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PREFACE

Welcome! You are about to embark on a wonderful woodworking journey. This book shares suggestions that I have discovered over 35 years, and as recent as yesterday. What is most important are the many mistakes that I have made over the years. They gave me a permanent reminder of what not to do. I hope that you can view this book as a bundle of ideas and construction techniques as a guided discovery into the art of ukulele construction. This is only one person's view and is always subject to debate. I encourage you to combine woodworking and luthery methods from many sources. There has not been a great deal of information written on the subject of ukulele construction, but there is a world of information available on every stage of woodworking and finishing. There are excellent books on guitar construction listed in the resource section at the end of this book. I am hopeful that this book can answer some question and encourage you to build a "uke". Most of my experience is in building guitars and my approach to building a ukulele is as if they are little guitars.

It is beyond the scope of this book to instruct you on the subject of sharpening methods, finishing processes, or advanced woodworking techniques. This book will help guide you through the process to build a professional quality instrument.

Please remember this:

- use only SHARP tools
- don't forget the wax paper
- do not try to apply finish until conditions are right
- always sand to at least 400 grit!

Every effort has been made to provide you with accurate information and precise dimensions. This book is one person's method and interpretation of the process of the construction of a ukulele. Any trade name or entity referred to in this book is for your convenience and I do not endorse nor do I receive any compensation from anyone for using or printing their names.

Anyone can build and enjoy a ukulele! This book is written with the first time builder in mind, but it contains some advanced applications.

Best of luck and don't forget your mistakes. Soon you will have a wonderful masterpiece of esthetic beauty and sonic excellence.

Chapter 1

Wood

When choosing wood for any stringed instrument it's structural properties and aesthetic qualities must be considered. Wood is a hydroscopic material and is subject to moisture changes. Wood will shrink or swell in response to environmental temperature and moisture. This reaction is known as *equilibrium moisture content* (EMC).

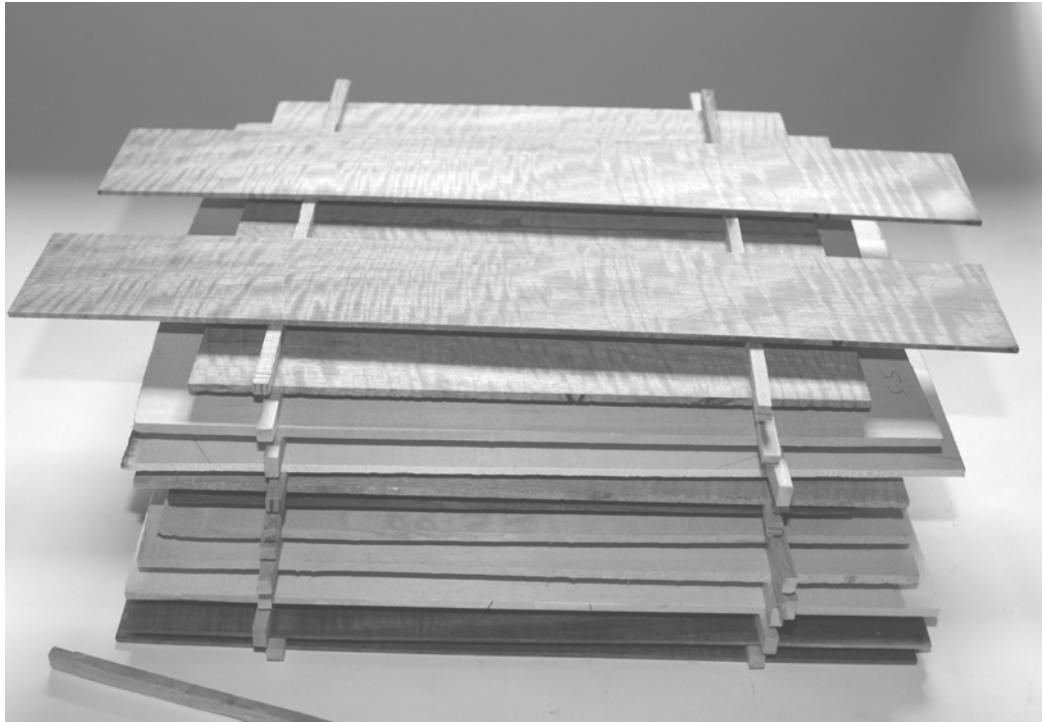
Because wood is so susceptible to it's environment, you should allow sufficient time for the wood to adjust to the conditions in which it is to be used. This is especially true for wood that comes from another part of the world as is often the case with exotic woods. If you order wood from Hawaii and it will be used in Alabama, you should let it sit open with free air movement for a while. Most wood that you buy from a luthier supply company has been properly air dried and usually safe to use soon after a short acclimation period.

Wood Storage

If you are able to buy wood for future use, you should do so. The more desirable wood used in ukulele construction is certain to become more valuable and some of the best wood has become endangered and no longer allowed to be cut. An example is Brazilian Rosewood. I view purchasing wood for instruments as an investment. It is a far better investment than many stocks!

