

A Long-Term Survival Guide - How To Make Bamboo Joints:

Bamboo is one of the most useful plants that survivalists can grow, as it can be used to make shelters, traps, cages, tools, weapons, bridges, rafts, towers, fences, water wheels, irrigation pipe, and thousands of other items. Once you have a supply of bamboo, the challenge is learning how to connect pieces, to make those useful items.

Bamboo poles can be tied together using any of the traditional lashing knots used for pioneering projects, such as the square lashing, round lashing, diagonal lashing, shear lashing, tripod lashing, floor lashing, or ladder lashing.

But there are also many kinds of joints used for connecting bamboo poles. Here is how to make some of them:



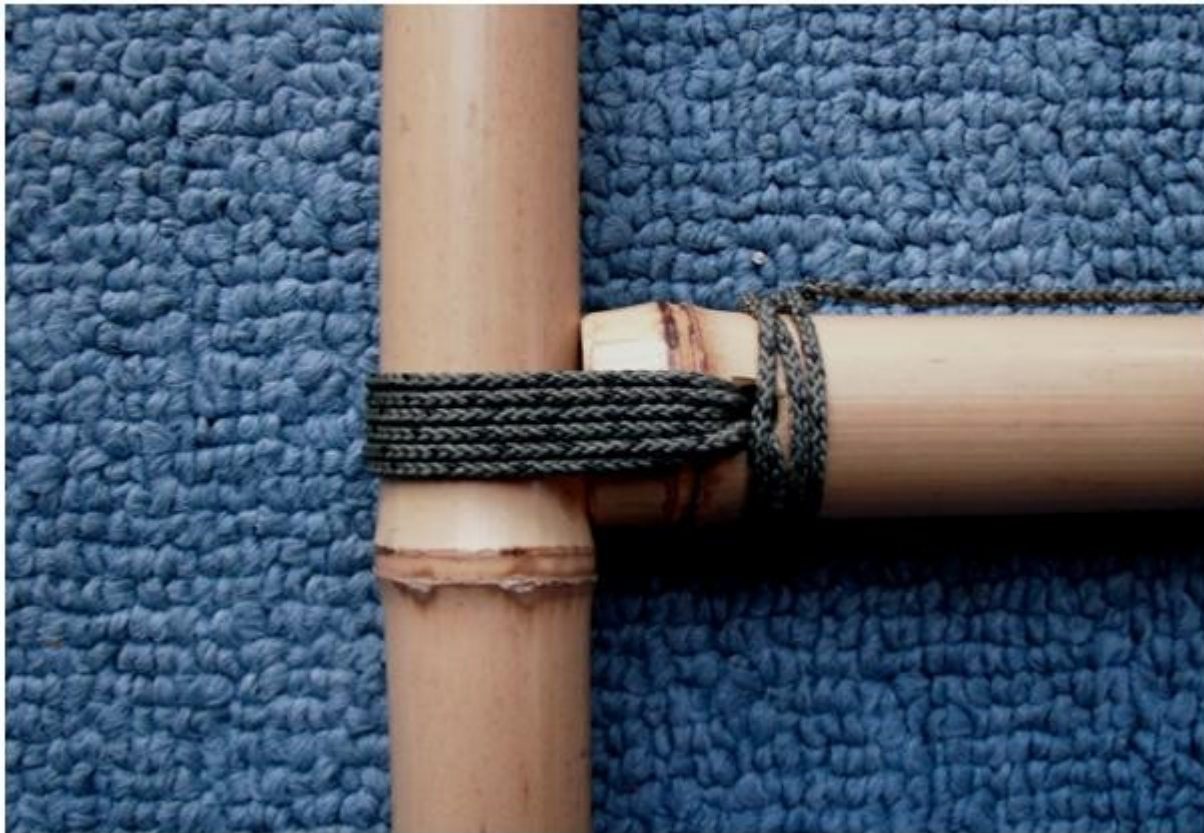
One of the simplest bamboo joints is the drilled lashing. An upright pole is cut above a node, and a hole is drilled all the way through the pole, just below the node. A cross-pole is then secured to the upright, by a lashing through the hole. For maximum strength, a node of the cross-pole should be positioned on the upright. Lashing on both sides of the cross-pole node prevents the poles from shifting.



