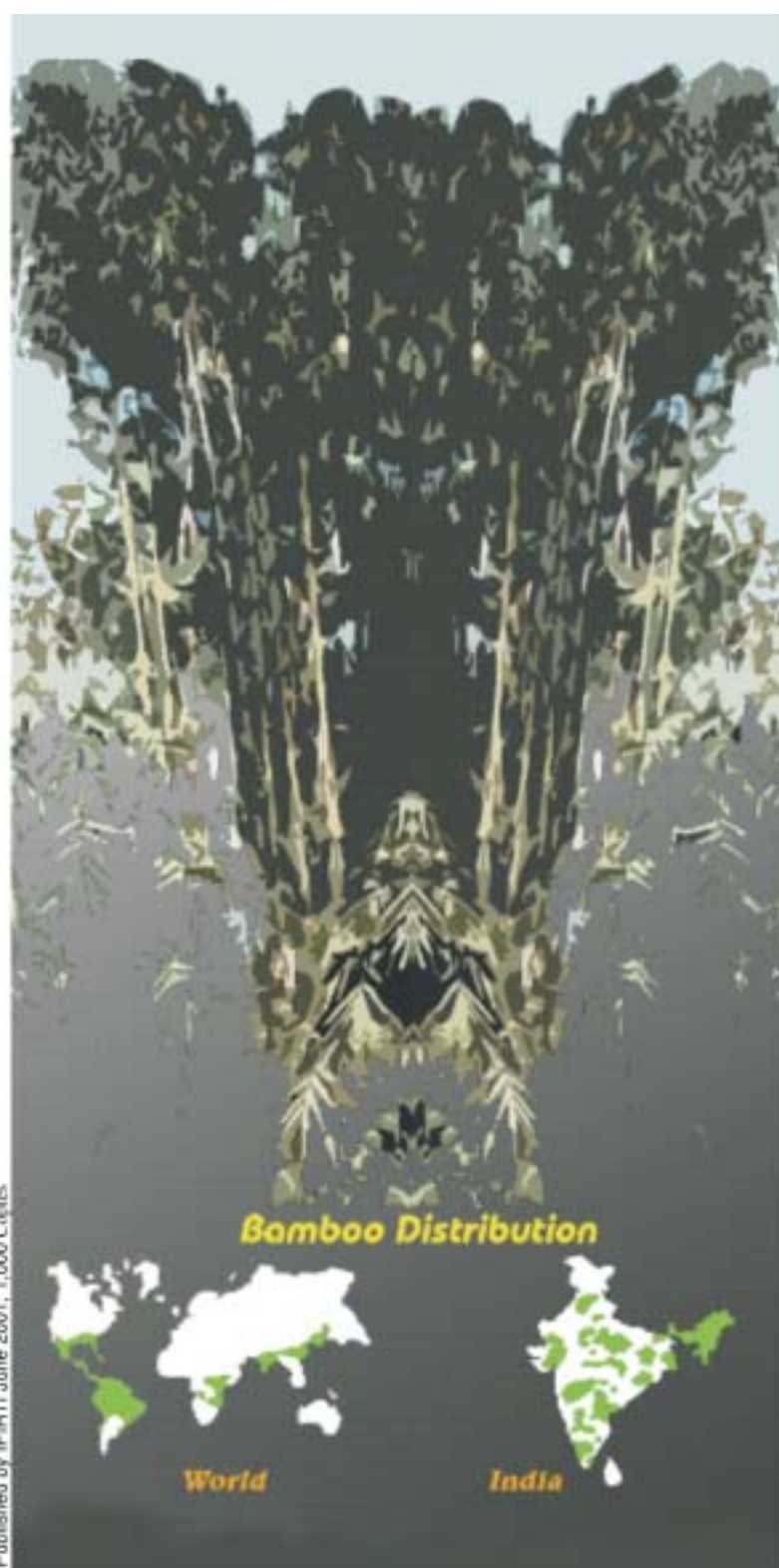


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An international
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Affordable shelter
using bamboo and
bamboo composites

Safe • Secure • Sustainable • Simple • Cost-effective



An international
initiative

Components

Performance

Construction

Detailing



Bamboo mat corrugated sheet (BMCS) is made from herringbone or rectangular pattern mats, which are hand woven from bamboo slivers.



The mats are soaked in resin and dried, then assembled in 3 to 5 layers and hot pressed in specially designed corrugated moulding dies.



Bamboo is treated against fungal and insect attack using eco-friendly boron chemicals. The Boucherie method involves sap replacement under pressure.



In the dip-diffusion method, culms are soaked in a boron solution. Holes are drilled to increase penetration.



Where the bamboo is exposed to direct wetting, creosote offers good protection. Columns can be treated by intermodal injection.



If the base of the column is in ground contact, it can be treated with creosote using the hot and cold method to offer the best protection.

Bamboo mat corrugated sheet is very strong and resilient. It is also waterproof and impermeable, with low thermal conductivity compared to other roofing materials.



BMCS has good fire resistant properties, and meets the requirements of IS:5509 for Fire Retardant Plywood.



Bamboo reinforced cement mortar walls are able to resist high wind and earthquake forces without damage. In tests, a 500kg in-plane load produced less than 1mm deformation



The walls are also able to resist high impact loads. Shock resistance, soft body and hard body tests to the IS for doors cause no damage.



A 3m span bamboo roof truss was able to carry 700kg without damage. This is over 2.5 times the design load.



A series of tests was carried out on bamboo and bamboo mat board to enable the performance of joints to be predicted for the design of larger roof structures.



Treated bamboo columns provide the basic framework for the building. The wall infill is non-loadbearing, and comprises a grid of split bamboo, tied together with binding wire at 150mm spacing.



The grid is tied to steel dowels passing through the columns. Chicken mesh is fixed to the outside face of the grid.



The roof is constructed from trusses and purlins with simple bolted connections, fixed to the wall plate above the columns using steel straps.



By virtue of the wire ties, bolts and straps, the entire framework is positively connected and fully integrated. In effect, once assembled it becomes a single, composite unit.



A 3:1 mix sand-cement mortar is applied over the grid to a finished thickness of 50mm. The walls become very strong, but still retain their lightness and resilience.



Door and window frames are made from sawn plantation timber. They are tied into the wall grid using nails driven into the outer perimeter as fixing points.

Large roof overhangs look attractive, and also provide protection from the sun and rain.



Large windows increase light and airflow. Bamboo mat board is ideal for window shutters and door panels, and offers a cost-effective solution.



A shaded verandah provides a useful external space for working or relaxing.



The BMCS roofing is left exposed on the inside, giving a light, and spacious feel. Surfaces can be finished with Cashew Nut Shell Liquid varnish.



Interior spaces are attractive, cool and light. Colours can be used to good effect at little extra cost.



Bamboo - the future of cost-effective construction?