Your collection of wood must be stored properly, even if you have only one set. Air must be able to circulate freely and remain in a controlled environment that is close to 50% relative humidity and no hotter than 75 to 80 degrees. Store it this way until you start construction.

Your rough or joined and sanded plate should be stored horizontally on "stickers". Stickers are small 3/8 X 3/8 inch straight and flat strips of softwood. Spruce, fir or white pine are good. Stack your wood with a pair of stickers between each piece of your soundboards, backs and sides. You must line up the stickers so that they are directly above the one below. The top piece of your stack of wood can be a 1/4 inch piece of plywood with a light weight on top. This will allow proper air circulation and help to keep you wood flat and allow the wood to move as it is air dried. See **Photo 1-1**.



(Photo 1-1) Wood air drying for future use. Some are rough blanks and some are glued and sanded to thickness. *Stickers* separate the plates.

When choosing wood for any stringed instrument, structural properties and esthetic qualities should be considered. Wood that is sawn perpendicular to the annual growth rings is known to be quartersawn or rife sawn. Quartersawn wood is the most stable and has very tight and straight grain on the face of the board. Quartersawn wood dramatically enhances acoustic qualities as well as its beauty. Careful resawing can create spectacular and dramatic *curly* or *fiddleback* rays. Koa wood is a prime example of beauty and good physical qualities. It is my first choice for ukulele construction. Sitka spruce and Engelman spruce make a good choice for the soundboard.

Some Hawaiian species for ukuleles:

- Koa
- Mango
- Pheasantwood
- Ohia
- Milo

Other hardwoods for ukuleles:

- Honduran mahogany
- Brazilian rosewood
- East Indian Rosewood
- Lacewood

Soundboards:

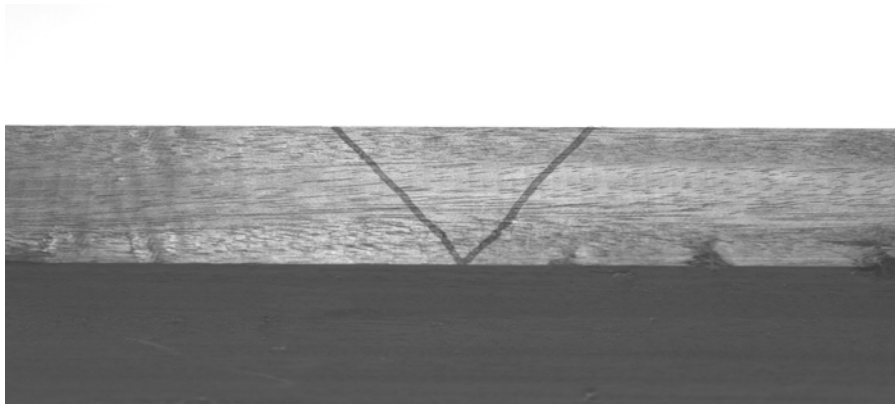
- Sitka spruce
- Engelman spruce
- Alaskan Yellow cedar

Necks:

- Honduran mahogany
- Quarter sawn maple
- Bird's Eye maple



(Photo 1-2) Resawing thick stock to make back plates. Each will be sawn to make ample thickness for joining the back halves and sanding out all of the saw marks. Saw the back plates and tops to a minimum thickness of $\frac{1}{4}$ inch to allow joining and final sanding.



(Photo 1-3) The mark on edge of thick board being resawn will allow the thin plates to stack up book-matched.

End of Chapter 1

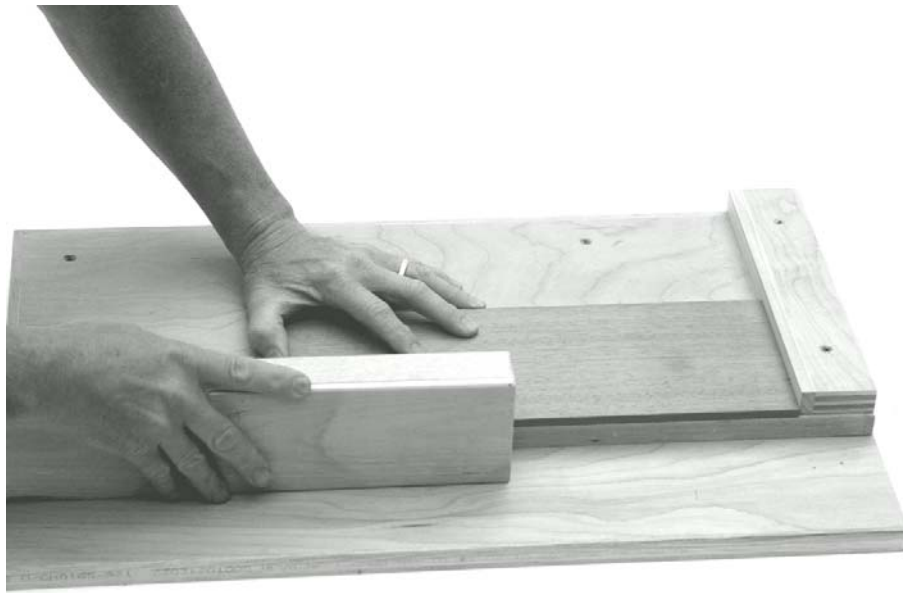
Chapter 2

Preparing the Soundboard & Back

Procedure: Preparing the soundboard and back plates:

