Greenville Woodworkers Guild
Introduction to Basic Furniture Making – Building a Bookcase
Lesson Plan

Object:
To build three bookcases

Subject matter;

1. Discuss characteristics of Plywood, MDF, and dimension lumber.
2. Review the design, material selection, bill of materials.
3. Calculate material requirements and cut the components
4. Discuss joinery options
5. Complete the joinery, and dados for back, drill shelf pin holes
6. Assemble the cabinet
7. Add back, cut, sand and install face frame
8. Sand and apply stain/finish.

Plywood:

- It is constructed with multiple layers of wood, peeled from a log and glued together. The outer surface is select veneer.
- Wood is stable, strong, and attractive on the surface
- It comes in 4'X 8' or 5'X 5' sheets.
- Finishes like wood.
- Edges are all "end grain" – need to be concealed – veneer, face frames, moldings, etc.
- Warps, face frame helps straighten

MDF:

- It contains a combination of glue, sawdust, and wood chips.
- Sometimes has an outside cover such as melamine, which provides a nice surface that does not require finishing.
- It has limited lateral strength
- It is constructed in various size sheets
- It is very heavy
- It does not hold screws or nails well and tear-out is a problem.
- Edges are all "end grain"

Lumber:

- Cut from a tree in various widths, lengths, and thicknesses, with different grain patterns.
- Wood planks can be twisted and warped.
- Must be Prepared - Jointed, Planed and maybe sanded before being used.
- Can be purchased in close to finished form
- Usually requires boards be glued together to obtain necessary dimensions.
- Allows one to select and match wood characteristics.
- WOOD MOVES! Discuss.

Design:
Drawing attached.

- Select plywood for sides and shelves
- Use lumber to face the cabinet (face frame)

- Cut rabbet to hold back
- Drill holes for adjustable shelves
- Joinery – biscuits
- Discuss dimensions

Calculating the materials:

A. Plywood - need to fit pieces on the sheet or use a program to calculate it, such as "Cut List" (Note: plywood sometimes dictates the size of the cabinet in order to maximize materials.) Example cabinet is 11 3/4 inches wide.

B. Lumber – must understand how it is measured. It is measured in the rough and allowance is sometimes made for straight line/ moisture.

- Uses nominal measurements – example a board planed to 13/16 inch thick is called one inch
- The width is always rounded, normally up and the average width is determined on irregular boards.
- The thickness X the width X the length in inches divided by 144 determines the board feet.
- Examples:
  - 1" x 12" X 120" / 144 equals 10 bf.
  - 1" x 12" X 12" equals 1 bf.
  - 2" X 6" X 96" equals 8 bf.
- Thickness is also addressed as quarters of an inch, a 4/4 board is one inch thick.
- After determining the board feet you require, multiply by a factor of 1.33 to 1.50 to allow for waste.

Cutting the materials:

A. Plywood
- Cut on panel and table saw. Need to be certified on machines.
- Panel saw may not produce as clean a cut. If possible, cut to rough size then finalize on the table saw.
- Consistency of size more important than actual size, so cut all like-size boards with the same saw setting.
- Tag and identify each piece.

B. Lumber
- Rip on table saw, 1/16 over size then sand to dimension. Suggest you sand surface before sawing to obtain consistent thickness.

Joinery options:

- Lumber has "with the grain" and "end grain" characteristics on its edges. Plywood and MDF are all end grain on the edge. END GRAIN DOES NOT HOLD GLUE.
- Lumber "with the grain" can be joined by simply creating an accurate edge, then gluing and clamping them together.
- All pieces where "end grain" meets must have additional - "Joinery"
- Demonstrate and explain the advantages of the following:
- Dados, dovetails, mortise and tenon, biscuits, etc. All of these joints provide a "with the grain" surface to hold the glue.
- Nails and screws are also used as joinery techniques i.e. Kreg system.

Biscuits:

- Biscuit cutting requires a cutter that cuts slots to fit the biscuits.
- Discuss and show different sizes.
- Review safety and operating procedures of biscuit cutter.
- Demonstrate the two cutting techniques - using the guide or the flat base of the machine.
- Both boards being cut must use the same reference, either the guide or the base to obtain correct board alignment.
- Make jigs to mark cut positions and/or align cuts on repetitive applications.

Complete the joinery

- Set up jigs, mark and cut all pieces.
- Review the dados/table saw options and then cut rabbets.
- Discuss various ways to drill shelf holes.
- Demonstrate the selected method. Note: If using a line boring machine – must be certified or have an operator do the work.
- Mark and drill holes.

Assemble the cabinet

- Discuss clamping options.
- Establish good working area to do the assembly
- Discuss gluing options with emphasis on drying times.
- Do a dry run assembly (no glue); be sure boards are correctly oriented.
- Glue and clamp.
- Check for square and tight fit
- Explain that glue will not stain
- Wipe off glue
- Note: back can be loosely inserted to help with square.

Add back:

- Discuss options for attaching, nails, screws, etc.
- Recommend 3/4 inch #6 screws.

Face Frame

- Discuss the various ways to attach.
- Explain the various types of face frame that can be selected, i.e. straight board, moldings, etc. and show how they can be used to create unique furniture designs.
- Discuss various widths and positioning, i.e. flush / overhang.
- Select 1 1/4 inch width for the sides and middle shelf, 3 inch for the top and bottom and 3/4 inch for the adjustable shelves. (Shape top face frame)
- Apply glue and attach.
- Discuss options for round-over, etc.
- Using a router, round over all face frame (certification on router required)
- Create a template to make a design in the top and bottom face frames.

Fill and sand.

- Discuss fillers, how they affect staining, and discuss how to cover the stain with marking pens, etc.
- Sand to 150 grit.

Staining (If required)

- Discuss water based, alcohol based, and oil based strains, color matching, etc.
- Discuss options for applying stain, select option, then stain the cabinet.

Finish:

- Discuss finishing options: lacquer, poly, and wipe on varnish, shellac, etc.
- Discuss method to apply, spray brush, aerosol can, rag, etc.
- Use poly with a brush to apply two to three coats.
- Discuss and practice sanding between coats.
- Review optional rubbing out techniques.

Final action:

- Select teams and schedule the work.

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