Bamboo as a solution for low-cost housing and storage in Pabal (India)

Department of Design, Manufacture and Engineering Management

Product Development Partnership

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Agenda

• Project and Problem Overview
• Culture, Vision and Vigyan Ashram
• Bamboo Properties
• Connections
• Structures
• Future and Summary
Problem

• Concrete and steel are expensive and hard to build.
• Bamboo structures are often built in an haphazard way.
• Bamboo is sustainable, cheap and readily available.
Objectives and Deliverables

Objectives
1. Research properties and types of bamboo available in Pabal/Pune.
2. Review, invent and develop joining methods for bamboo structures.
3. Design structural system for wide-scale implementation in India.
4. Testing of prototypes.

Deliverables
1. Develop bamboo joining types.
2. Prototype bamboo structure and propose methods for implementation in Pabal/Pune after assessing feasibility on the prototypes.
3. Recommendations on the type of structures that can be built using the proposed methodology.
“Bamboo has the image of being the building material of the poorer class, for example in Colombia the upper class especially prefers concrete. In India the highest caste builds with stone, the middle castes use wood and only the lowest castes use bamboo.”

— Institute for Structural Design of RWTH Aachen University
Enable anyone to build a quick and cheap home.

Produce as a kit of:

- Connections
- Tools
- Instructions/Rules

*Just add bamboo*
Vigyan Ashram

A centre of Indian Institute Of Education (IIE) for Pune
Pabal, Approximate Pop. 10,000
Application of science and technology for rural development
“Learning While Doing”
• FabLab
• Geodesic Domes
• Mech. Bull Tractor
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Bamboo Properties

Moisture content impacts compression strength more than bending/tensile strength – the lowest values of the compression strength is ~ 40MPa

Connection Categories

Simple Lashing

Gusset Plate & Bolting

Sleeve Joint

Wood Core Insert

Expandable Joints

Steel Insert & Concrete

Davies, C., (2009), “Bamboo Connections”, University of Bath, April 2009 (MEng Final Year Project Dissertation)
Connection Concepts
Existing Structures

Concept Structures
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Future Work

• Evaluation and Development of Concept
  – Connections
  – Structures
• Modelling, Simulation & Analysis (Pro/Engineer)
• Economic and Cultural Consideration Review
Summary

• Masses of academic literature on bamboo mechanical properties and connections

• Many large scale examples of bamboo architecture

• Our focus is on implementable solutions
Many Thanks

Any Questions?

G. Leake, C. Torres-Sánchez, et. al.