A piece of wire bent in half (or an improvised wooden needle) makes threading cordage through the drilled hole easier, especially the last pass or two, after the hole is already packed with several strands of cordage.



Here is the completed joint, showing how lashings are made on both sides of the cross-pole node. The lashing is finished with a clove hitch around the upright, and a square knot. Tying lashings around any drilled hole is a good way to strengthen the joint, and helps prevent bamboo poles from splitting.



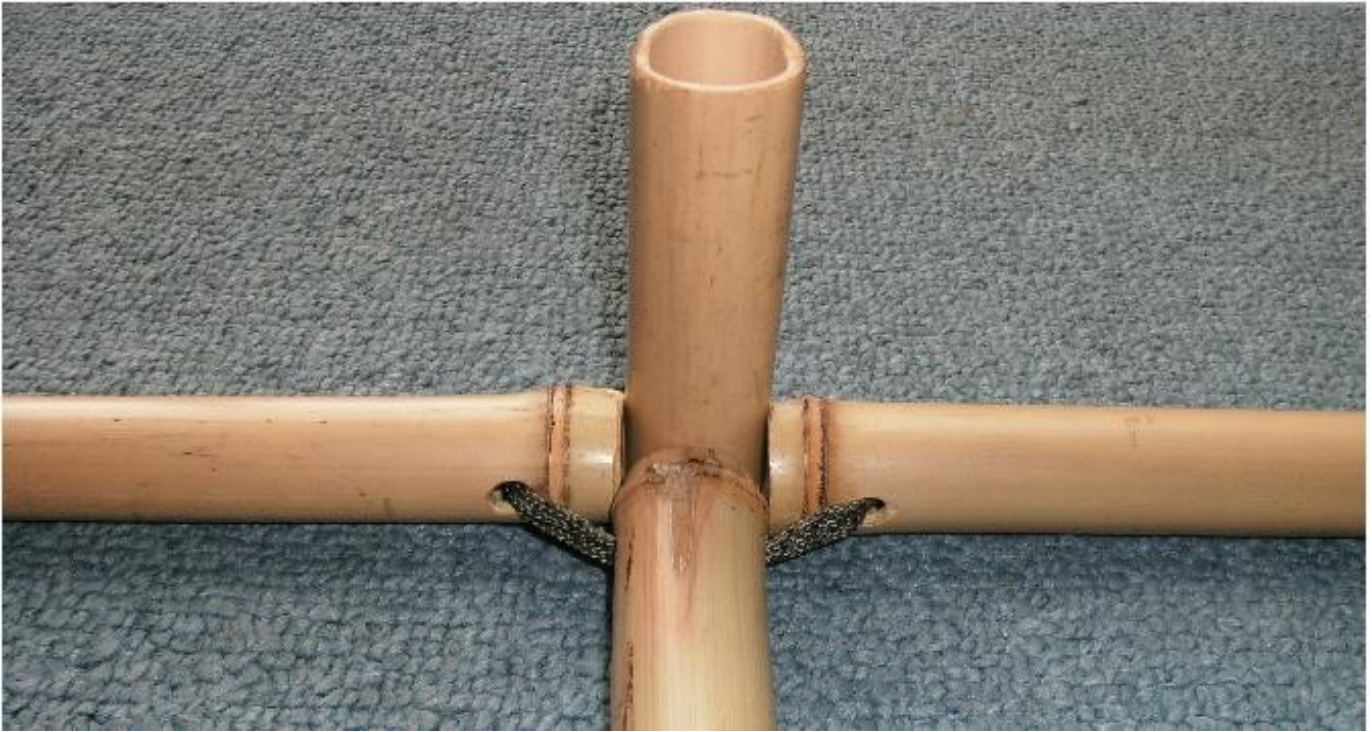
The drilled joint can also be used to connect the end of a cross-pole to an upright, as shown here. For this application, the lashings should be tied above a node on the upright. Downward pressure on the cross-pole will simply tighten the lashings further, as they encounter the larger diameter of the node. This is one of the most basic principles used in bamboo construction; having the nodes work for you, to prevent slippage.



Drilled lashings can be used to connect more than one cross-pole to an upright, a good way to make frameworks.



Using the drilled lashing, two cross-poles can be connected to an upright at right angles, to form a corner joint.



