Advanced Woodworking

VALLEY OAKS CHARTER SCHOOL

PROJECT PREPARATION
UNDERSTANDING WOOD
PROJECT CONSTRUCTION
CABINETRY I and II
WOOD SPECIALTIES

Contents

EXPECTATIONS

Introduction

The Woodworking Department of Valley Oaks Charter School exists to partner with parents by helping students reach their fullest potential as:

Academic Achievers who have a passion for life-long learning.

Effective Communicators who demonstrate competence in oral, written, illustrative, and artistic communication.

Critical Thinkers who can analytically read construction plans, build woodworking projects, and prepare wood surfaces for finishing material.

Literate Operators of Technology who efficiently, effectively, and safely utilize woodworking equipment to produce useable products.

Culturally Aware Citizens who considerately and selflessly work with others.

Motivated, Self-Directed People who strive to learn and apply goal setting techniques, organize and manage time efficiently, and assume personal responsibility for planning, constructing, and finishing woodworking projects.

Teaching Method:

To help each student reach his or her fullest potential, we employ the LEARN method of instruction, which is an acronym that stands for Listening, Examining, Applying, Researching, and Notifying. That is to say, students will learn by:

L__istening__ to information taught in class

E__xamining__ classroom demonstrations and methods of woodworking techniques

A__ppling__ what is learned by building woodworking project(s)

R__esearching__ outside articles to further gain knowledge on given subject matter

N__otifying__ others what has been learned through written responses, group collaborations, and oral presentations.

PROMPT WRITING

Introduction

Each week students are required to write a response to a prompt. Prompts are provided at the beginning of each unit of study and are designed to help students fully process what they have seen and heard in the classroom. To do so, students are required to investigate each topic presented in the prompt by researching outside articles on the internet. Following are the requirements for submitting prompt responses to the instructor:

- At least one quote from an online article must be included in your work. Dictionary and/or encyclopedia references will not be accepted. Make certain citations are in quotation marks and numbered.
- At least one quote about the subject from this class textbook must be included in your submittal.
- Resources must be listed at the bottom of the page under RESOURCE CITED as follows: Name of author, *Name of article,* Web URL address, the date you found it. For citing the text, simply put down the name of the text, the chapter, and the page number (see below).
- Prompt submission requirements are as follows:

  Top right hand corner
  Name
  Date
  Class name
  Prompt number

  First line of page, starting at the left hand margin: Prompt number followed by the prompt written and underlined.
- Prompt responses shall be graded as follows: Internet citation(s) = 1pt. Class textbook citation(s) = 1 pt. Minimum amount of words included = 1 pt. Submission requirements of prompt are met = 1 pt. Work turned in is legible and well organized = 1 pt.
- Prompt responses will not be returned to the student, but shall be submitted to his/her resource teacher.
- Late papers shall receive a reduction in points.
- Homework not turned in before the unit test shall receive a "0".

Sample:

Joe Smith
February 2, 2014
Advanced Woodworking
Prompt #18

Prompt 18: In 150 words, explain how to submit prompt responses to the instructor.

Skip a line and then begin writing your answer. "Whenever you refer to or use another's words, facts or ideas in your paper, you are required to cite the source."[1] It's that easy. Just explore the web by typing the topic in a search engine, find an article, and include a quote in your response. And don't forget, "make certain the citation is in quotation marks."[2] Of course you will say all of this in 150 words. Be sure to include practical "how to" information in your response, and use your own words.

RESOURCE CITED:

[1] Georgetown University Library, *Turabian footnote/endnote style,* http://www.library.georgetown.edu/tutorials/research-guides/turabian-footnote-guide, 5/17/13

[2] Advanced Woodworking, Valley Oaks Charter School, *Welcome: Prompt Writing,* p. 4

EVALUATIONS

Introduction

To further help students comprehend the subject matter presented in this text and the corresponding lab work they are required to prepare for evaluations by reviewing the material, processing it, and presenting what they learned to the instructor. A list of evaluations and a brief description are below.

Daily Evaluations:

Developing a good work ethic is very important. Students will receive daily work ethic grades based on their diligence, behavior, and cooperation in class.

Unit tests:

Unit tests are multiple choice questions pulled directly from the text.

Group tests:

The students work together to solve a problem presented to them by the instructor. After they choose the role each will play on the problem solving team (facilitator, presenter, secretary, messenger, researcher, illustrator, and problem solver), the students pull together their combined knowledge to develop a solution. Each member of the team receives the same grade for the presentation. Individual participant scores are given by the students after a peer evaluation.

