



Wonder Grass
BUILDING BAMBOO HABITATS

WONDER GRASS

'Venu-Gram', A Cluster-Housing project at Wardha

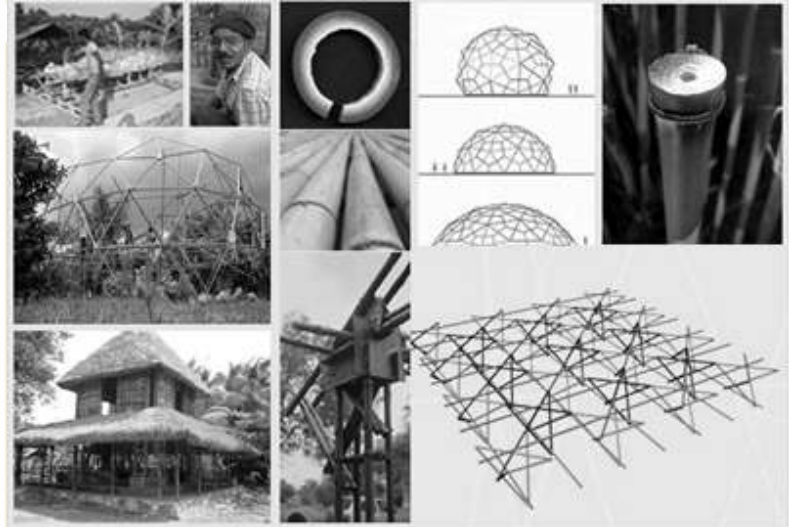
Mason Training Center, Trivandrum

Bamboo Geodesic Dome, Bangalore

Terrace Top structure at T-ZED apartments, Bangalore

Modular Housing Solution

WORK PROFILE





WONDER GRASS

A Broad Structure



Wonder Grass is an Entrepreneurial initiative that strives to bring Bamboo based building system in the **mainstream of construction-industry**.

Our mission is to Provide a complete 'End-to-end' solution that will enable a common-man build with bamboo in 'One-stop-shop' format.

Wonder Grass is modeled such that, it can;

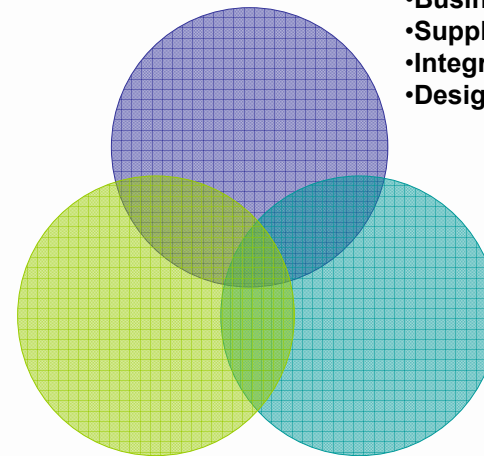
- Scale-up the operations and cater to large volumes,
- Provide 'On-call', Efficient and Accountable 'Building-services'
- Achieve Cost-effective and competent Building-technology with bamboo.



Wonder Grass to fulfill its vision, would conceive and implement all the 'links' within '**Supply-Demand chain**' in order to achieve **efficient and effective** delivery of Bamboo based Building-services.

Process-Innovation and Optimization

- Business Models
- Supply chain management
- Integrating ICT for efficiency
- Design-Innovation



Backward Linkages

Procurement, Processing,
Fabrication, Quality
Supply, Logistics,
Delivery, Erection

Forward Linkages

•Business development,
•Communication,
•Marketing and Sales
•After-sales, Revenue



'Venu Gram', A Cluster-Housing project at Wardha

Project site: Village Sawangi, Wardha

Built-up area of a single-unit: 325 Sq ft

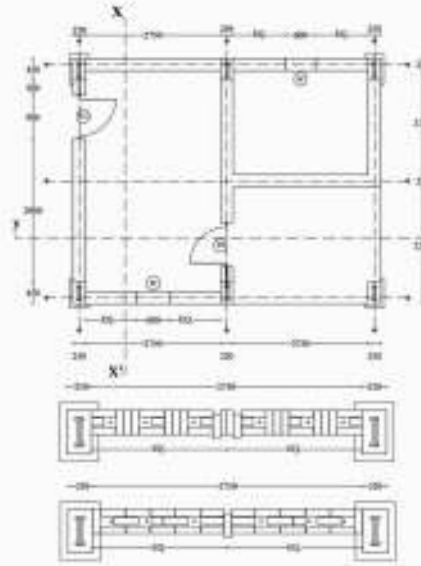
Number of Dwelling-units built: 50

Year of completion: December, 2004



The primary purpose of this project was to develop construction technology using bamboo and demonstrate it at a moderate scale so as to test the technology on a pilot scale.

