

I WATER PROBLEM IN ARID AREA (LOESS PLATEAU)

I BAMBOO GRIDS

Bamboo Grids collect rainwater from the slopes and store it in tanks. At the same time, Bamboo Grids reduce the sandiness of the slope surface and retain soil moisture, and grass seeds are sown in the gaps between Bamboo Grids to improve vegetation cover and reduce soil erosion.

• ENVIRONMENTAL

The Loess Plateau, facing the Gobi Desert and the Mongolian Plateau to the north, is located in northwestern China. The Loess Plateau was once a high, flat plain with the most widely distributed region of loess on Earth. Now, more than 70% of the area is a gully-hill dominated region owing to massive soil erosion during the later Quaternary and intense human activities over the past thousands of years.

The loess, being loose, porous and homogeneous, is easy to cultivate and has been an early and long-lasting center of cultivation because of fertile farmland (Liu & Ding, 2004; Montgomery, 2007; Wang et al., 2010). Agriculture started about 7,000 years ago on the Loess Plateau, and hence, it was considered as the cradle of Chinese civilization (Zhu, 1989).

• LOCAL SOLUTION

Terracing is an efficient way to control soil erosion on slope cropland by leveling ground surfaces and reducing the slope lengths.

One strategy regional officials have developed to keep the desert from - literally - gaining ground is to stabilize sands at the edge of the desert with a grid of straw squares, measuring about 1 square meter each. The grid, which looks like a massive fishnet over the sand, holds the ground together well enough to grow some hardy species of grass, which in turn provide enough stability to cultivate larger plants (www.dw.com), 2021).

For railway lines running through the border zone of semi-desert where shifting sand dunes stretch and undulate, there are protective belts built and forming a protective system in combination of “sand-fixing, sand-stocking and sand-transporting” on both sides of the road in proportion to the yearly advance rates of sand

dunes. The Zhongwei-Gantang section of Baotou-Lanzhou Railway on the southeastern fringe of the Tengger Desert is such a case.

