

BAMBOO PRESERVATION

PRACTICAL ACTION
Technology challenging poverty



Preservation of bamboo means:

- sound management in storage, and in cutting time: cut the bamboo in the season when the starch content is low;
- attention to details such as keeping the bamboo dry:
 - protect the bamboo from splashing rainwater (build the roof with an over-hang),
 - allow the bamboo to dry quickly and completely after the rain has stopped, avoid contact with soil (use stone foundations) etc. (see Chapter 5 of *Building with Bamboo* by Jules J. A. Janssen);
- preservation in the more narrow sense.

Before dealing with preservation we should first discuss the natural durability. This is lower than for wood and in most cases it is too low for an economic lifetime. The lifetime of untreated bamboo is:

- in contact with atmosphere and soil: 1-3 years;
- under cover: 4-6 years;
- undercover and in a not very humid climate: 10-15 years.

Normally bamboo will be attacked by fungi (rot, only when moist) and insects (beetles and termites). To avoid the last, bamboo has to be treated. Unfortunately it is quite difficult to treat bamboo: the outside and inside are covered with a tight layer of cells, and the vessels through which any liquid can enter the bamboo cover only about 10 per cent of the cross-section of a culm.

The non-chemical or traditional methods will be discussed first, and then the chemical methods. All procedures should be effective, safe and economic.

Traditional methods

The advantages of these methods are that they are very cheap and can be done without special equipment.

Clump-curing The culms are cut, but left in place in a vertical position. The evaporation in the leaves reduces the starch content and consequently beetle attack. However, attack by rot and termites is not diminished.

Smoking The bamboo is stored above the fireplace. The smoke will blacken the culm and might cause cracking too. The effect on durability is doubtful.

Soaking The culms are placed (immediately after the harvest) in water or mud with stones on top of them to keep them down. They are left for several weeks and then dried over a full week (in the shade, not in the sun!).

Seasoning Bamboo has to be dry. This is achieved by drying in the open, under cover, with as much air movement as possible. It can take one or two months.

A general remark to end with: if the local population has a tradition of working with bamboo they will know best the differences in natural durability between the several local bamboos as well as the effectiveness of traditional treatments for various end uses.

Chemical treatments

Many chemicals are used as a preservative for wood or bamboo. We will deal with the most common.

CCA (copper-chrome-arsenic composition, in the proportion 3: 1:4) is good for timber, but not for people. CCB and CCBF are better! (B = boron). Its commercial names include ASCU.

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technical brief

The concentration of the solution in water (%) should be approximately the same percentage as the retention (as a guideline only), i.e. how many kilos of dry chemicals remain in 1m³ bamboo after treatment:

- in contact with atmosphere and soil: 8 (to 12);
- in contact with atmosphere, not soil: 5 to 8;
- under cover (trusses, purlins): 4;
- undercover (ceiling, etc.): 3.

Method: modified Boucherie process (i.e. with airpump), lasting as many hours as the percentages of retention and concentration (this again is a rough guideline).

Precautions

Most preservatives are toxic! Avoid contact with your skin. Wear gloves for handling the preservatives and treated bamboos, as long as they are wet. Anyone who drinks CCA or Octabor should drink a lot of water (milk is even better) and be forced to vomit (put your fingers down his or her throat) at least three times. Consult a doctor as quickly as possible; take a package of the preservative with you and show it to the doctor.

Boric acid, borax and boron are cheaper than CCA and less poisonous. For boric acid and borax the commercial names include Octabor. The concentration of the solution is 2.5 per cent each, to be dissolved in hot water; the retention, for use under cover only, 5kg/m³. For boron the full name is Octoborate disodico tetrahydrate; the concentration is 10 per cent in water.

However, both will diffuse out of bamboo when moist.

Method: open tank method, or modified Boucherie until moisture of 10 per cent of the volume of the bamboo has left the lower end.

Diesel oil is not toxic, but beetles do not like the smell. They wait until the smell has disappeared or until they are really hungry.

Three methods of treating the bamboo with these preservatives are as follows.

Put the solution into the trough, using a plastic bucket. Before putting the bamboo into the trough, cut it to the required length, splitting it if required, in order not to treat bamboo which will not be used. All bamboo should be covered with preservative. Put big stones on the bamboo, enough to keep the bamboo down (Figure 1A).

Open tank method

An open tank is a trough of about 4m long. This can be made by cutting two 200-litre drums in half vertically and welding them together like a canoe. Cut the drums with a cold chisel and a hammer; flatten the sharp edges with a hammer. After welding, paint the inside with bitumen, tar, or anything like that to protect the drums from corrosion.

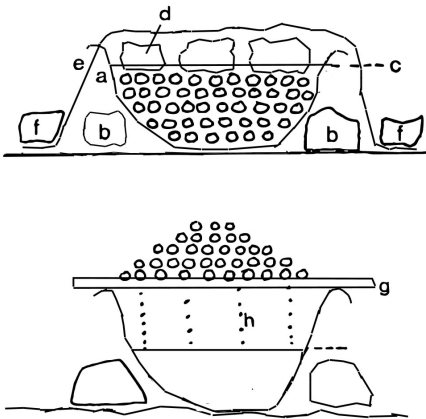
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The bamboo must soak for a full week (split bamboos three days). Cover the trough with plastic to keep the rain out, and keep children and animals away. After soaking lift the bamboo (wear gloves!) on to sticks across the trough (Figure 1B) and let the preservative drain back into the trough for a few hours. After that, let the bamboo dry for a week in a rack, protected from sun and rain.

