Jörg Stamm

To his person

bamboo boardings

After having finished school and social service, Jörg Stamm began his **apprenticeship as a cabinetmaker**. In the same time he learned to speak spanish and by this he built the basis for his aim: to work in the development aid in south america. As a joiner he was very fascinated of stairs, houses, boats and bridges for years and so he worked in several wooden construction firms, too. His **first project in the development aid** was a **biogas facility** in a village in Ecuador. Not until Columbia he learned about **bamboo** and really to appreciate it. He already used it as **boardings for concrete buildings -** a true alternative to cutting down precious tropic trees in the rain forest.

After this first contact with this underestimated material he recognised its potential and it drew him in its ban.

Jörg Stamm at work

Bridge of Coquiyo

History

An earthquake close to "Nevado del Huila" in june 94 after months of heavy rain caused a **mud wave** of about 20 m of height, which went down in the valley of the river Paez. 2000 people were killed by the avalanche, 120.000 lost their homes and income. In a very short time houses, streets and many bridges had to be built. Soon after the first relief actions an organisation of the government (called "NASAY KIWE" = "our land" by the indios) began with the **reconstruction of the territory**. In less than half a year all natural materials were used up due to the reconstruction measures in the area of Paez up to Tierradentro. Fortunately programs for reforestation were initiated and other efforts to keep the balance of the ecological system in the area. As the director of the NASA KIWE, the environmental expert Gustavo Wilches and his engineer Victor Jose Gomez were discussing the reconstruction, they arrogated a bridge and chose the project of Jörg Stamm, who had planned a roofed bamboo bridge. The only condition was to issue a comparison of costs with a metal bridge. So Jörg Stamm drove to the institute of light construction "Frei Otto" in Stuttgart.

Here he met competent people for construction with natural fibres. But for the static of his construction they referred him to **prof. Führer of the RWTH Aachen**. in Aachen they were able to present the research, some recommendation, graphics and calculations in just three days. Afterwards Jörg Stamm returned to Columbia and signed the contract.