Drilled lashings have been used to connect three cross-poles to an upright, in this example.



And in this example, drilled lashings have been used to connect four cross-poles to an upright.
(Once the joint has been formed and tied in place, extra lashings can be added, if desired, for reinforcement.)



A variation of the drilled lashing is the pegged lashing, where a bamboo peg is inserted into the drilled hole, and then the lashings are tied around the peg, instead of being threaded through the hole. The strength of this joint is limited by the strength of the peg, so use a bamboo peg that has thick walls, or a hardwood peg.



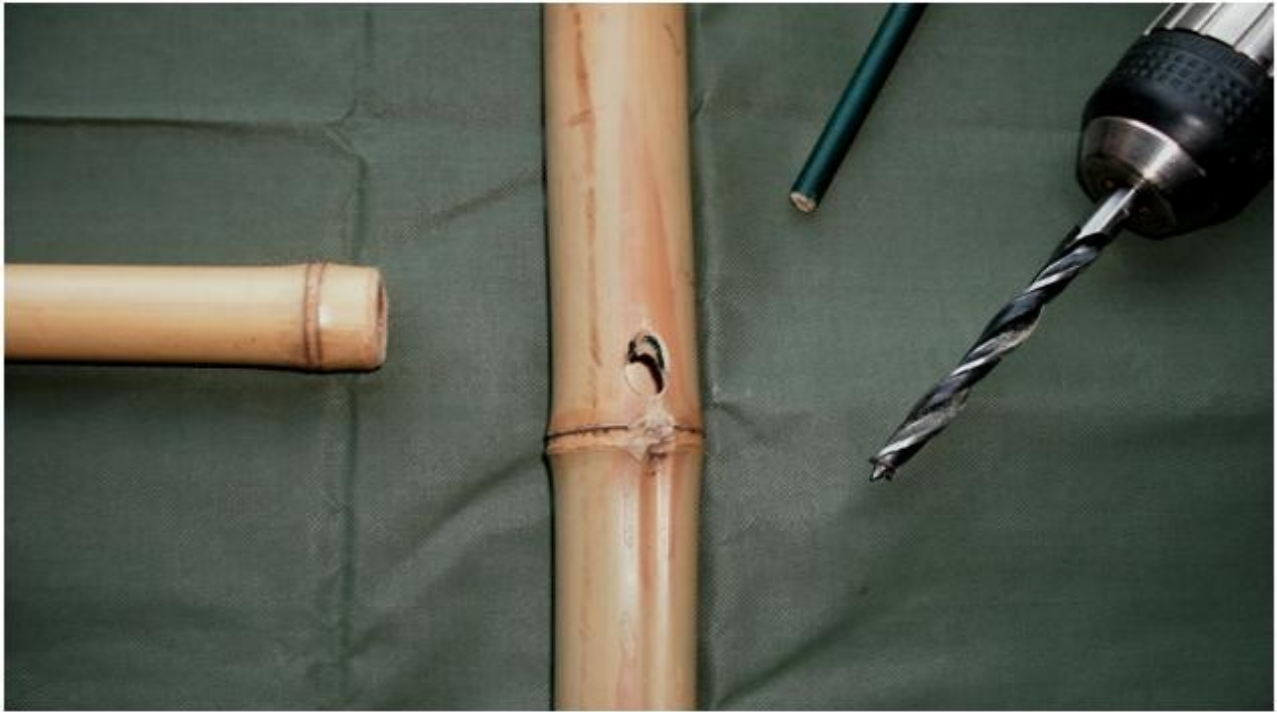
Start the pegged lashing by tying a clove hitch on the upright, below the peg.



