Alaska Bird Observatory Shelves

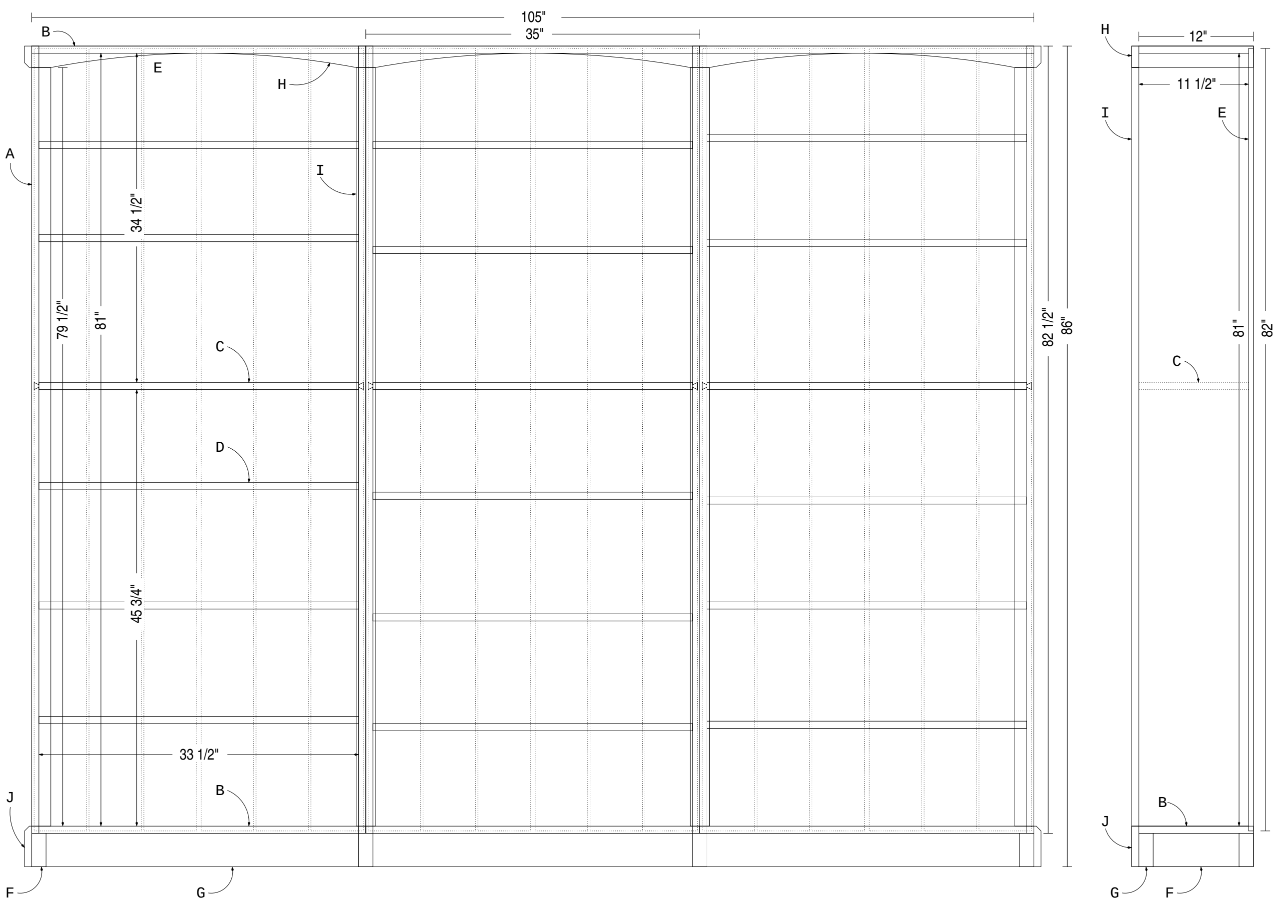
Christopher Swingley

Introduction

These are the bookshelves I built for the Alaska Bird Observatory's new building at Wedgewood Resort in Fairbanks. My version was built from alaskan birch with a ship-lapped back made from aspen. The shelves are built from three seperate, dovetailed boxes which are joined together and rest on a base built from 2×4 lumber. One of the shelves in each case is fixed and the rest are adjustable on holes drilled into the sides. A baseboard molding hides the bottom support, a crown molding dresses up the top of the case, and vertical moldings hide the joints between the shelf cases.

Plans

These plans show the design of the bookshelves.



