Building with Bamboo
Design and Technology of a Sustainable Architecture
Gernot Minke
The pavilions were developed by Markus Heinsdorff for the “German Esplanade”, a three-year government-sponsored cultural initiative during which Germany presented itself as a modern, creative and future-oriented country in selected large cities in China under the overall theme “Cities in Motion”. In 2008 and 2009 Heinsdorff presented an arrangement of different pavilions on city squares in Chongquing, Guangzhou, Shenyang and Wuhan. Each pavilion was composed of different elements that could be combined for different forms and spaces. They are dismountable after their use. The bamboo used is Phyllostachys pubescens, called “Mao bamboos” or “moso” in China. Most of the façades are transparent; others have double walls with an intermediate room where air circulation naturally occurs. The roofs are of white and semi-translucent membranes, fixed to steel rings.

The Navette and Lotus types of pavilion have stairways of two bamboo canes, 35 cm apart, diagonally tensed by steel cords. The same elements serve as trusses to support the roof. The membranes of the pavilion roofs are tightened by the centre column, which is composed of bamboo canes. This column can be raised to tension the membrane. The façades have beams of laminated bamboo, horizontally curved where the gold- or silver-coloured metal weaves are fixed. Behind these are plastic, coloured or translucent membranes to enclose the pavilion space.

The central pavilion has columns in the form of a “V” in the wall, and beams in the form of a “V” in the roof, which are interconnected with a type of portico (see Chapter 10, “Beams, Trusses and Porticos”). More connections can be seen in Chapter 9, “Joints”.

Architect
Markus Heinsdorff
Organisation and realisation
MUDI Architects, Shanghai
Completion
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The two-storey, 8 m high building with a footprint measuring 25 × 10 m, contains an exhibition space and game and conference areas. The roof construction is made of 8 m long poles of Julong bamboo from South China with a cross-section of up to 23 cm. Laminated bamboo frames support the floor of the upper storey. All structural bamboo elements have been treated with a fire prevention agent. The stainless steel connecting pieces were developed especially for this pavilion and are designed so that the building can be easily disassembled after use. Threaded elements at the foot of the columns make it possible to accommodate tolerances. The ends of the bamboo canes were first soaked with polyurethane resin and a further layer of polyurethane-resin-soaked grit to provide a good mechanical key. The ends were then filled with a concrete mixture made with a high proportion of fly ash, which ensures that the concrete adheres firmly and without pores or cavities to the inner surface of the hollow bamboo section. Steel connecting pieces set into the concrete allow the bamboo sections to be connected to one another. The façade of the pavilion is covered with a light-permeable ETFE membrane covering, the roof with a PVC membrane. The furniture, also designed by Markus Heinsdorff especially for the pavilion, is made of laminated bamboo profiles.