

BAMBOO

Architecture & Design

Chris van Uffelen

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Preface

Bamboo is a giant grass that is native to all continents except Europe and Antarctica. It grows in the south of North America, in Central America and in the northern part of South America, where it can even be found on the east coast all the way up to Patagonia. In the Andes it even grows at a height of 4,700 meters above sea level, just below the snow line. In the Himalayas, bamboo can be found growing at a height of 3,800 meters above sea level. In Asia, it grows in an area that reaches from Japan, through China and India, all the way to North Australia. Furthermore, bamboo also grows in many places in Western, Central and Eastern Africa. It was scientifically documented for the first time by Carl von Linné in 1778, and today there are approximately 1,450 known types and around 130 non-woody varieties. The latter grows primarily in South America, while China has the largest variety of bamboo species, boasting over 500 different varieties.

Although not all types of bamboo are equally well suited to serve as construction material, it is traditionally used for building by all the different cultures native to the regions in which it grows. Bamboo is easily available and grows quickly; a growth rate of from ten to thirty centimeters a day is typical. Because it is mostly the lignifying type of bamboo that is used as a building material, it is usually only harvested around three years after it was planted. The natural compound material has outstanding properties: its compressive strength is equal to that of wood, stone or concrete, while its tensile strength is equal to that of steel. It varies in length from eight to fifteen meters and has a diameter from five to twelve centimeters, making it pretty much the perfect raw material for building. The *Guadua angustifolia* variety has a diameter of 12 centimeters and a length of 20–25 meters. The “lightweight” construction of the stem as a series of hollow chambers with nodals between them gives these ‘skyscrapers’ their stability. Their natural composition makes them robust and gives them a high degree of elasticity, which helps to make bamboo earthquake resistant. The smooth surface is almost like a layer of varnish and makes the stems waterproof, weatherproof and resistant to fire and chemicals. However, the stems can easily split if they are dried out, or can rot if they are exposed to too much moisture. Appropriate harvesting and drying processes can help to prevent this. The outstanding static characteristics of bamboo made it

a much-coveted material for constructing scaffolding, although this practice is now slowly being replaced by the use of industrial solutions. The use of bamboo as a building material is also decreasing and slowly beginning to disappear from large cities; although, it still enjoys great popularity in rural areas as the “poor man’s wood”. However, traditional building techniques are also endangered even in rural areas. Its reputation as a ‘cheap’ material has led to a certain amount of opposition to using bamboo as a building material in the regions where it grows. Although bamboo is not native to Europe, it is becoming evermore popular as an attractive and ecological building material in product and interior design here. Even its use as a building material is increasingly being discussed in North America and Europe; and it is not just the pioneers of lightweight building constructions, such as Richard Buckminster Fuller or Frei Otto that are interested in this subject; but also other architects that are inspired by bamboo for ecological or esthetic reasons. Today, even European architects can be found working in areas where bamboo grows, although this does involve an exchange of knowledge in both directions: new construction principles in exchange for traditional knowledge of the material.

Bamboo is also becoming more popular as a material for building large buildings. After the Expo in Hanover in 2000, everyone was fascinated by the halls built for the environmental protection agency Zeri by Colombian architect Simón Vélez, and the paper-covered Japanese Pavilion by Shigeru Ban. Various pavilions from the Shanghai Expo 2010 are presented in this book. The projects included in this volume demonstrate a wide range of projects of all sizes. Bamboo is not only used as a structural material but also often as a design element in itself. The variety of uses, functions, types of bamboo and inventive ways of using it make this book an exciting and interesting read. The compatibility of state-of-the-art technology and bamboo is demonstrated by the American inventor Thomas Alva Edison: After he had carried out more than 1,200 experiments with a wide variety of materials, he financed expeditions to collect exotic plants and later used carbonized Japanese *Phyllostachys bambusoides* to create filament for the electric light bulb, patented in 1881.

→ Traditional bamboo architecture in the Mekong Delta / Vietnam

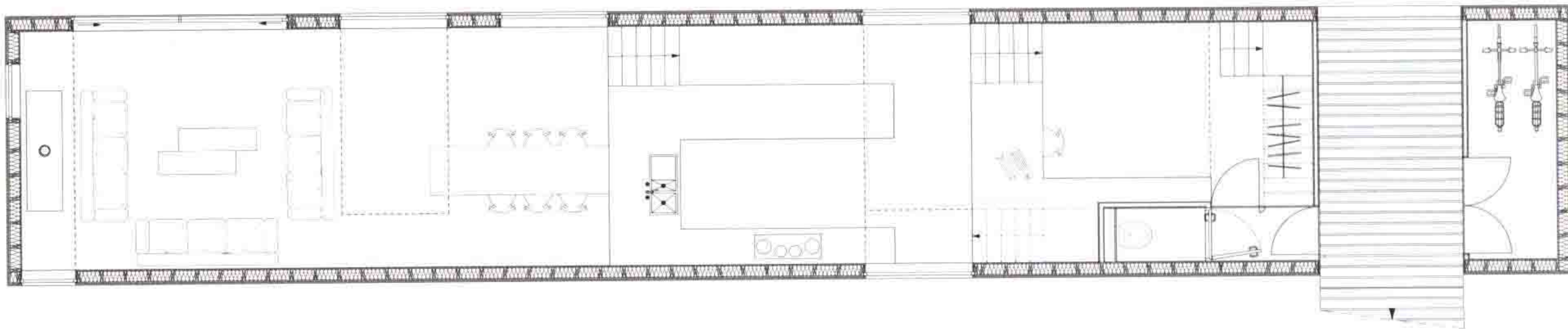


Low Energy Bamboo House

AST 77 architects and engineering

Location	Rotselaar, Belgium
Completion	2011
Client	Thijs - Peeters
Type of use	Living
Gross floor area	260 m ²
Bamboo used	Moso bamboo
Photos	Steven Massart

Designed by Belgian practice AST 77 the Low Energy Bamboo House is nestled within a woodland plot in Rotselaar, Belgium. The 26.3-meter-long by 4.5-meter-wide dwelling is an open volume which navigates a steep slope. The exterior is clad with bamboo poles framed with black steel structural elements. The façade treatment attempts to recede into the context of tree trunks. Strategically placed windows offer outward views and increase passive solar gain, ventilation and natural daylight. Ideal orientation within the woodland setting as well as a heat pump, floor heating and good insulation reach low energy coefficients K33 and E40. The internal organization is placed at various floor heights to interconnect upper and lower stories.