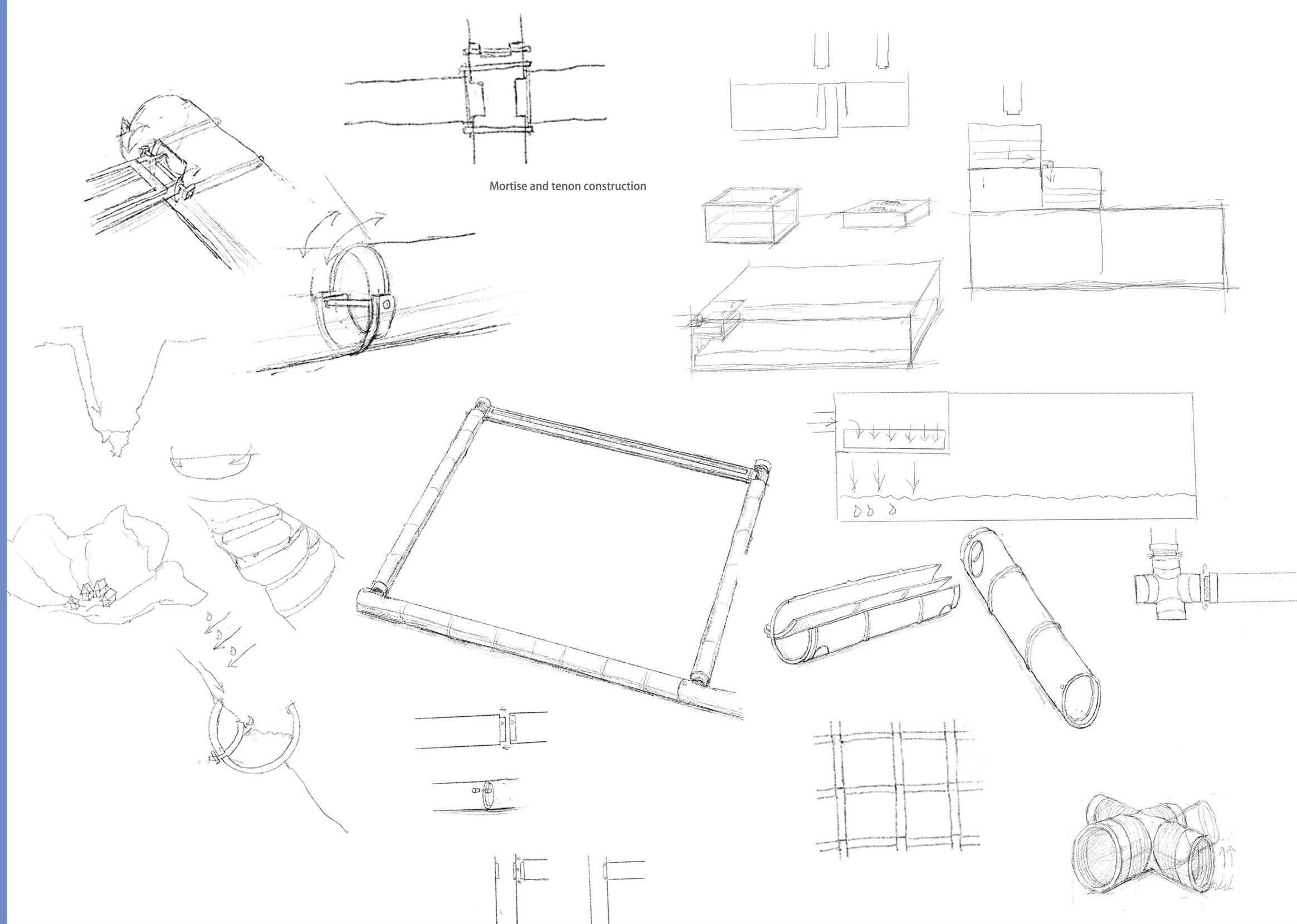
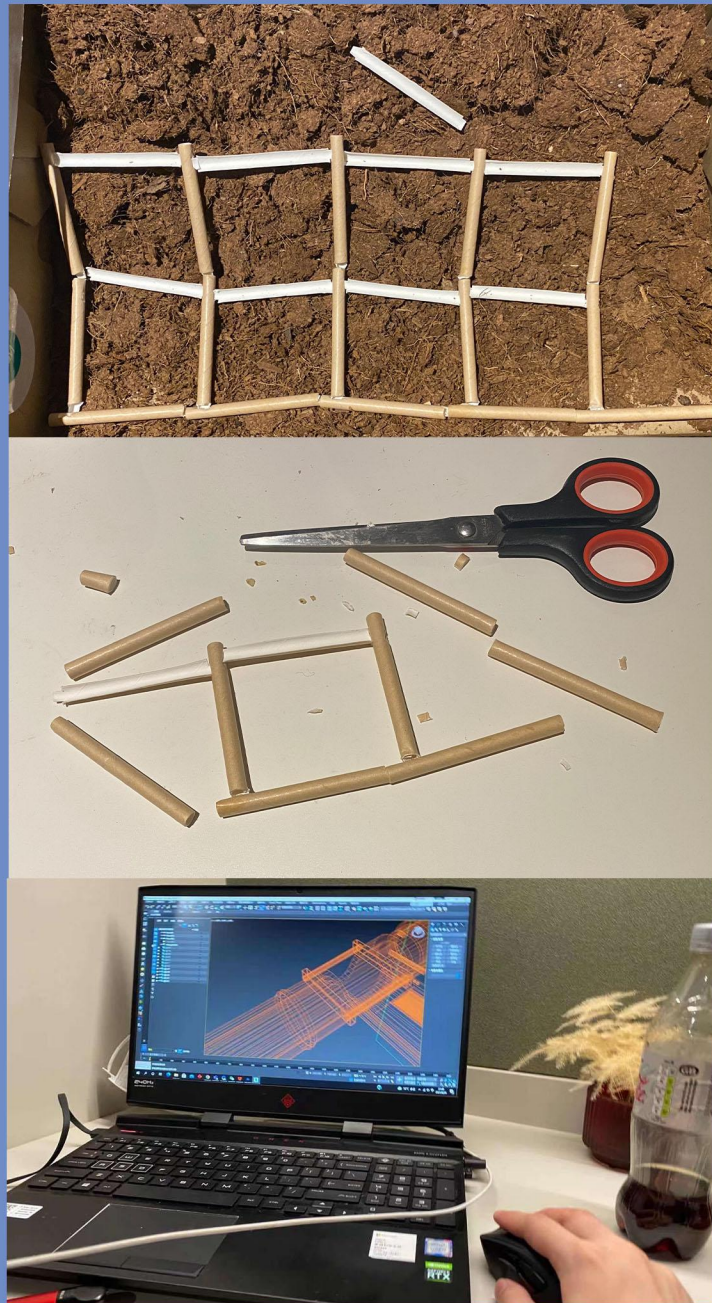
There they built a 500 m wide belt on the side of the main wind direction and a 200 m wide belt in the secondary wind direction which widespread straw checkerboard sand barriers (1 m × 1 m) with planting sand-fixing plants in grids. Besides providing gravel protection on the slopes of the road and gravel platforms on both sides of the road for transporting sand and checking the advance of sand dunes. Above-mentioned measures are adopted extensively in this section of the railway so as to guarantee the smooth operation of railway in the desert .(Wang et al., 2013)

In some parts of the Loess Plateau where the soil layer is thin, wells can still be drilled. For people living in places with thicker layers of loess, wells are out of reach. People can not from the rivers, springs, streams, pools, lakes, wells to take the daily water, will have to rely on the sky to rain water and drink. Loess Plateau arid semi-arid climate type, summer is the season of rain, other times of the year rain is very little, is the summer rain, sometimes it is difficult to use enough. But there is nothing to do but to cut pools and store water (Qing 163, 2021).