Static system

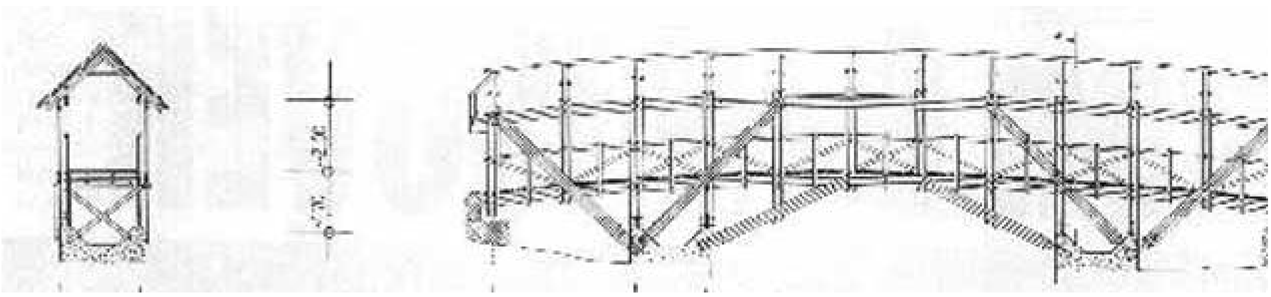


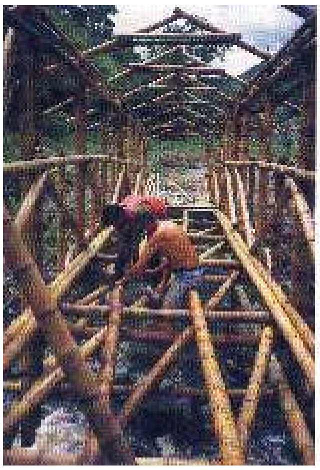
Bild 6: Querschnitt

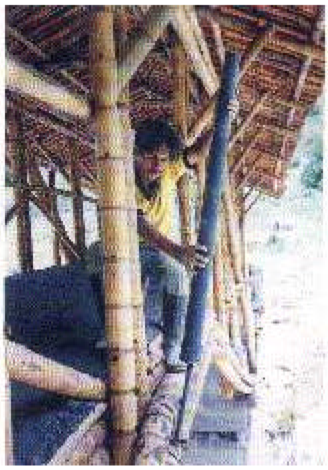
The force introduction just happens at the two piers, meaning that **the outer fields of the bridge are ac cantilevers**. The reason for this is the instruction of the bridge ramps on the shore. These gravel filled wire b did not get any foundation and are exposed to a danger of rinsing by high tide. The bridge would be able to ke position independently without the shore connection, because only the piers are founded.
The floor covering is made of **concrete**, because the bridge is also at the traffics disposal. This amounts a **bright of 2m**. **Bamboo** is used for boardings as well, by splitting the pipes and so receiving the lost boardings The construction is laid out for the load of a 2t-truck. It is with its **124 mostly stiff and continous bars** extı static indefinite, what probably the great scittering of the material qualities compensates.

Construction process

First of all a cableway was installed for material transportation, with which a little supporting bridge was built. Now the **preparation of the carriers** begun, by whom Jörg Stamm not only in his activity as a carpenter was demanded. It was very important to get the natives used to a strange way of working. Working after complete construction plans. But he succeeded with good **teamwork and comprehension**. After concluding all connections the next step was to move the **two ton carrier** at the same place. The natives were very sceptical and tried to convince Stamm of the failure of his intentions. Finally he succeeded again with the help of two 12m high posts, pulleys and the power of just two men.

Now the centres could be made and filled with **mortar**. Here the consistency of the mortar must be adjusted, so that already a very small hydrostatical height must be enough to fill the hollows completely.





Jörg Stamm thinks that this project is an unusual variant of the technology transfer, because the "veteran" european system gets integrated with different materials in the columbian area.

Construction process in pictures

Preparations

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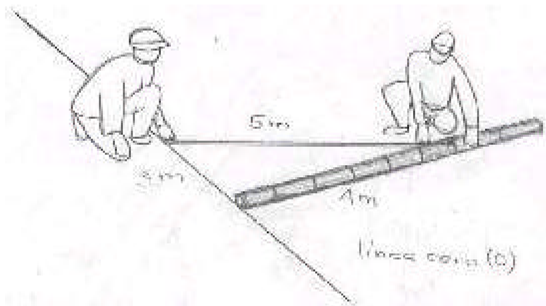
From the bambooplant to the bridge

Preparation

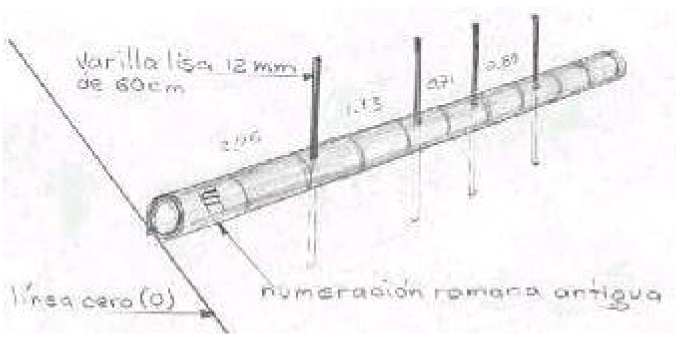
Naturally in the beginning is the harvest, which is unfortunately caused by a bare blow, because reforesting just happens occasionally. As experience shows **the central third of a bamboo pipe** has the greatest firmness. First of all the pipes were cut bit by bit **to dry them 6 - 12 weeks** on a wooden storage place. If you take into consideration, that every bamboo was exposed to individual conditions during growth, it´s only natural that every pipe has different properties. So **you arrange all bamboo pipes by length, straight, functional abilities,** etc. Additional you make a prechoice which pipes you could insert into the suitable part of the bridge, because in some spots you even need curved bamboos.

After the drying the braids and the moss were washed off, and the little walls inside the pipe were stuck through. So it was possible to **waterproof** the bamboo actually and completely, because just the smooth zones inside are able to take up the salt solution. Normally in Columbia people use benzine or pentachlorphenol for this process, but Jörg Stamm refused and decided on a **waterproof solution of bor**.