↑ Ground floor plan
↓ Building situated on a slope





↑ Front view
↓ Façade with bamboo and black steel frames





↑ Large windows provide views of tree tops
 ↓ Façade detail



↑ Living area
 → Building surrounded by trees





Ranch House

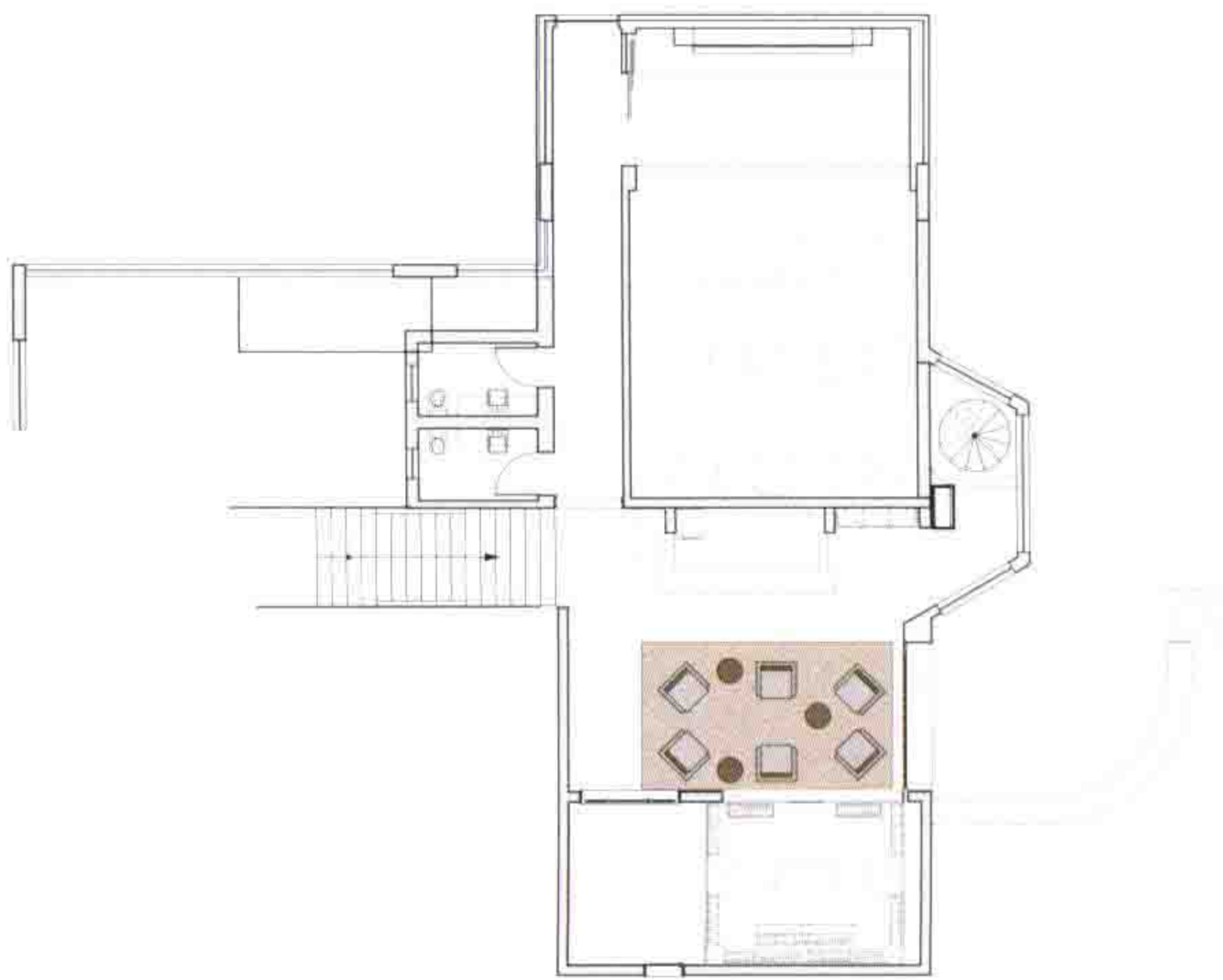
Galeazzo Design

Location	Caucaia do Alto, Brazil
Completion	2013
Client	Confidential
Type of use	Leisure
Gross floor area	2,800 m ²
Bamboo used	Dendrocalamus giganteus, Phyllostachys pubescens
Photos	Maira Acayaba

This small hotel has an abundance of private spaces where guests can relax in peace. An old elevator has been restored and now connects all three floors. Outside, fountains, lakes, waterfalls and a variety of gardens amplify the sense of tranquility and relaxation. The high ceilings inside are lined with bamboo. The large openings and windows, combined with the bamboo ceilings create a light-flooded bright interior that successfully combines modern design with traditional materials. The use of natural materials and neutral colors underscores the intended tranquility of the design.



↑ Interior of living area
↓ Terrace and pool



↑ Ground floor plan
→ Bamboo roof leading to entrance