The Salient Features of the Bamboo House:



- The plan of a dwelling unit is evolved around a grid of 2400 mm X 3000 mm.
- The approach in this project is to try and integrate conventional construction systems with bamboo based building systems.
- The foundation and construction up-to plinth level is done in 230 mm Brickwork with Cement mortar and PCC for column-pedestal.
- Bamboo used for construction is treated with CCB method recommended in VENU BHARATHI for a longer life span of about 25-30 years .

'Venu Gram', A Cluster-Housing project at Wardha

Bamboo poles inserted inside brickwork and bamboo-splits are woven in a fashion as shown



All the structural members are prefabricated and then erected after the plinth is ready.



Prototype House

- The Built form gels with existing housing typology of villages and yet it has a very contemporary characteristics which is because of building materials used, opening systems incorporated etc.
- The plastered wall surface of a bamboo composite wall is as good as any other wall surface. After doing basic lime-wash on the exterior and painting the exposed brickwork below, the house is ready for inhabitation
- As part of the project we are not painting the houses, this will allow individual owners to paint the exterior and interior as per his choice and add a tinge of individuality to his house.

Final and second coat of plaster being applied



Close-up View, Showing the joining of three members vis the Column, the Beam and the Truss.



Interior view of a house.



A finished dwelling unit

Finished Dwelling units as a cluster



Mason Training Center, Trivandrum

Client: Habitat Technology Group

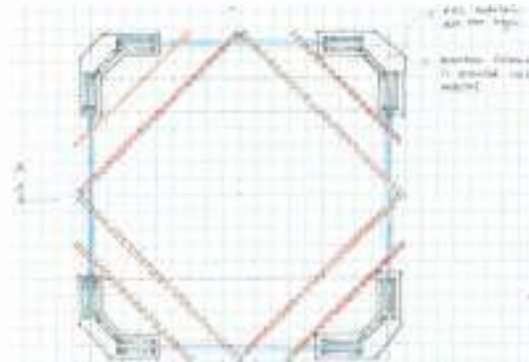
Site: Habitat Commune, Trivandrum

Built up Area: 1000 sq ft

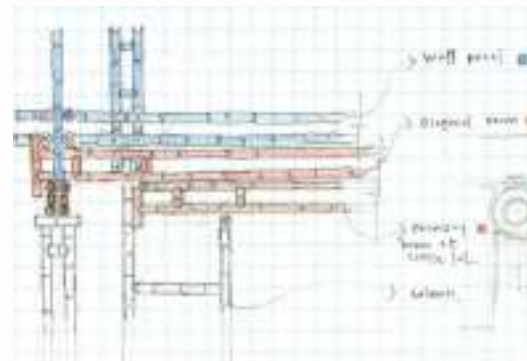


Habitat Technology Group, a well-known organization for its pioneering work on Mud-applications for building houses and residences, as part of its new campus wanted to build a structure with bamboo. The primary function of the building is to perform as a training-centre for numerous training programs that HTG keeps undertaking for masons, engineers etc.

The structure is a two-story building with two class-rooms on top of each other, with a verandah running on all sides of ground floor.



Schematic Plan



Column-Beam Junction detail

Salient features:

- All the structural components, from columns, beams, rafters etc are made with Bamboo. The Mezzanine floor is also made from bamboo.

- The walls are modelled on Wattle-and-Daub principal, with bamboo woven mat as the structure plastered with either stabilized mud or cement mortar.

- The roof-structure is a pyramidal in form, achieved with four principal rafters, placed diagonally and connected at apex. The intermediate horizontal rafters tie these four diagonal beams making a very strong pyramidal structure as roof.



Wall corner detail



Wall-structure

The structure was tested for the load-factor of 300 Kg/Sq mt. The first-floor slab was subjected to the load of 6 Tons, to study the behaviour of the structure and deflection if any. The Structure withstood the load-test to satisfactory level.