Cut List

Key	Qty	Description	T	W	L	Notes
A	6	Side	3/4	12	82 1/2	Dovetail pins on the top and bottom, rabbet cut in the back, sliding dovetail for fixed shelf.
B	6	Top & Bottom	3/4	12	35	Dovetails on the ends, rabbet cut in the back.
C	3	Fixed Shelf	3/4	11 1/2	34 1/2	Dimensions include sliding dovetail on the ends.
D	15	Adjustable Shelf	3/4	11 1/2	33 1/2	
E	18	Back piece	1/2	7 1/2	82	Middle boards have rabbets cut on opposide sides so adjoining boards can overlap. End boards have a single rabbet along the edge.
F	4	Bottom support	1 1/2	3 1/2	12	Dimensions include tenons on the ends.
G	2	Bottom support	1 1/2	3 1/2	105	Mortises cut for the cross-pieces (F).
H	1	Top Molding	3/4	2 1/4	129	Decorative curves cut into bottom edge, mortises for vertical moldings (I).
I	4	Vert. Molding	3/4	2	79 1/2	Dimensions do not include tenons on the ends.
J	1	Bottom Molding	3/4	4 1/4	129	Molding profile run on top edge, mortises for vertical moldings (I).

All dimensions are in inches.

Construction Notes

If you selected lumber that is as least 12″ wide you can skip the edge jointing steps that follow. Otherwise, the first step in the project is to edge joint and glue all the pieces for the sides, tops, bottoms, and the shelves to the necessary width. Cut the pieces to their approximate length, match the grain direction along the joint, and draw a witness mark across both boards so you know how to orient the joint when you glue it together.

Place the boards into a vice such that the edges to be jointed are up, with the witness marks either touching each other or opposite one another. Line up the edges as closely as possible. I use a leg vise to hold one end and a board jack on the other.

If the edges are very far out of line from each other, or if the boards aren't very straight, start with a jack plane (#5) or a fore plane (#6) until the edges are close to straight and even with one another. Use a jointer plane (#7 or #8) set for a fine cut for the actual jointing.

I use the following method. First I run the jointer across the boards until I get a full length shaving from both boards. Because of the nature of a hand plane, it is possible that the boards are convex and will only touch in the middle when brought together. To flatten them completely, or make the edges slightly concave ("springing the joint"), start planing the middle of the boards, gradually increasing the length of the stroke. The final pass or two should be made across the entire length of the boards.

If the edges of the boards opposite the edges to be glued are wavy, now is the time to mark a straight line on them from the edge you just jointed. Once the boards are glued together, the only straight edges are in the middle of the board. Use a panel gauge set to the minimum width of the board, and strike a line all the way down the board. It is only necessary to do this for one of the boards since you will need only one straight edge to cut the board to the correct width.

I've used hot hide glue and yellow glue for edge gluing joints. Hide glue has the advantage of drawing the joint together as it dries, but it has a much shorter open time which give you very little margin for error. If your joints are very good and the boards are straight hot hide glue is a good choice and can be used without clamps.

On this project I used yellow glue for the longer pieces because the longer open time allowed me to make sure the joints were even for the length of the board. Very few of my seven foot long boards were straight enough for a simple rubbed joint.

Once the glue has dried, the first step is to get one long edge straight. Possible methods include simply jointing the edge with a jointer plane, marking a straight line with a chalk line and ripping to this line, and ripping or planing down to a line you marked before gluing the boards together. If the edges are fairly straight already, using a jointer plane is probably the easiest method. Be sure to check the edge with a long straight edge or a taught string.

From this edge, use a panel gauge to mark the final width of the board, rip to this line, and plane the second side flat. Finally, square up one short edge, mark the final length, and cut the final edge to size.

Now that all the boards are the correct size and are square, plane the surfaces smooth and even. Getting them perfect isn't really important at this stage because the surfaces will get damaged while cutting the joints. You just want to get them flat and close to their final thickness. Make sure that the joint between the two boards is even.

Choose the best faces of all boards and mark the locations of the rabbets that will hold the ship-lapped back pieces. Cut the rabbets using whatever rabbeting plane you have available. I cut the rabbet 1/2″ deep and 1/2″ wide. A side rabbet plane (#78 or #98 / #99 pair) and a shoulder plane (#92) can be helpful for squaring up the rabbets.

Once the rabbets are cut, carefully trim the side pieces to length (82 1/2″). A fine cut cross-cut saw is best, but use whatever saw is sharp and make sure you are sawing from the outside–in so the tear out will be inside the case.

