Natural Building Briefs

Materials Profile:

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Bamboo

Quick facts...

Some Species can grow 12-36 inches a day.

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- Several Species of bamboo are edible and tasty!
- Bamboo has superior biological processing properties making it useful in bio re mediation.
- It's light weight and high strength ratios make it well suited for a variety of building applications.
- Poles can be harvested after 6 years

Bamboo Basics

The over 1200 species of bamboo now catalogued, all have one thing in commonthey are all grasses. Each plant spreads itself through the soil by means of an intricate web of roots, also called the rhizome. As the rhizome spreads through the soil, it creates the perfect environment for biological activity. Microbes, which thrive in this moist, regulated temperature, aid the plant in extracting minerals from the soil in exchange for the benefits the plant offers.

Water and nutrients are absorbed through the roots and then transported in microscopic tubes above the ground, following the plants vascular tissue. This network is like the veins and arteries that flow in our own bodies.

The combination of its cylindrical shape, high silica content, and orientation of the vascular tissue is unique when compared to lumber, earth, concrete, or steel. The vascular tissue grows in bundles of delivery tubes that are in line

with the growth of the pole, except at the occurrence of nodes and branches, where a complex diaphragm is formed inside the otherwise-hollow plant. Without this occasional crisscrossing of tubes, the plant would have little ability to hold its cylindrical form, especially when used in crafts and construction.

Young shoots emerge from the forest floor at roughly full diameter. This plantation in Belize is filled with mature poles ready for harvest.





Architect: Martin Coto

The poles are used in building construction, furniture, and other artisan and craft purposes. The material can also be processed into laminated boards, beams, and sheet goods. Bamboo poles can be lashed together with cord or rope, joined using traditional pegs and dowels, or – as in modern structures—connected using bolts and fillers to attain engineered construction limits.

Testing has shown certain species of bamboo to have up to double the compressive strength of concrete and tensile strength when compared to steel. Considering bamboo's weightto-strength ratios and the minimal processing needed to capitalize on this strength, this giant grass is an ideal natural building material. Individual poles have a great amount of strength, great care must be taken in detailing connections to properly transfer loads.

Though numerous traditional and modern techniques exist to aid in the design process, individual poles can strain or fail unnecessarily without properly designed connections.



Testing like this one conducted at Santa Clara University in part to support the Ecological Building Networks (EBNET) reconstruction efforts in Haiti following the 2010 Earthquake.

Treatment

The materials few limitations can easily be mitigated by applying proper processing techniques. For example its high sugar content makes the plant susceptible to rot and pests. This can be mitigated through material-specific building design and proper post-harvest treatment processes including treatment using a borax solution. Harvesting poles during the lunar waning cycle can greatly reduce the poles vulnerability.



Recently harvested poles are treated in a Borax solution prior to installation on a project site in Cambodia. Community members were able to process the material easily on the building site. Proper harvesting and treatment are the best ways to ensure a buildings longevity.

Cultivation

Bamboo is relatively easy to cultivate. Many species grow in slightly acidic soils with few nutrients. With so many species and variations, bamboo can be found in tropical, subtropical, and temperate climates alike. In each zone, different species will have found traditional applications appropriate to climatic and environmental conditions.

Additional Resources on Bamboo

International Network For Bamboo and Rattan(http://www. inbar.int): • Technical papers, manuals, workshops, Conferences, standardization.

Columbian Wood and Bamboo Building Standards http://www. thenaturalbuilders.com/pdf/edu/ ESTRUCTURAS%20DE%20GUADUA. pdf:

Amercian Bamboo Society

(http://www.bamboo.org):Technical papers, regional memberships, workshops, planting catolouges,

Bamboo Building Essentials A book By: Darrel Deboer and Megan Roth http:// bamboobuildingessentials.com):

 Covers the basics of bamboo construction in a broad manner, highlighting projects from around the globe.



Ecological Building Network

www.ecobuildnetwork.org/): • Ecological Building Network promotes, fosters and catalyzes the transformation of building to favor intelligent design, clean energy and healthy materials.