Column-beam
Junction



Primary &
secondary
beams



Principal rafters of the roof
being placed

Bracket-detail





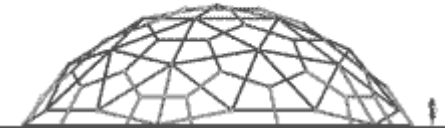
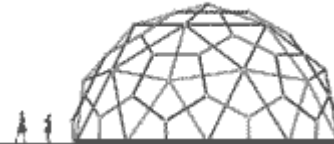
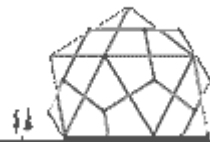
Bamboo Geodesic Dome, Bangalore

Client: Biodiversity Conservation India Ltd, Bangalore (BCIL).

Year of completion: August 2006

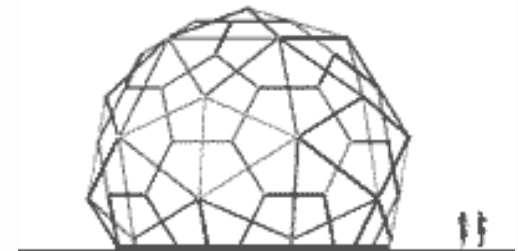
Area covered: 800 Sq.Ft

Roofing: Fabric



This particular structural system was developed by Buckminster Fuller in early 20th century. In this structural system the members are subjected to only pure compression and tension forces. This way we can use minimum section of material and achieve large spans.

It is a single-frequency geodesic dome known as Truncated-icosahedrons, just like a common football. It is derived by arranging equal-sided hexagons and pentagons together, in a geometric formation.



Hexagonal and pentagonal components being fabricated



Polygonal components being assembled



The metal joints at the nodes of the polygons



Bamboo Geodesic Dome, Bangalore

Salient Features

The dome we have constructed is 30 Ft (10 meters) in diameter and rises as much as 21 ft at Apex in the centre.

All the components are fabricated on the ground and then assembled on site. The components are lightweight and the system of joinery is simple.

The structure could be dismantled and assembled at will.

The roofing is designed using Weather-resistant fabric, which is used for making tensile structures.



Terrace Top structure at T-ZED apartments, Bengaluru

Client: Mr. Venkatesh

Year of completion: August 2008

Area covered: 150 Sq.Ft

Roofing: Mangalore tiles



The client intended to have a sheltered space as a sit-out on the terrace of the apartment.

The columns, beams and purlins were pre-fabricated in the workshop and then were erected on site. The junctions were designed and made up of wood to aesthetically blend with the bamboo components.



The wooden joint at the junction of column & beam



The wooden joint at the junction beam & the wall



The traditional 'Rubbugallu'- (made up of granite stone used to grind chutneys in kitchens in the region) was used as pedestal for the columns. This was done to avoid the cumbersome method of casting concrete pedestals and also to give a ethnic touch to the design.

Terrace Top structure at T-ZED apartments, Bengaluru



The Beams mounted on the wall and the columns respectively.



The purlins fixed to the beams carried the wooden battens.



Mangalore tiles were used as a roofing material



The artisan team



The finished structure

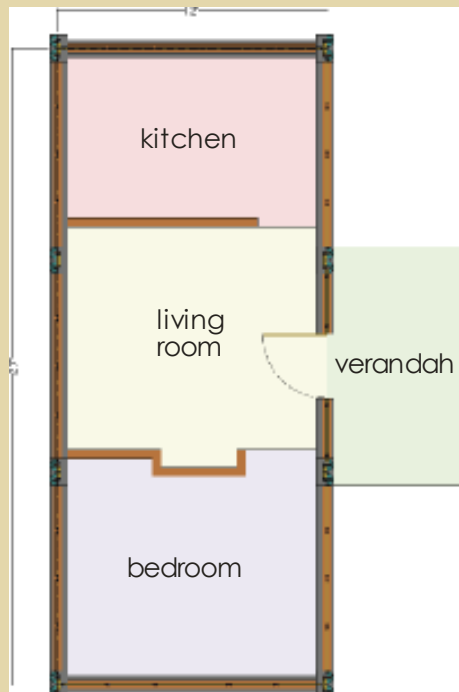


Standardized modular housing solution

- The idea behind developing a housing unit which is standardized is to bring efficiency in production, delivery and cost of the housing system.
- A standard dwelling unit would be about 350-400 sq ft.
- Typically a house would have a Hall, a kitchen-dining area and a Bed-room. Toilet can be separate or attached depending on preference of the individual or a community.
- The standard Dwelling unit developed by Wonder Grass is available in two variations.- i) 15'x27' & ii) 12'x27'.
- Individual can have a choice for the one being demonstrated here has 370 Sq ft Built-up Area, with Hall in the center, a bed-room and Kitchen-dining on either side of the hall.
- Each Room is typically 12' X 9' = 108 Sq ft in carpet-area.