At this point, the procedure is the same for preparing the soundboard and back. Select a pair of bookmatched top plates & back plates. They should be no smaller than 5 X 14 inches. You must end up with a joined plate no smaller than 10 X 14 inches. Bigger is better so you can avoid any defects in the wood. The final sanded thickness of the top will be 0.125 inches or about 1/8 inch. The back and sides after final thickness sanding will be .095 inches or about 3/32 inch. Keep this in mind as you mill your wood. If you are building your ukulele from a kit, everything may be sanded for you. Some dimensions may be slightly thinner for mahogany kits. It is most essential that you work from professionally drawn plans of a proven design. (See *Sources of Supplies*)

Step 1: Using the plates described above, the edges must be straight and true. The edges can be prepared with a joiner, edge sander or shooting board. We will use the shooting board. See below.



(Photo 2-1) Simple shooting board used to prepare sides for gluing.

The large sanding block has 120 grit sandpaper glued to one side. The wood for the sanding block must be dead square to the table. Many times a block plane is used instead of a sanding block. See section on *Jigs* for detailed instructions.



(Photo 2-2) A beautiful example of a bookmatched curly Koa plate

Determine the bookmatched edges and fold the sides together using the marked edges as a guide. Place the two halves together on the shooting board and clamp. Using a sanding block 10 inches long, 120 grit sandpaper, sand the edges of the plates in pairs using the shooting board as a guide. When the edges are sanded, hold the joint up to the light and check the fit. If you see any light repeat the process.

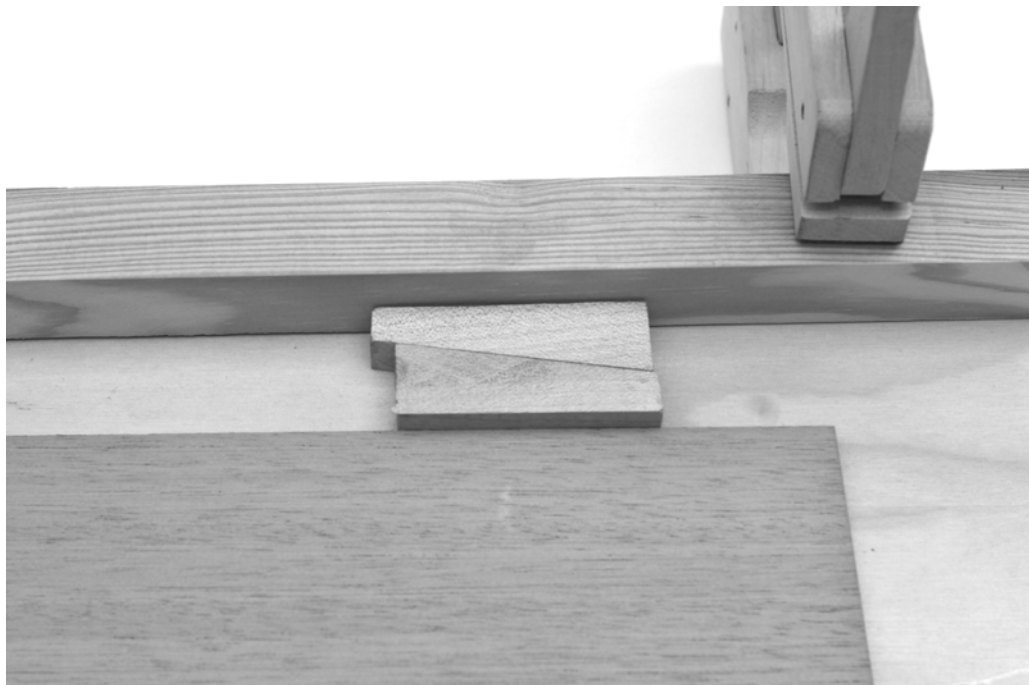
Step 2: Gluing the Two Halves Together

Using the edge gluing jig, position one of the halves against the wooden guide strip. Place a strip of wax paper under the joint. Place the other half plate against the first plate. Adjust the movable wooden guide to a position where there is enough room for the clamping wedges to fit between the guide and the plate being glued. Clamp the movable guide at this position. Each of the two pairs of small wooden wedges are pressed together so as to push the two half plates together. Once adjusted and the movable guide is clamped, apply a line of glue and smooth with finger. Use enough glue to adequately cover the edges. Clamp as described for now. We will add a caul above the glue joint. First cover with wax paper and clamp a 2 inch wide piece of $\frac{3}{4}$ plywood directly over the joint. This will keep the joint level. Allow to dry two hours minimum. The wax paper slows down the drying process, so allow extra time.

See **Photo 2-3**



(Photo 2-3) Plate Gluing Jig. Notice the small wooden wedges at the back and the caul across the center seam. The two extra clamps in the front corners are just used to keep the bottom board level.



(Photo 2-4) A close up detail of the opposing small wooden wedges that serve to clamp the two half plates together.