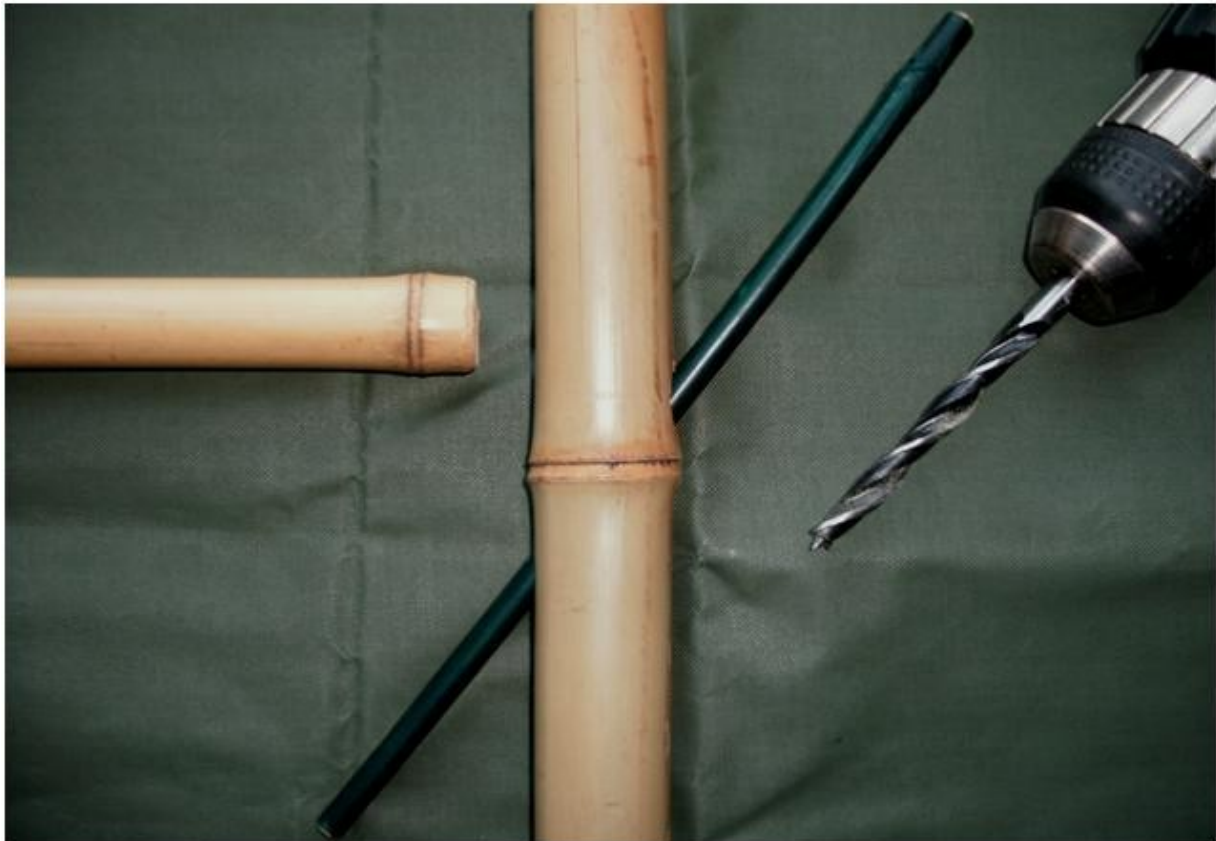
Lash the poles together, then add one or more frapping (tightening) turns around the lashings, and finish with a square knot. The lashings could also be criss-crossed over the cross-pole, if you prefer.



Another way to make pegged lashings is by aligning the peg at right angles to the cross-pole, as shown here.



This joint is a slant-peg lashing. A hole is drilled above a node on an upright pole, so that it passes through the node, and comes out below the node, on the other side. The exact angle can be adjusted a bit, as desired.



A long peg is inserted through the slanted hole, and will be used as the support for a cross-pole.



The lashing is made by starting with a clove hitch.



This lashing was made with a single cord. Separate lashings between the two main poles, and around each point where the peg passes through the upright, could be made instead, if you prefer, and would probably look neater.



This joint is a pegged socket joint. A hole is drilled into an upright, the right size to fit a smaller cross-pole.



The cross-pole is then fitted snugly into the socket, until it touches the back wall of the upright.



A hole is drilled through both pieces, so that a peg can be inserted, to pin the joint together. This joint is often used to make bamboo ladders, using two larger uprights, and smaller cross-poles for the rungs. Maximum strength is obtained by locating the cross-poles just above the nodes, on the upright poles.

(The pegs can be cut off flush, if desired, or left protruding, to make disassembly easier.)



Lashings should be added to these joints, to help prevent splitting under heavy loads.



This joint is called a Key Joint. An upright is drilled, to allow a key piece to be installed. The key supports a cross-pole, and the key and cross-pole are secured together with a pin.