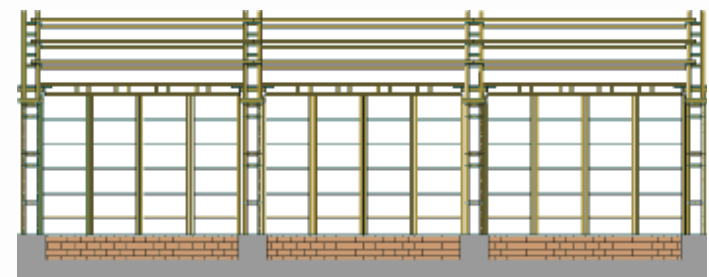
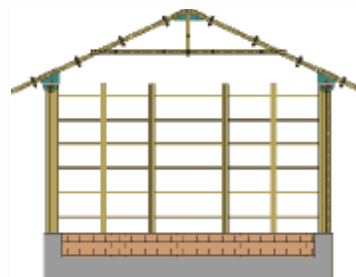


CROSS-SECTION



LAYOUT PLAN

The Structure:





Specially developed Joinery:

- As part of bringing in standardization in building system, a set of MS-joinery has been developed which takes care of column-truss, column-pedestal and Truss-purloins junctions.

- One of the interesting outcomes of the Design-innovation process has been the development of 'Smiley-junction plate'. It is a circular plate which acts a multi-purpose joinery detail for column-truss, column-beam and column-pedestal.

- Truss-junction box – A junction box to simplify the construction of truss

Bamboo-Structure:

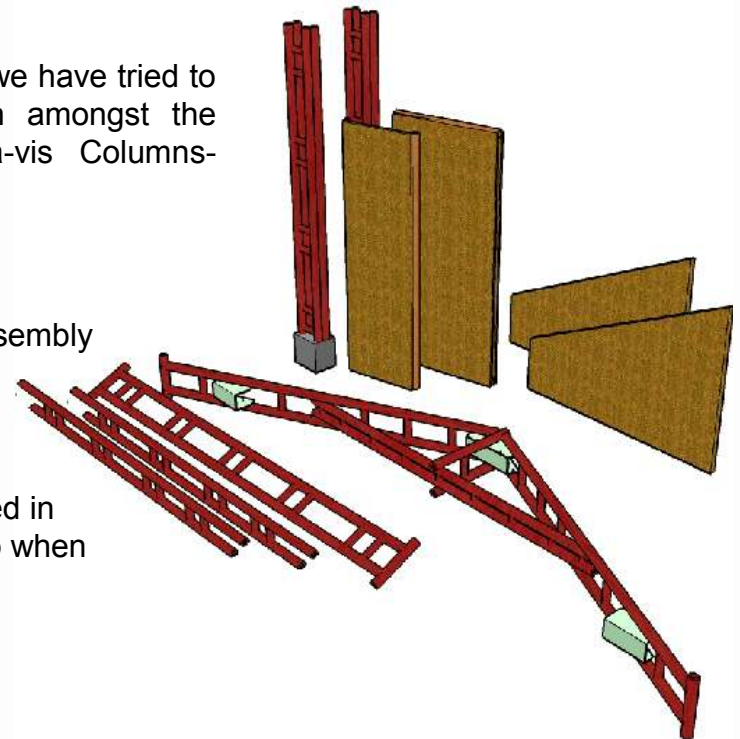
- The primary idea in this built-form is to simplify the structural system to a point that the fabrication-transportation and erection on site is efficient in terms of time and energy required.

- The Building-components are interrelated in terms of dimensions and sizes.

- To simplify the fabrication process, we have tried to bring in a dimensional-coordination amongst the various building components vis-à-vis Columns-Beams-Trusses and Purloins.

- Standardized components allow interchangeability and simplify the assembly processes.

- Truss has been specifically developed in such a way that it can actually fold-up when dismantled and transported.

