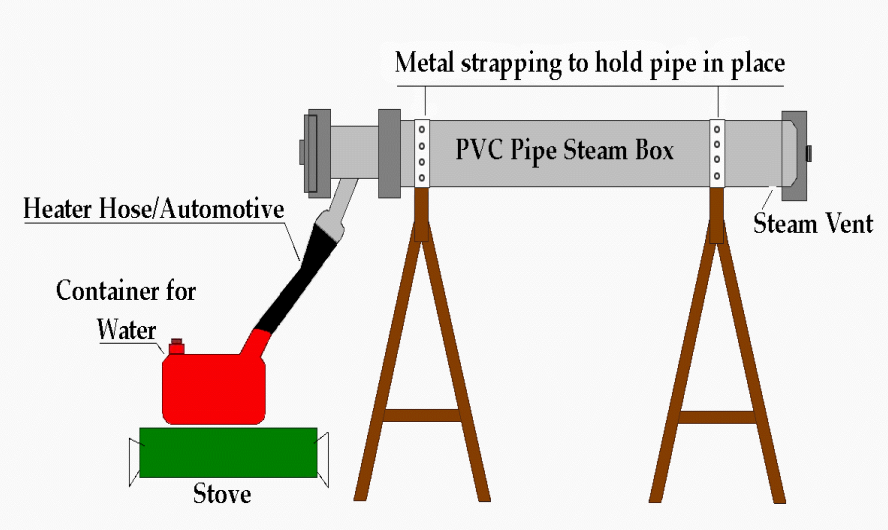
Build A Steam-Box



The steam-box consists of the following parts:

1) **Saw horse (you can use one or two – more if so desired)**
2) **PVC Pipe – length and diameter depend on size of wood you are steaming.**
3) **End caps, PVC Cement, 'Clean out' end cap.**
4) **Metal Strapping**
5) **Small length of metal pipe (see description for size)**
6) **Rubber automotive radiator hose**
7) **Vessel to hold water (NEW gas tank)**
8) **Heat source (Coleman camp stove)**
9) **Screws, drill, bits, screw driver**

Select the PVC pipe of a diameter and length to accommodate the size of wood you are going to be steaming. Based upon this selection, choose an end cap that has a screw in cover, which is of suitable size to fit the pipe you have chosen. The cap and steam inlet for the other end is chosen the same way, but the fitting needs to be a 'cleanout' type fitting – this means that it has a smaller diameter tube which comes off the side – it is to this that you will affix the radiator hose. Cement the end caps fittings on; make sure you have the correct screw fittings to close the ends (these do not get cemented on – they need to be removable to access the wood). In the bottom of the PVC pipe at the opposite end of the pipe from where the steam enters, drill a hole to allow the steam to escape. This forces steam to travel along the length of the wood. Once assembly is made, mount it across two sawhorses.

For a heat source, you can use a camp stove, propane stove, or a hot plate. You need to keep in mind that you want a lot of steam, and you need to keep it coming for at least an hour. If you need to add water in the middle of the process, keep a kettle boiling on the stove so you can add water without cooling it. For a container to boil water in – you can use most anything that is sealed with an outlet that will permit the attachment of a hose to duct steam in to the steaming chamber. If you use a 5 gallon gas tank as shown in the diagram make sure it is NOT USED, it has to be NEW and has never contained GASOLINE or other flammable liquids – you will blow yourself up and burn your shop down.

To get an even flow of steam you need to support the wood inside the pipe by using dowels cut to the width of the pipe and wedged in place. Also keep a set of tongs handy – these work well for reaching in and pulling out the boards you have steamed – also WEAR GLOVES!!!

1) To bend wood you should steam it appropriately 1 hour per inch of thickness
2) Exotic woods (Bubinga, Cocobolo etc…) do not bend well
3) Soft woods do not bend well

When choosing the grain for the wood you are bending, it is best to bend along the grain of the wood, if you try to bend across the grain you are likely to break the wood (Though it is possible to bend it this way).

Following are general dimensions to which some wood can be bent:

Ash	4.5" radius	Cherry	6" radius
Elm	2" radius	Hickory	2" radius
Maple	8" radius	Oak	2" radius
Walnut	3" radius		

Alternate Bending Methods

Free Bending
Oval or teardrop shapes are formed by thinning the wood in the area of the bend.

Heat Bending
Applying wood directly against heated rocks or metal and pushing the wood until it bends. Dabbing the wood with a wet sponge or a rag keeps the wood from igniting.

Moisture Bending
Wood is often immersed in water, urine, or moist vegetation to soften before bending. The bending and carving of bone, antler, and ivory is also done by soaking in urine. In some cultures, wood was bent in the sweat bath.

Kerf Bending
This is a type of heat and moisture bending that creates square corners out of a single board. The kerf is a groove cut in the board that folds back on itself as the wood is bent. Seaweed was traditionally used to provide moisture for bending.

Pressure Bending
Wood can be bent with pressure alone, but it must be done slowly and with great care and skill. The bending is helped by crushing the wood fibers on the inside radius.

Laminate Bending
Technique of layering wood strips flexible enough to assume a desired curve through gluing, bending, and clamping.

Salt Water Soaking
A method of making wood limber is that presented by Viking boat builders, they would soak their boards in a salt water bog or marsh for a day or two prior to bending them in to shape on the form from which they were building their boats. Boats built at this time were built from green lumber, which has a very high moisture content. What we get from lumber- yards and hardware stores today is kiln dried. This lowers the moisture content down approximately 25%. Green lumber has the advantage of more readily bending on its own, no steaming, and it will not swell as much when the finished boat hits the water. On the other hand, it will also shrink more and is more unpredictable when constructing something other than a boat which will remain moist. The long and short of this is that green lumber would be soaked in salt water to make it bend more easily, an added benefit of this soaking is that the salt would start to pickle the wood and act as a preservative. When it comes down to it, if you decide to steam wood, and think you want to use it, you will have greater success steaming green lumber.

Quick Field Method
Take a piece of bull kelp, which is hollow at its upper end, put the stick inside and heat it under a fire. Steaming can also be done in a long pit oven with lots of green plant material to provide the moisture. [Dig a pit, line it with rocks, heat the rocks, rake out the fire, fill the pit with wet grass or leaves, lay in the wood, add green stuff, cover with dirt, wait a few hours, remove and bend wood].

The ability to shape wood with simple tools and methods such as steam bending served our ancestors for the millennia it took to create more sophisticated systems. This technology belongs with fire making, cordage spinning, knapping, twinning and tanning in the skills of collection of all primitive technologists.

Websites used for gathering information on steam bending:
http://www.primitiveways.com/bending.html
http://www.megspace.com/lifestyles/njmarine/Steam.html
http://www.megspace.com/lifestyles/njmarine/mold.html
http://www.allwoodwork.com/article/woodwork/methods_of_bending_wood.htm