The hole in the cross-pole is made just large enough for the body of the key to fit inside, but not large enough for the node at the end of the key to pass through.



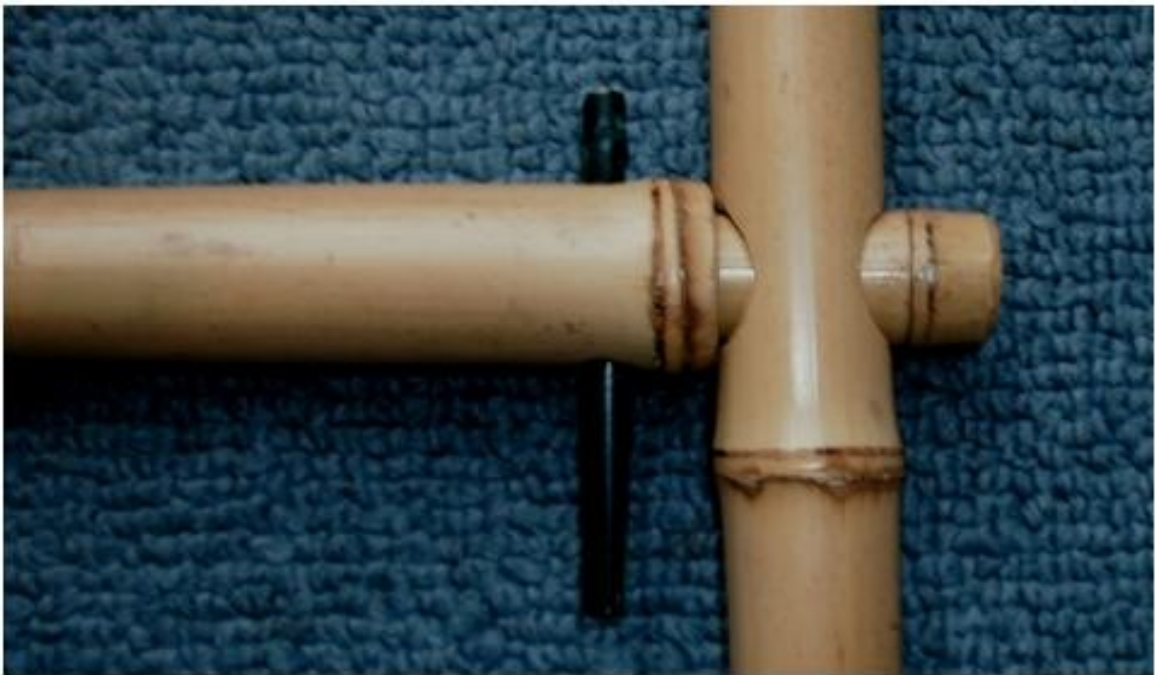
The key piece is installed in the hole in the upright, so that the node jams against the side.
The end of the cross-pole is drilled out, so that the key piece can fit inside.



The cross-pole is fitted onto the key piece, until it contacts the upright.



Next the cross-pole and key piece are drilled, so that they can be pinned together.



Finally, the pin is used to secure the finished joint, as shown here. Lashings can be added, if desired.
Note: A large key piece was used for this tutorial, but a smaller key would weaken the upright less.



This joint is a lashed cross-pole support. A section of bamboo is lashed to an upright, as shown here. (Longer supports can also be used, and these should be lashed at the top, bottom, and center.)



The cross-pole is then lashed to the upright, above the support.



The lashed cross-pole support can also be combined with the drilled lashing, for use when the nodes are not in a convenient location. Just vary the length of the support, to reach the nearest node below the cross-pole.



Diagonal braces can be added to almost any joint, to provide extra stability. Note how the support is positioned so that the ends connect at nodes, for maximum structural strength. Lashings can also be added, as needed.



Two diagonal braces can also be used, instead of one. Multiple holes may weaken the upright, if drilled at the same point, so braces should be staggered, or even connected at different nodes, on the upright.



Lashings above and below braces that do not end at nodes are critical, to guard against splitting.



Diagonal braces can be added to any of the bamboo joints that form right angles.
(The ends of the diagonal braces can be pinned in place or securely wrapped and lashed in place, if desired.)