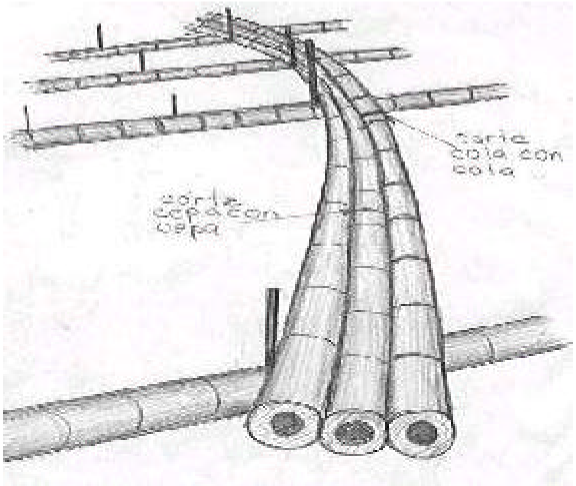
In the next stage the first curve construction will be made of one piece on the ground. To put the geometry of this bridge with very simple measures at the face into action, people served some tricks. At first they put up with the help of a tightened rope the **zero line**, which will correspond in the end to a horizontal line (here the lower side) of the bridge. For this step you choose the greatest possible area in the surrounding, where you can **measure and mark the distances** of the carrier elements. To put on exactly rectangular the correct height of every vertical bar, you span a triangle with the help of a second rope and fix the bamboo bar by means of the **Pythagoras sentence**. First of all you mark this spot.



At this mark the bamboo bar will be drilled through and a metal bar will be hit through the hole about 30 cm into the ground.

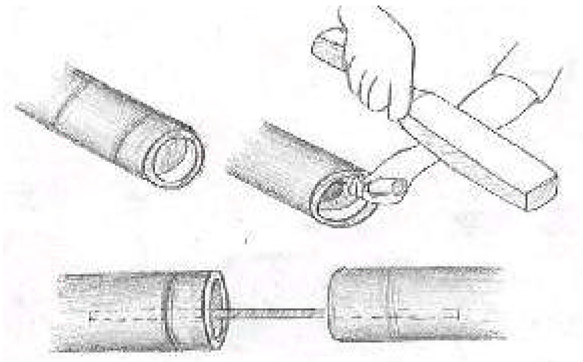


12 cm of the metal bar should be visible, so you can fix the curved bamboo pipe in this centre.

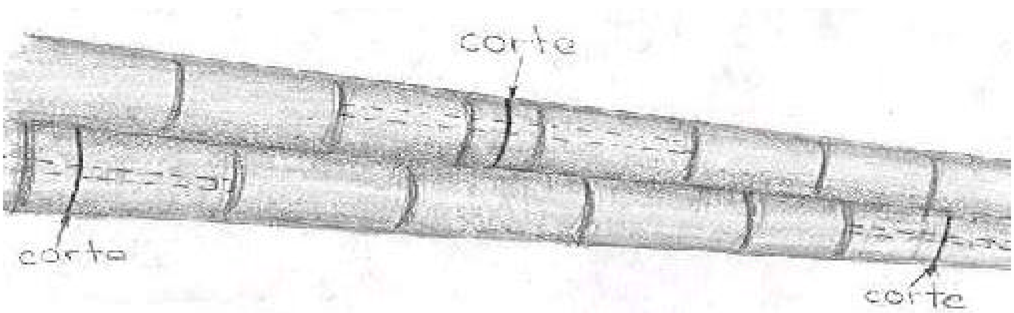


Connections

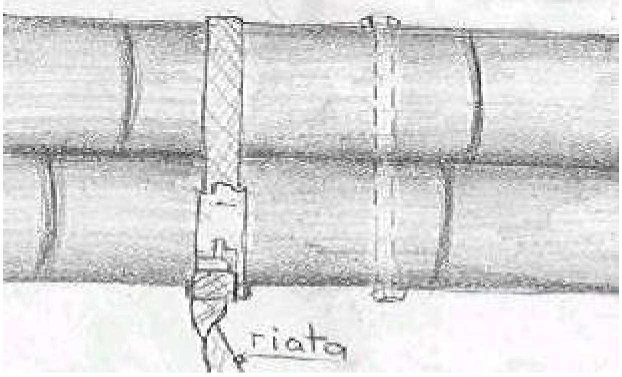
To produce a very long and loadable pipe out of several little bamboos, the **intersection should be close to the second or third knot**. Then you process the inside of the pipe and break through the little walls to lay in a little metal rod. Now the mortar can be filled in. The distance of the cuts of these combined carrier elements should amount at least **1.5 m**.