Project Evaluations:

Student projects will be evaluated accordingly.

25% = Project Preparation/Drafting Plans
25% = Project Construction
25% = Finish (sanding, stain, topcoat, wax, etc.)
25% = Work Ethic

Oral Presentation:

At the end of each semester, students are required to present their project and portfolio to the class. The forms and outlines for both the oral presentation and the portfolio may be found in the appendix.

Unit 1

Project

Preparation

Intentional Beginnings

Pictorial Drawings

Working Plans

Cutting Schedule

List of Materials

Writing Prompts

Answers to prompts must include one reference from the class text and one reference from an internet article (dictionary and encyclopedia resources will not be accepted). Be sure to put quotation marks around your citations, number them, and place footnotes at the bottom of your paper to reference where your material came from.

Prompt 1: In 150 words, discuss three work ethic values you value the most and explain what you will do to excel in them this year. Be certain to explain why each of the three traits is important to you. Finally, create a work ethic code to put on your portfolio cover page (you may list more than three work ethic standards).

Prompt 2: In 150 words, explain the different elements required for completing a set of project drawing and why each element is important (pictorial/isometric, plans/views, materials list, cutting list, and cutting schedule). Finally, sketch out your project on a sheet of graph paper.

Prompt 3: In 150 words, explain the difference between a cutting schedule, a cutting list, and a list of materials. Explain why each is important. What information should you include on each? Also, develop a list of materials, cutting schedule, and cutting list for your project.

Prompt 4: In 150 words, explain what the terms "hardware" and "joinery" mean in woodworking and why the type you will use should be decided, noted on your drawings, listed on your materials list, and bought before you begin cutting. Finally, provide any hardware item numbers to your teacher to purchase

Prompt 5: In 150 words, explain why people should consider the look, the cost, the durability, the environment, and the type of finish they will use when selecting wood for their project. Two of these should be included on your material list before you begin cutting? What are they? Finally, include the finishing method and color you will use for your project.

Chapter 1

INTENTIONAL BEGINNINGS

Introduction

Preparing to start a wood project must be an intentional act. In other words, you must set out the time to think through what you're going to do before you ever begin cutting. The person who begins a project without planning properly wastes time, energy, money, and materials. This type of negligence will produce nothing but frustration.

Project preparation begins with knowing where you are and where you want to be. Sure, that may sound easy when it comes to a woodworking project. Anyone can say, "I don't have a cabinet in my room. I want a cabinet in my room." But proper project preparation requires a whole lot more than that. Project preparation begins with knowing how something will be built before you ever begin, and seeing in your mind's eye what the finished product will look like. That's called *forethought*.

Next, you must *develop a thorough plan*. Without a detailed plan, the road to completion produces more mistakes than results. This means taking the time to draw your building plans and write down important notes.

After the plan is developed, *envision the end product*. Draw a picture of what the project will look like. This will help you put the project together in your mind and it will give you a clear idea of what you want to accomplish. Think of this pictorial as a snap shot of what you plan to build.

Finally, keep yourself organized by placing everything in a *portfolio.* Keeping organized will save you a lot of headaches.

Forethought

- **Decide your Work Ethic:** Before you begin anything, you should know how much effort you will put into the project and the degree of excellence you will work towards. Write your commitment down and include it in your portfolio on your cover page and the work agreement.
- **Imagine the possibilities:** Think outside of the box. If you can dream it, it can be done. Don't just do what you've always done. Stretch yourself. No one gets anywhere by doing the same thing over and over again. Get new ideas from the internet, magazines, and/or books.
- **Think it through:** Once you've dreamt up the idea, think it through. Consider how it will go together, the type of hardware you will need, the type of joints you will use, the type of wood, and more.
- **Sketch up the idea:** Once you have imagined the possibilities and thought through the process draw a rough sketch of your project. This will further help you consider how the project will be built and what it will look like.

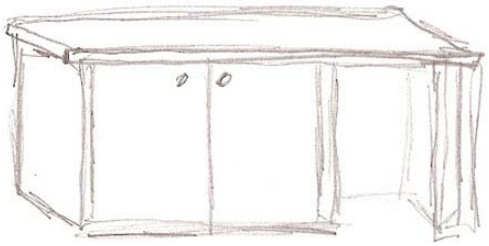
Develop the plan:

- **Determine overall measurements**: Dimensions don't need to be exact at this time. Simply decide the height, depth, and length of your project. Include these on your sketch
- **Draw the Plans**: Plan the work, work the plan. At the very least, your plans will have a top view, front view, and side view. If your wood project will be a case or box of any kind, you will need to include a section (a look inside to show how it is built). If your project has more than one piece, such as drawers for a cabinet, you will need to have separate views of each piece. Sketch these drawings out in scale on graph paper first. After the corrections have been made, then draw your final set of working drawings.
- **Develop the List of Materials**: The list of materials is your shopping list. On it you will list everything you need from lumber to stain, and from hardware to fasteners (see chapter 4).