A good variant for split bamboo is the dip-diffusion method: dip the bamboo for 10 minutes, as before, but in a higher concentration, and next wrap it in plastic for one week. Then season it in a vertical position for at least three days.

Treated bamboos must not be burned; the gases of such a fire are toxic. Bury them in the ground, away from wells (for example, in a pit latrine, because these are always at a safe distance from wells).

Figure 1: Open tank method



- A. Cross section of a trough
 - a. Trough with bamboos
 - b. Stones to keep the through upright
 - c. Level of preservation
 - d. Large stones, to keep the bamboo down
 - e. Plastic cover against rain
 - f. Stones to keep e in place
- B. Draining the bamboo
 - g. Sticks
 - h. Dripping preservative

Butt treatment method

The freshly cut culms should immediately be put bottom ends first into a drum containing preservative. The leaves, still in their place, act as a pump, because of the process of transpiration. After one or two weeks the preservative reaches the top; watch the change in colour of the leaves. Place the bamboos in an empty drum to regain the surplus preservative from the culms. This method can be used instead of the Boucherie when only a few culms are to be treated.

Boucherie method

This method must be applied on fresh bamboo, the very day the bamboos are cut (or they can be kept under water). Pressure is needed to press the preservative into the bamboo, and can be created by an airpump, or a tower. In this last case a drum containing preservative is put on a tower of 4 to 6m high and connected by tubes to the end of the bamboos (see Figure 2) using cuffs (see Figure 3). At first, sap will drip from the low end with hardly any preservative. As the process continues the concentration of preservative in this sap will steadily increase.

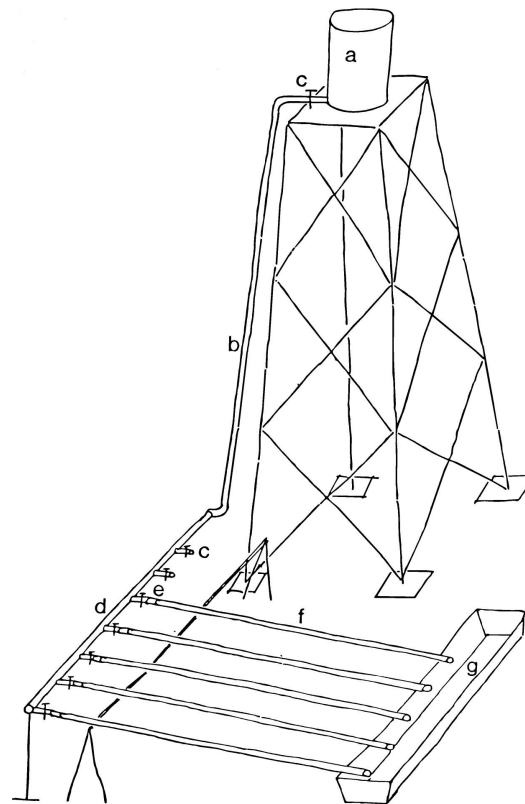


Figure 2: Boucherie method.

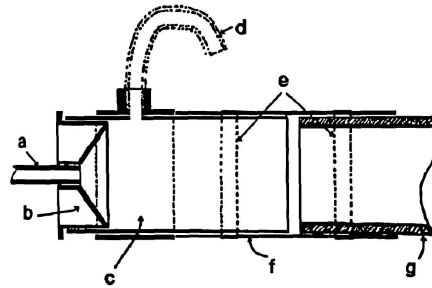
- a. Drum on tower
- b. Tube, pressure resistant
- c. Valves
- d. Pipe, steel or iron
- e. Connecting tubes with metallic clamps
- f. Bamboos
- g. Drip trough

This sap must be collected. It can be used again if preservative is added to achieve the original concentration. The culm is ready when preservative in the original concentration

drips out the far end. This takes about one hour. Check this yourself: give the preservative a colour from which you can judge the result, or use a piece of pH (litmus) paper to check the concentration. Put the bamboos in vertical position in an empty drum to regain any surplus of preservative from the culm. (Note: this method is not applicable to bamboos with thin walls)

Figure 3: Cuff to connect bamboo.

- Entrance of liquid
- Reduction of diameter (PVC)
- Pressure-chamber, PVC, 100mm diameter
- Exit of air, flexible plastic hose
- Metal wrapping
- Rubber sleeve



The economics of preservation

Generally speaking, a good (chemical) preservation can increase the natural lifetime of bamboos to 15 years in the open and 25 years undercover. Unfortunately, very few data are known about the price of preservation. The author has calculated from a real case in Africa in 1985 that preservation with Octabor in an open tank costs 30 per cent of the price of the bamboo, which is certainly economic. The same ratio has been found in Costa Rica in 1994 with boron and Boucherie: the bamboo costs \$0.36 per metre, and the preservation \$0.13 per metre.

For an economic use of bamboo in building it is important to pay attention to sound construction methods.

Termites

If the bamboo is likely to be attacked by termites, 1% Dieldrin added to the preservative is effective. However, Dieldrin is dangerous, and use is illegal in several countries.

Note: the remaining preservative can be stored in a closed drum for another use in the near future.

Further information

- *Non poisonous Timber Protection* Practical Action Technical Brief
- *Designing and Building with Bamboo* by Jules J. A. Janssen
- [Traditional Bamboo Preservation Methods in Latin America](#) INBAR
- [Bamboo Preservation Compendium](#) INBAR

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An international organisation that develops, provides and promotes appropriate technologies and other bamboo and rattan based solutions to benefit people and their environment.

Bamboo Technologies <http://www.bambootechnologies.com/>

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