ISKETCH

- CONCEPTS



- CONCEPTS

Concept 1 is concerned with taking advantage of the local environment, or turning a disadvantage into an advantage, and then using simple materials that are available locally, with simple structural designs that can be easily made and maintained by local people. The first is that the topography of the Loess Plateau, with its high and low relief, and the fact that most of the villages are located in the basin terrain, is the main reason why the local people have difficulty in obtaining water from the rivers.

But water flows lower down, so the basin is undoubtedly the perfect terrain for collecting rainwater, as it is like a huge basin. Rainwater can be collected on the slopes by means of a system of pipe structures made of bamboo, and the materials are locally available and inexpensive, as well as being simple and easy for the locals to make.

Concept 2 focuses on how to solve the fundamental problem of soil erosion while addressing local water difficulties. The bamboo grids would have half of their volume buried in the soil so that the pipes would collect rainwater from the slopes while also serving to retain some moisture in the soil.

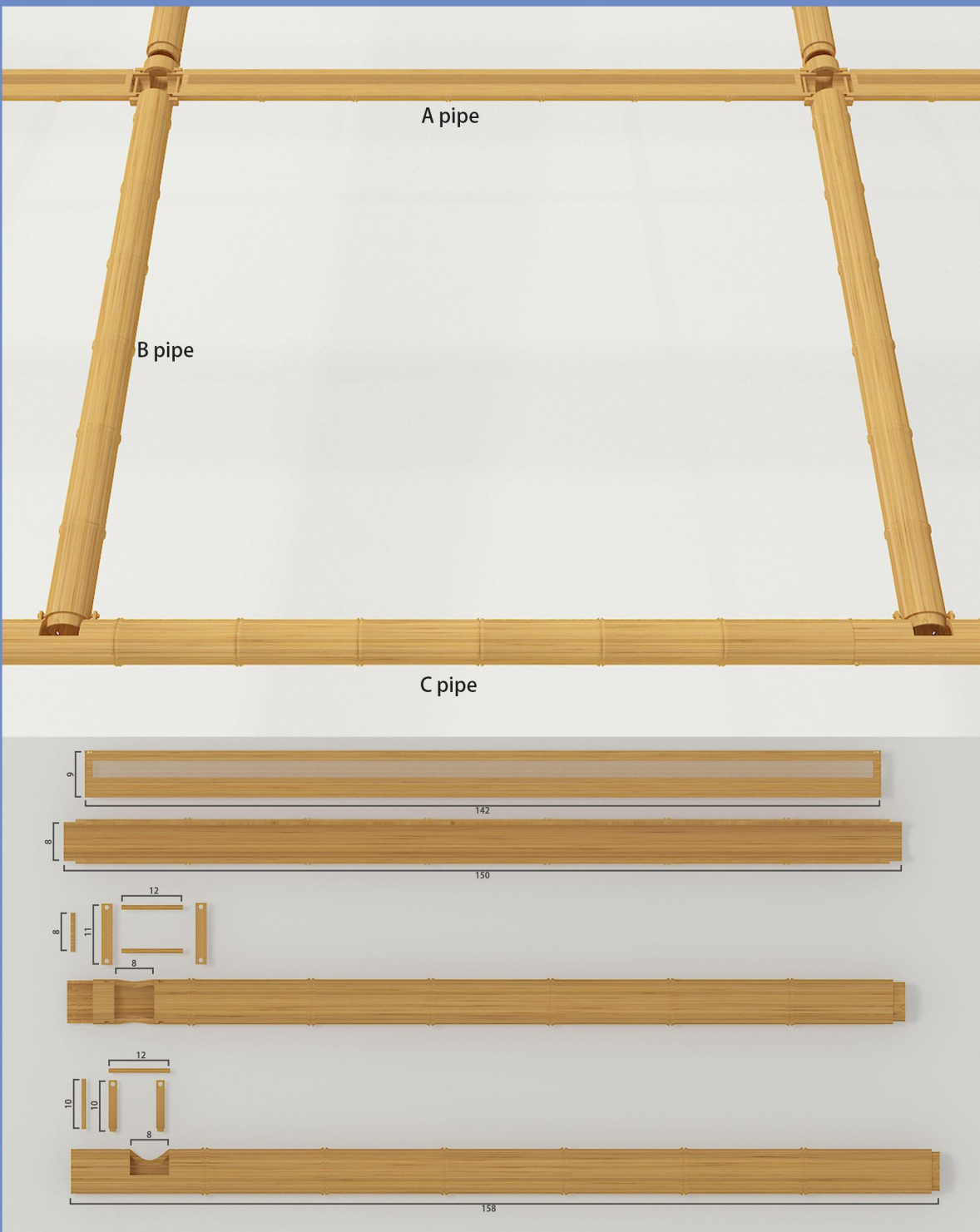
Grass seeds can then be sown in the middle of the bamboo grids, so that after a certain period of time the bare slope can be turned into a lawn, which in turn reduces erosion, thus creating a virtuous circle with regard to erosion.