Poles of different sizes can be connected, by inserting the smaller pole into the larger pole. The end of the larger pole must be lashed first, to prevent splitting. Socket joints like this are used for making long fishing poles or spears, and for flagpoles. Variations include pinning the smaller pole in place before lashing, cutting slots in the end of the larger pole, so that the ends clamp down on the smaller pole as the lashings are tightened, and just using a tight friction fit to hold the poles together. The friction fit is good for uses where the object will be disassembled, and for holding a short fore-shaft, for a spear-head or harpoon.

Bamboo water pipes are made by knocking out all of the node walls with a pipe that fits inside the poles, then fitting the small end of one pole into the large end of the next pole.



Two poles can be connected, using a smaller internal pole for a splice. The inner pole can be left visible, or the two larger poles can be touching, with the inner pole concealed inside. The ends can be pinned, or clamped.



To make a clamped joint, saw or split the larger bamboo pole down to the first node twice, making four sections. (Note: Adding a lashing to the pole, on the other side of the first node, will keep the splits from going too far.)



Enough material must be removed at the saw cuts (or splits), to let the sections clamp onto the inner pole.



The smaller bamboo pole is inserted into the larger pole, until it reaches the node section.



Verify that the sections have enough material removed from the gaps to allow them to clamp onto the inner pole securely, before adding any lashings, by squeezing the ends by hand, and removing more material, if necessary.



Start the lashing at the node end as shown, wrapping the cordage over a long loop of the cord.



After making several tight turns, pull on the end of the loop, to tighten up the first turn of cord.



Continue adding turns, keeping the cordage neat and tight, and then put the end of the cord into the loop.



Pull on the beginning of the cord, to draw the loop tight against the lashing turns.



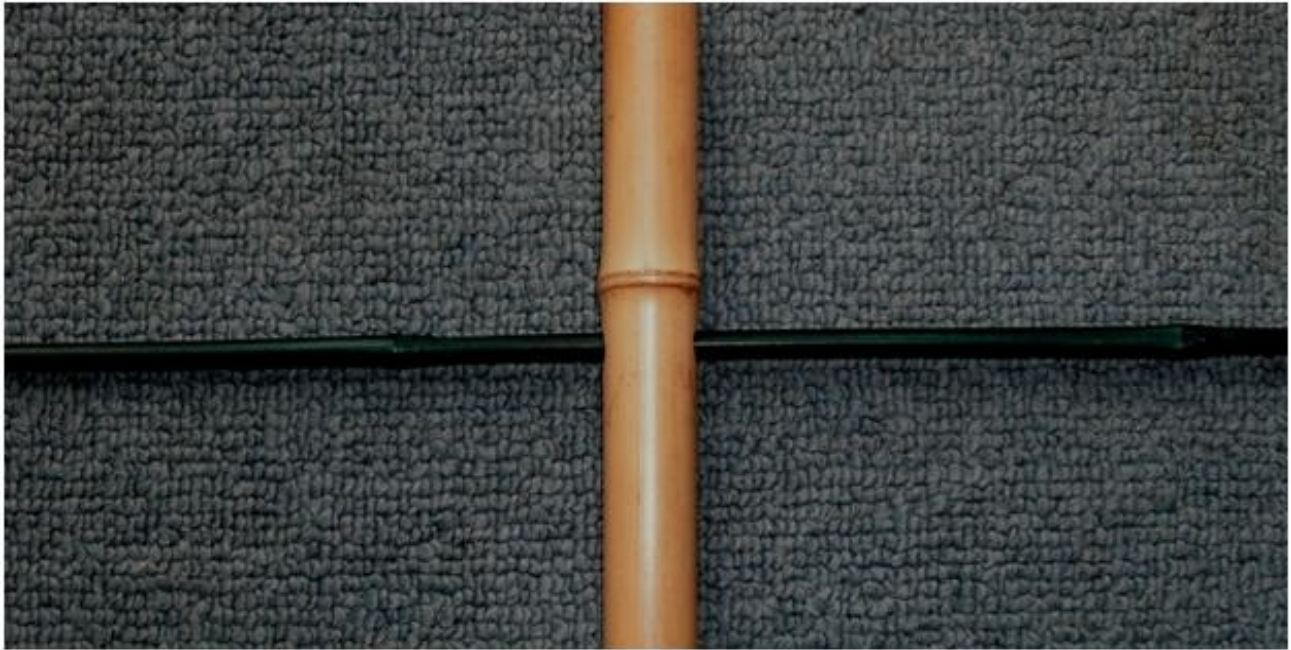
Now keep pulling, and the loop will be drawn under the lashings, taking the end of the cord with it.