- **Develop the Cutting List and Schedule**: The cutting list includes every piece of lumber you will use to build your project and the exact finished cut size of that lumber. The cutting schedule is a drawing of the lumber in its purchased form, such as a 4x8 sheet of plywood, and how it will be cut to maximize use and guarantee proper grain direction (see chapter 5).

Envision the end product

- **Draw your pictorial:** Your pictorial is a three dimensional drawing of the finished product. It should clearly communicate what the final product will look like. Different types of pictorials will be discussed in chapter two.



Portfolio

- **Get it together:** Your portfolio will include:

☐ **Cover**: Include on the cover page your logo, the name of your business, your name and city, a catchphrase, and a list of machine certifications. You may also want to include your work ethic.

☐ Section **1**: Title page (T1) – Include on the title page the name of your project and an isometric or pictorial drawing of the project. The title page shall have a title block. The title block shall be the same for every page of your portfolio.

☐ Section **2**: Drafting plans (D1, D2, D3) – Provide a complete set of plans with all necessary dimensions and notes. A stranger should be able to build your project by using the plans you have drawn. All pages shall have a title block. For smaller projects, all views will be on same page. For larger projects, or projects with multiple assemblies (i.e. cabinet, drawers, mirror holder, etc.), a page for each will be required.

☐ Section **3**: List of Materials (F1) – Provide a list of all materials required to build and finish your project, the quantity of the material needed, the individual cost of each item, and the total cost of materials. Also, include a fictitious hourly amount for your labor (be realistic), how many hours you think it will take you to finish, and the total labor cost (or profit) you would make. Finally, combine the two amounts. Be sure your logo, your name, the date, and the name of your project are included.

☐ Section **4**: Work Agreement (F2) – Information of client and yourself, the estimated cost of the project including your labor cost, necessary clarification notes, estimated time to complete the project, your work ethic agreement (i.e. how you will work in the VOCS woodshop), your logo, and the signatures of both you and the client (the teacher and a parent/guardian).

☐ Section **5**: Cutting List and Cutting Schedule (F3) - List of every piece of lumber required to build the project and the exact finished cut size of that lumber. The cutting schedule drawings of lumber in its purchased form, such as a 4x8 sheet of plywood, and how it will be cut to maximize use and guarantee proper grain direction.

☐ Section 6: Picture of the finished project.

A sample portfolio is provided in the appendix.

Chapter 2

PICTORIAL DRAWINGS

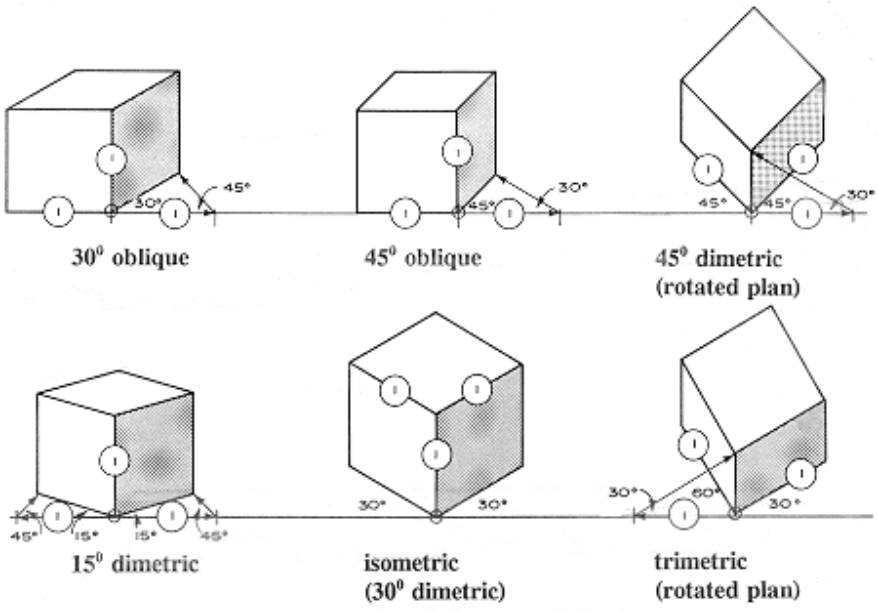
Introduction:

When preparing to construct a woodworking project, it is important to draw a *pictorial* - a two dimensional drawing of a three dimensional image. Pictorial drawings not only provide you with a realistic picture of what the final project will look like, but the process of drawing the pictorial will also help you work through the construction process in your mind, discover problems in your design, and promote artistic creativity to liven up your desired product. Simply put, a pictorial allows you and others to imagine the possibilities.