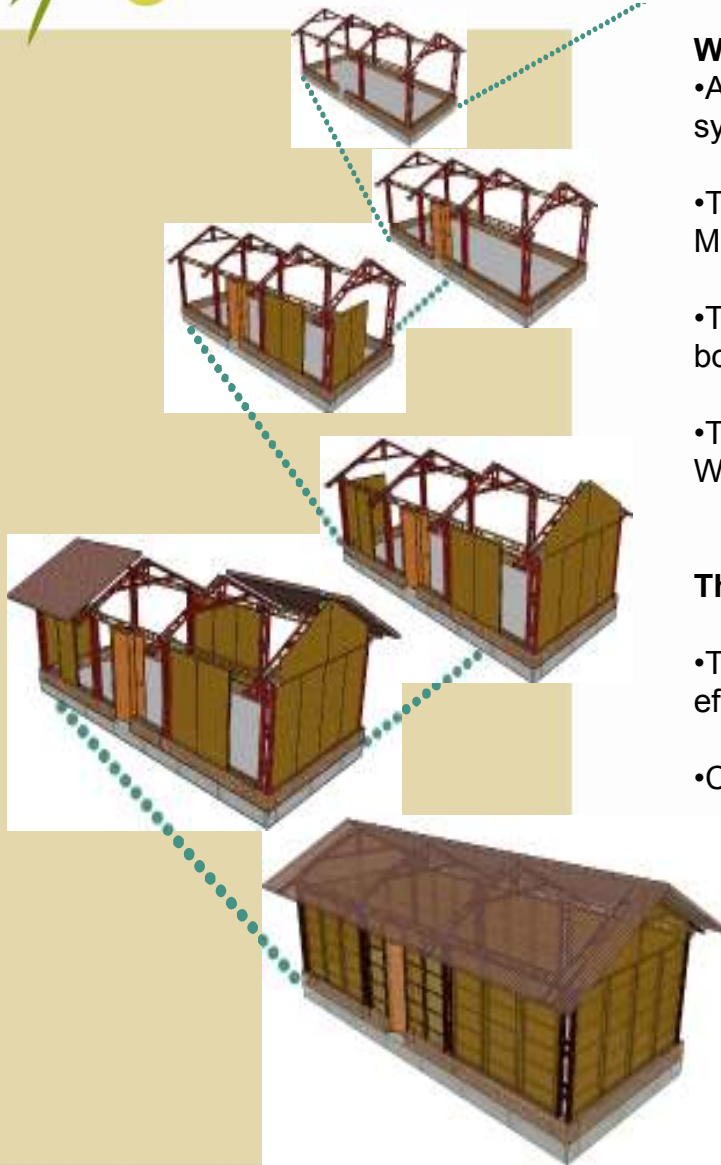


**Wall-Panels:**

- A modular 2' X 6' bamboo frames work as the basic-structure of the walling system.
- This frame then can be woven with bamboo-splits and hen plastered with Mud, Lime or cement plaster as per the need.
- The same frame can act like a structure for the sandwich wall with composite-board fixed onto it from either side.
- The same frame also perform as the primary frame for the openings like Windows and Doors.

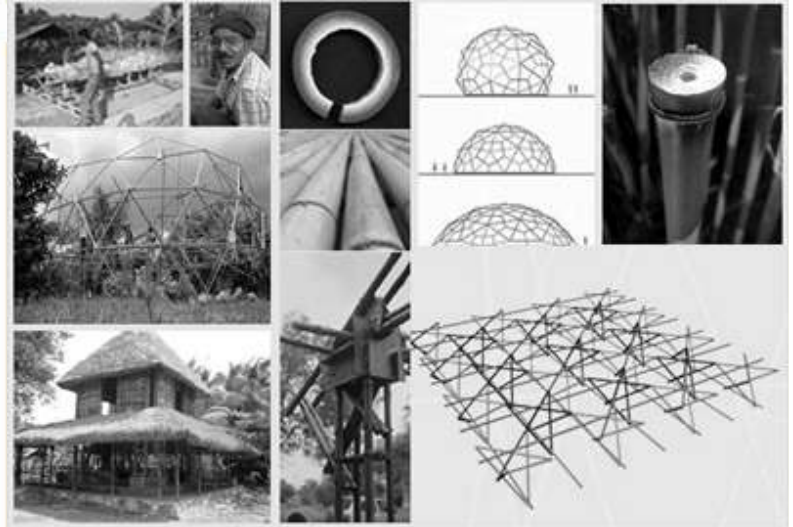
The Roofing:

- The overall size of the built-form has been derived keeping in mind most efficient use of roofing sheets which are commonly available in market.
- Corrugated GI sheets which are available in 2.5' X 8' size are used.





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