RENDERING

STRUCTURE AND TECHNOLOGY

Three types of bamboo pipe are used as basic modules, which are joined together with small bamboo blocks and bamboo sticks. Local people can make these three modules and join them to Bamboo Grids according to their needs, allowing for a high degree of user customisation.

The traditional Chinese mortise and tenon construction is used as the main connection method so that it is not difficult to make and to ensure that each section of bamboo pipe is flexible at the joints.



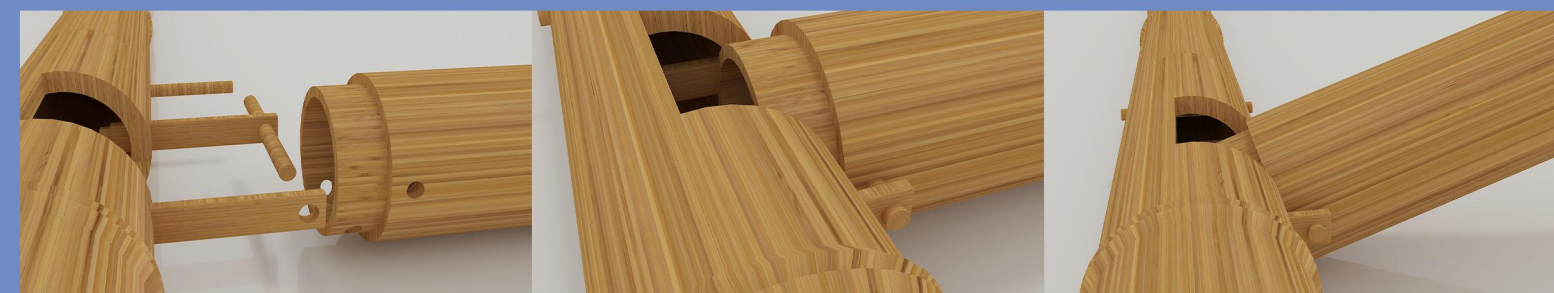
THREE KINDS OF FLEXIBLE JOINT



B pipe connect B pipe

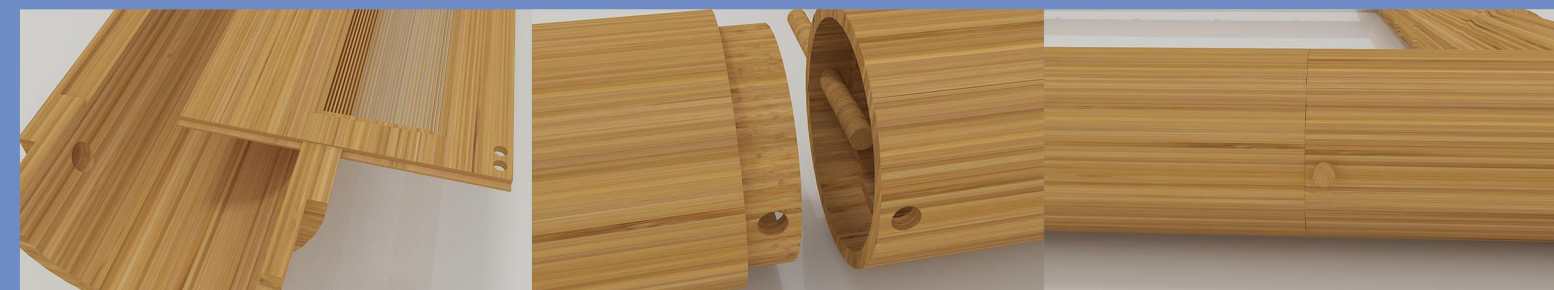


A pipe connect B pipe



B pipe connect C pipe

TWO INFLEXIBLE JOINT



A pipe filter connection

C pipe connect C pipe

• WATER TANK AND FILTER

The local people dig a pool of the right size at the foot of the hill, build a water tank out of bricks and make a simple filter out of bamboo. In this way the rainwater collected in the summer can be stored well and have water tap available for local use.