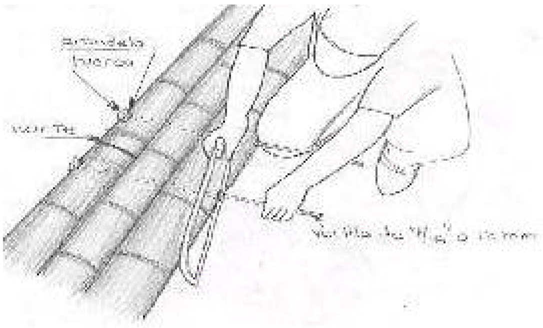
By curves of static effective pipes, which lay on top of each other, the knot should better be **moved**. this principle is known from the brickwork building, too.

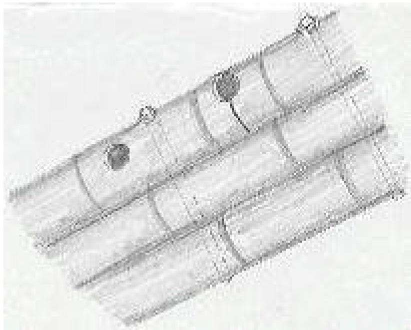


During time of construction it is necessary to connect the pipes temporary, for this a **strap** will be put on which keep the bamboos in the corrct position. Later on the holes for the screws will be drilled and the connection gets durable. This screw connection should be close to the knot, though you have to pay attention not to tighten the screws too much, because there is the danger of **crushing** the pipes.

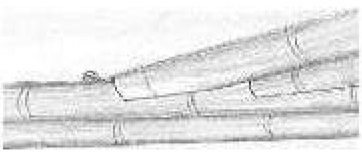


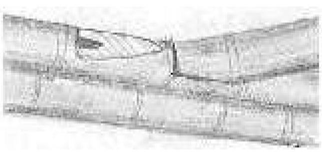
To resist the arising thrusts during **compression**, thin metal rods will be laid in the appropriate spots in the "beam".

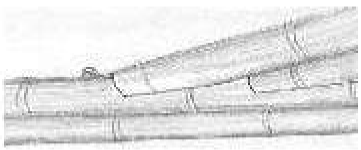




To prevent the rods from crushing the pipes under compression, the knot will be filled with mortar, too. For this it is necessary to drill a hole with a minimum diameter of **1 cm** to fill in the mortar as good as possible.

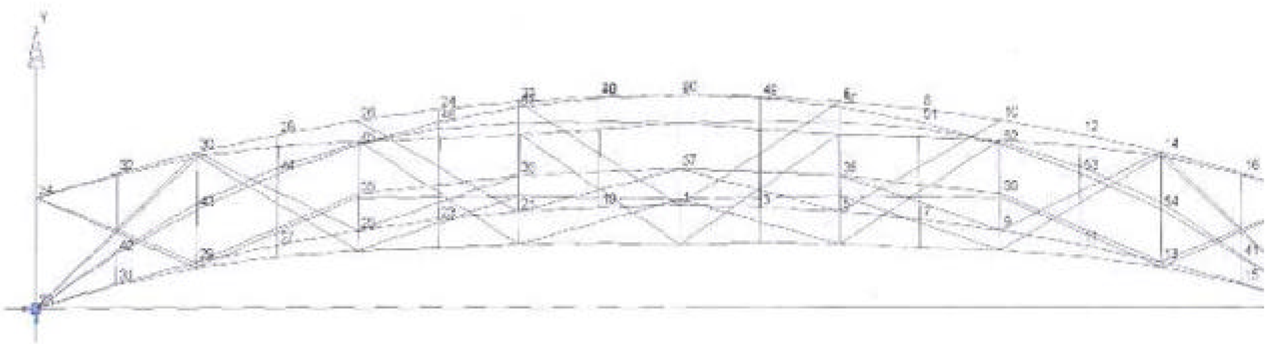






Research

Scientific studies



One problem which still hinders the bamboo construction is the fact that there are only **few scientific s** **practical values** to this material. So a static calculation, which is demanded by the planning council, is mor issue than for usual materials. Even in this field Jörg Stamm engages, he investigated the load behaviour of bamboo carrier of his bridge.

