

Skeleton Consultants Pvt. Ltd

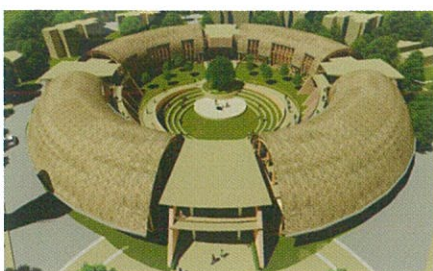
PROJECT BRIEF

Based on the Sustainable, Bio remediation, eco-friendly, Low cement landscape, and creating local jobs of the project, Bamboo Research and Training Centre was awarded to the Shift studio, New Delhi for architectural planning led by Ar. Sanjay Prakash. The buildings are located at Chandrapur Maharashtra. The project consists of five building (Including one hostel block) and Overhead tank. OHT is RCC structure having circular geometry, 27m high and 300mm thick RC wall and bamboo shall be used only for outer portion of the tank with spiral steel staircase.



Buildings have different types of geometry like inclined, curve and circular roof. Some buildings are ground storey structure and some buildings are ground storey with mezzanine. The material used for these structures are Bamboo, RCC, steel and rammed earth. The total built-up area is 144076Sq. ft.

The construction is being done keeping in mind strength, durability and eco-friendliness of the materials which are being used. Bamboo columns are inserted in pockets provided in RC pedestals and pockets are grouted.



Structural Geometrics

The circular, inclined and curve shape of the structures made it difficult to analyze and design. The modeling, analysis and design of the structure was done in the Staad Pro software and properties of the bamboo were manually calculated and were input in Staad. The shape of the pedestals are of different types due to the number of bamboo as a unit (Straight and inclined). The building is designed as a RC-Bamboo hybrid structure. The super structure is designed using Bamboo and rammed earth to give it a unique identity, whereas RCC is used in the substructure. A Bamboo column consists of three or more number of culms bounded as an integrated unit. It was analyzed as a hollow tubular structure (not perfectly straight). Roof of the structure are considered as non-structural member but load of the roof sheeting was considered during the analysis and design. The columns are cast in various shapes i.e. in rectangular, square, circular and irregular shape.

Foundation of these buildings are isolated, combined and strip footing as well. OHT with circular in shape enhances the grace of the structure. The various key points of design and construction in this project gives sharp view of the structure as well as the productivity of design.

Rammed earth wall is like a full masonry construction in which earth-walls form the primary gravity load bearing elements of the building transferring load b/w roof and floor to the foundation.

Challenges

• Different types of species of bamboo are available. Out of all, 50mm dia bamboo was chosen as it can be bent

easily as per architectural view and 100 mm dia bamboo was chosen for straight members.

• Properties of bamboo are not readily available in staad pro. We developed an in house spreadsheet for calculating the section properties of bunch of bamboo as per requirement and same has been put in Staad as equivalent steel section.

• Density, Elasticity and strength values of Bamboo varies with species.

• Bamboo to bamboo connections are challenging. In order to have uniform behavior of bunch of bamboos, section was formed by inserting steel plates between bamboo and then were bolted together.

• During construction the bamboo were crushing and tearing, to prevent this no of bolts was increased and diameter was reduced.

Salient features

• Inclined, Curve and Circular shape of buildings.

• Bamboo as a design & construction material
• Two types of Bamboo are used 50mm and 100mm dia with 10mm thk with different properties.

• Zone 3 , Response Reduction Factor 4 for Bamboo structure and Damping ratio 5%

• Rammed earth walls

• Steel Spiral stair case along tank

Fast facts

• **Project Name:** Bamboo Research and Training Centre

• **Client:** TATA TRUSTS

• **Architect:** Shift Studio for Habitat futures, New Delhi

• **Structural Consultant:** Skeleton Consultants Pvt. Ltd., Noida

• **Current status:** In Progress

• **Working Team:** Er. Mohd Mueez Khan Er. Shubhankar Petal,

Mr. Devi Prasad under the guidance of Er.(Dr) Abhay Gupta

Website: www.skeleton.in