Finish the lashing by trimming off the ends of the cordage, or leave some showing, to make untying easy.



Another way to connect poles is by lashing them together, using external connecting pegs. For this type of connection, more connecting pegs are better, so use as many as possible. The joint can be completely encircled by six or more pegs, or as many as will fit, for maximum strength. Longer connecting pegs can be lashed at multiple points, and strips of split bamboo can be used for the connectors, instead of using the round pegs.



Another simple bamboo joint is the through-joint. A hole is drilled through an upright, so that a smaller cross-pole can pass all the way through, and then it is lashed securely, both to tighten the joint, and prevent splitting. (These joints are often used when making bamboo rafts, by passing the crossbar through a line of holes made at each end of a set of bamboo raft timbers, and then lashing the crossbars securely, to create the basic raft body.)



The holes in the upright must be made large enough to let the nodes of the cross-pole to fit through (unless the nodes are sanded down first), so lashings are needed to secure the joint, which will be quite loose. Adding a peg to this joint, to pin the poles in place, is a good way to prevent the cross-pole from shifting to the left or right.



Bamboo Lashings: Green bamboo is a lot more flexible than dried bamboo. It is flexible enough and strong enough that branchlets, small diameter stalks, and split strips of larger stalks can be used as lashing material.



To use green branchlets for lashings, cut off the leaves, but leave the short leaf stems in place.



The green branchlets are flexible enough that they can be twined around themselves, to create a circular shape. The short side-stems help to lock the branchlet loops together, to keep the lashings from unwinding themselves. Once you have practiced making these little lashings by themselves, you will be able to make them around a pair of crossed poles. Two such lashings, one going in each direction, are enough to make a single light-duty lashing.



Here is a completed lashing, made from two green bamboo branchlets. Once the green lashings dry out, they will lose most of their flexibility, but not their strength. Several branchlets can also be braided together, to create heavier lashing material. Small-diameter green bamboo stalks also make good lashings. The small stalks may develop lengthwise splits, as they are being bent around the crossed poles, but the lashings will still be strong.



Larger green bamboo stalks can be split into strips, and these strips are as strong as steel strapping. (Split green strips may have to be thinned down before use, by shaving some of the inner side off, if the bamboo stalk was thick-walled.) Green bamboo lashings should be secured by using hitches, such as the clove hitch, or half hitch. Do not use knots, because the sharp bends in most knots will cause the fibers in the bamboo strips to break.



The bamboo strips shown here were used to create these lashings while they were still green, and most flexible. Once the strips dry, they harden and retain their shape, and they are as strong as lashings made from heavy rope.