Cutting the sliding dovetail joint is next. Set-up is critical for this joint. I use a dovetail plane to cut the male end of the joint first, marking the thickness of the end of the tails with a mortise gauge, and planing down to these lines. Once a sample is cut, measure the thickness of the inner part of the tail and scribe two lines matching this thickness onto the side piece. I use a bevel gauge set to the exact angle of my dovetail plane and saw down to define the sides of the sliding dovetail. Be sure to check the angle of the saw frequently. A stair saw is helpful to insure the depth is accurate, but it is not necessary. Use a chisel to knock out the waste from each end, and use a router plane (#71) to clear out the remainder. Make sure you can repeatably cut both male and female joints before attempting the joint on the shelves and sides.

Through dovetails join the sides of each case to the top and bottom. I marked and cut the pins on the side pieces first, but there isn't any reason you couldn't do it the other way. Marking and cutting dovetails on the ends of boards almost seven feet long is difficult. I clamped the sides to one of my garage door supports and stood on my workbench to do the marking and clamping. If you have an outdoor deck, you may be able to use the railing to support the long pieces.

I used a wheel marking gauge to mark the baseline of the pins, a bevel gauge set to a 6 : 1 ratio for the angles, and a dovetail saw to cut down the lines. A series of bevel edge chisels are used to chop out the waste between the pins.

The easiest way to mark the tails from the pins is to use a miter clamp that secures two boards together at exactly 90°. The inner corner of the side board should line up with the depth mark struck on the edge of the top or bottom board. Mark the tails from the pins using a sharp pencil or marking knife. Be sure to cut on the waste side of these lines. I remove most of the waste between the pins with a coping saw for the inner pins and a crosscut backsaw for the waste at the ends. Chop out the remainder using a chisel. Gently test the fit and trim the pins or tails as necessary.

Once all the joints on the five pieces that compose the frame of the case (two sides, top, bottom, and fixed shelf) have been cut, the pieces are ready for finish. I put masking tape on the inner ends of the dovetailed boards so that finish won't hinder the glue when the joints are assembled. I used dewaxed super blonde shellac for the finish on my bookshelves. My procedure is: one coat of a one pound cut, followed by a light sanding with 220 grit sandpaper. Then three coats of a two pound cut, followed by a light sanding with 220 grit sandpaper using lightly soapy water as a lubricant. Finally, two more coats with the two pound cut. After a few days to insure the finish has dried, rub out the finish with fine grit sandpaper and water, followed by softened paste wax applied with #0000 steel wool.

Tools Used

Tool	Uses	Substitutes
Saws		
Disston D-23, 8 tpi	· Cutting all lumber to size	Crosscut handsaw
H. Peace, 5 1/2 tpi rip	· Cutting all lumber to size	Rip handsaw
IT dovetail saw	· Through dovetails	Backsaw, filed rip
Disston #4 backsaw	· Starting sliding dovetail	Backsaw, filed crosscut
Stair saw	· Cutting female sliding dovetail	Backsaw, filed crosscut
Coping saw	· Removing dovetail waste	
Handplanes		
Stanley #3	· Smoothing all pieces	Smoothing plane
Stanley #7	· Edge jointing all pieces	Your longest plane set for a fine cut
Stanley #80 scraper	· Final smoothing	Cabinet / Hand scraper
Primus dovetail plane	· Cutting sliding dovetail	Saw and chisels
Stanley #71	· Flattening sliding dovetail	Chisels
Moving filletster	· Cutting rabbets	Rabbetting plane
Stanley #78	· Cutting rabbets	Rabbeting plane
Stanley #79	· Squaring rabbets	Bevel edge chisel
Stanley #92	· Squaring rabbets	Bevel edge chisel
Chisels		
Marples Blue chisels	· Removing dovetail waste	Chisels
Marking and Measuring		
Metal tape measure	· Long measurements	Your favorite measuring tool
Starrett folding rule	· Shorter measurements	Your favorite measuring tool
Large square	· Squaring ends of wide boards	Your largest square
Panel gauge	· Marking final widths	Ruler and a straight edge, chalk line
Veritas wheel gauge	· Marking dovetail depth	Any marking gauge
Bevel gauge	· Saw guide for sliding dovetails · Marking dovetails	
Miscellaneous		
Hand scrapers	· Final smoothing	Broken glass, sandpaper

Notes

These plans are not complete. The diagrams are not expected to change, but the **Construction Notes** and **Tools Used** sections will be updated as I work on the project in my shop.

`[ Wed May 22 09:40:35 AKDT 2002 ]`