Results:
-by processing the concrete covering a distributional load of 20 tons over 40 meters came into being. Under the carrier just lowered about **4 cm**.
-by an additional load of a 3 ton truck on the first third of the bridge, the carrier just lowered about **3,5 mm**.

Exactly tests have not been made yet, but these little tests let you realize that the fibres of the guadua bar **serious competitor** for several "innovative" high-tech fibres.

Bamboo seminar

Pedestrian bridge

An actual project of Jörg Stamm is his **bamboo seminar**. After six years of experience in this field, star
mediate his innovative and practiceorientated knowledge.

In august 2000 he arranged in cooperation with the german society for technical teamwork (**GTZ**) and university in pereira a comprehensive course of **bridge building** for architects, engineers and workm chairmanship of dr. Samuel Ospina (dean of faculty) and dr. Michael Tistl (GTZ representative of the environm the course developed a 40 m spanning pedestrian bridge over two lanes.
According to the same construction plans a bridge in Tierradentro, Inza came into being. This 30 m long bridg river.

Bridge in Tierradentro

Ground plan and front view

This seminar was finished in september 2000 and it showed that even unpractised workers are able to proc girder after just three days with very little mechanical expenditure. The bridge is the first bamboo building in ur got all static permissions. Finally this step was owned to the frankness of the major.

Construction in pictures

Construction of the carriers on the floor

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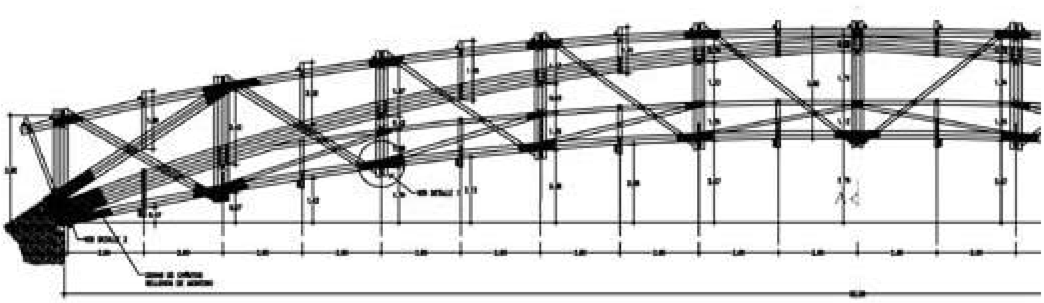
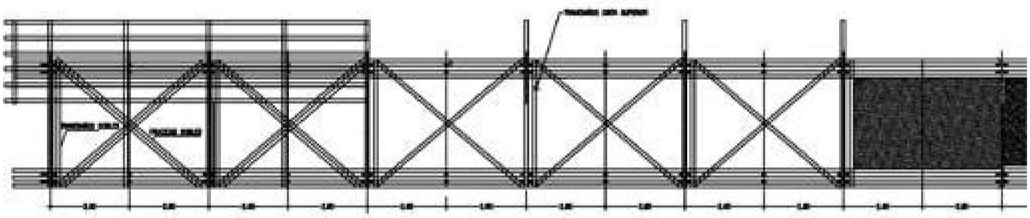
Further projects

52m bridge

This bridge (Liceo Frances, Pereira) with its **span of 52 m** is the longest one realized by jörg stamm. like at the bridge built during the bamboo seminar, two compression curves, each bundled of 12 bamboo pipes, are the main constructive elements. Although the foundations were pressed aside some cm by the huge horizontal force of the very flat curve, the bridge still exists and is used furthermore, after having reinforced some elements.

For Jörg Stamm the greatest success is seeing people accept and use his constructions.





Precast bamboo bridge

An important component of development aid is the **export of bamboo**. With this goal, Jörg Stamm developed precast bamboo installations like this bridge. It consists of premounted sinlge elements, that can easily be transported and only have to be sticked together. Areas of application could be golf courses, expositions etc.

Precast single elements

Other projects