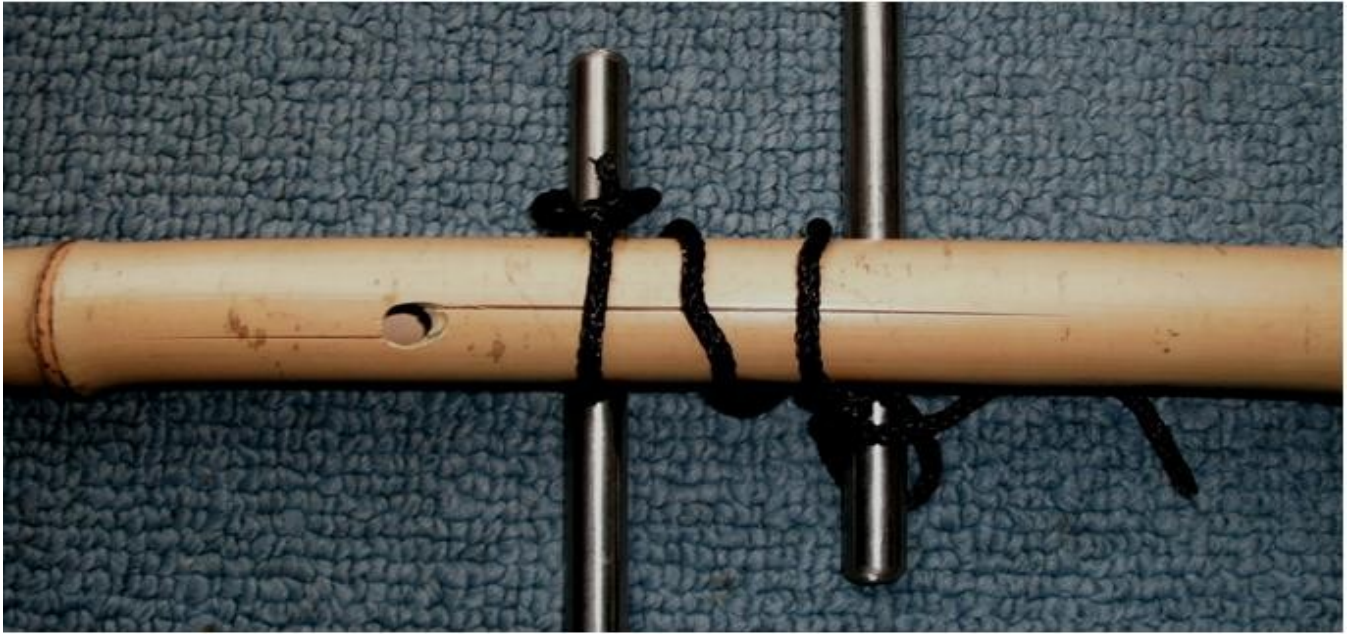
How To Make A Bamboo Split-Closing Tool:



If your bamboo has a split, or if it splits while you are drilling a hole, you can fix it with a simple tool.



The split-closing tool is made from two levers, and a short length of rope. Tie a bowline at each end of the rope.



Slip one bowline loop over the end of one lever, then lay the bamboo across the lever. Wrap the rope around the bamboo, over the split area, two or three times, and then slip the second bowline loop over the end of the second lever, as shown here. The exact length of the rope can be adjusted by re-tying the second bowline loop, if needed.



Now rotate the second lever around the bamboo pole, to tighten up the rope, so that the split is squeezed shut.



Another length of cordage can be used to keep tension on the levers, if you are working alone.



Now lashings can be added to the split area, to keep the split closed after the tool is removed. Long splits may have to be lashed in several places, to close the entire split. Cordage works ok for lashings, but the best material is lashings made from substances which shrink as they dry, such as strips of rawhide that have been soaked in water, and cordage made from animal sinew fibers that have been soaked in water.

How To Make Bamboo “Planks”:



This table has a top made from green bamboo planks, which are just flattened green stalks.

Bamboo “Planks” are made by flattening out large green bamboo stalks. The green bamboo is chopped lengthwise with a machete, until it is split on one side. The nodes are smashed with a club, or chopped lengthwise in many places, each node being split in from 8 to 16 places. The rest of the stalk is also chopped lengthwise in as many places as needed, to make the entire stalk flexible. The stalk is then forced open along the main split, and the inner node sections are removed. This allows the stalk to be laid out flat, like a crude plank full of splits.



This green bamboo has been split lengthwise repeatedly, so that it can be opened and flattened out.

How To Make Bamboo Roofing Tiles:



Large bamboo poles make good waterproof roofing material, when they are split and arranged correctly.



Bamboo halves are arranged like Spanish tiles, as shown here, to make a drip-free roof.



Junctions of roof sections can be covered by larger pole halves, like this example.



Bamboo poles are split in half, then the nodes are removed with a knife or chisel, to make a gutter shape.

Crooked poles can be straightened while still green, if needed. Either drill a small hole in each section, or knock out all of the node walls, by using a long pipe which will fit inside the pole. This is to keep the sections from bursting, when the pole is heated. Hold the area to be straightened over a heat source, such as campfire coals, turning the pole to heat it up evenly, until the skin of the pole is sweating water vapors. Now straighten the heated section, using a sturdy brace (such as a pair of closely-spaced trees) as a prying station, and tie the pole in the straightened position, then leave it to cool. Once cool, repeat for any other areas that need to be straightened.



Done properly, bamboo roofing tiles make a sturdy, waterproof, and durable roof.

Roofs like this make a good rain catch, when a split bamboo pole is placed along the bottom edge, to send the rains to water barrels or cisterns. Collecting rain water this way makes it easier to survive tropical dry seasons.