There are two different types of pictorials: Parallel Projections and Perspective Projections.

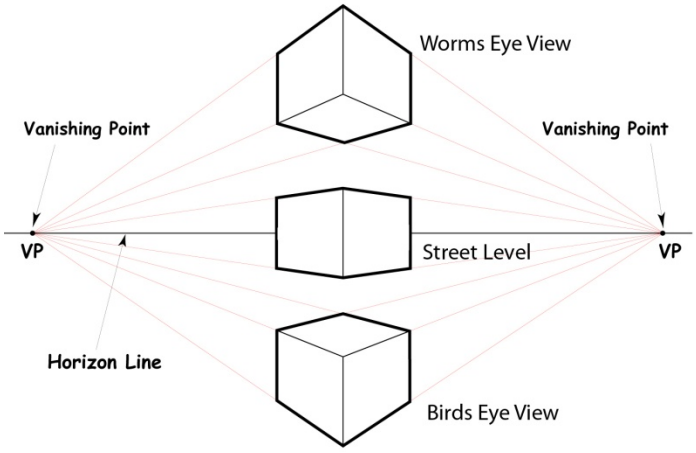
Parallel Projections:

In a parallel projection, the lines of the drawing representing each side of the object are parallel to one another, such as illustrated below. As you can see, there are different types of parallel projections (oblique, diametric, isometric, and trimetric). The type chosen is determined by the purpose of the drawing (manufacturing or marketing), and which projection will best communicate the needed information. Parallel projections are often used in engineering and machine work.



Perspective Drawing:

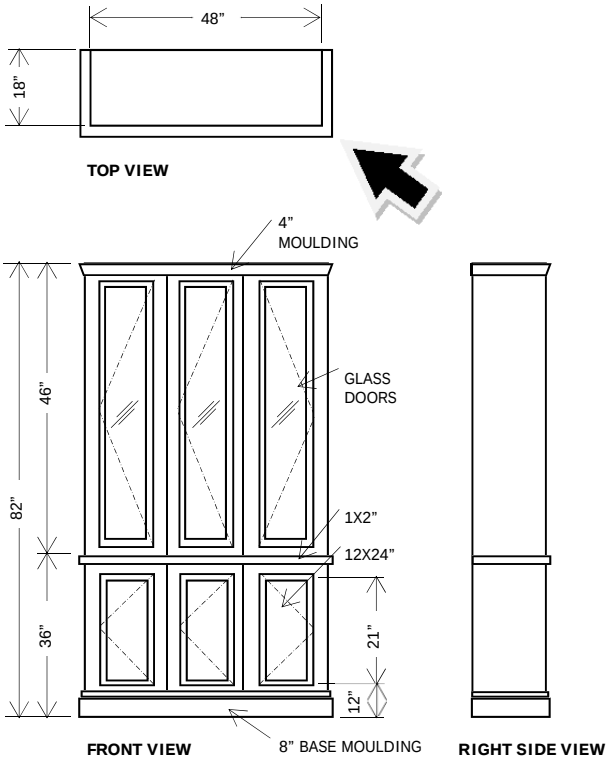
In a perspective drawing, the lines "fade away" to a vanishing point and represent a true-to-life image of the object. Perspective drawings are often used for artistic presentations, such as in architecture, and are more conducive for marketing or selling your product.



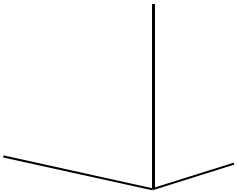
Unless you have been taught how to draw a perspective, it is best to begin with a parallel projection called an isometric drawing. Keep in mind that when preparing to build a woodworking project you will begin with a simple sketch. Your drawing, therefore, does not need to be perfect. The beginning sketch is simply done to get you thinking. After you complete your working drawings, you will draw a more exact pictorial. Below are some steps to keep in mind while drawing an isometric.

Drawing an isometric sketch:

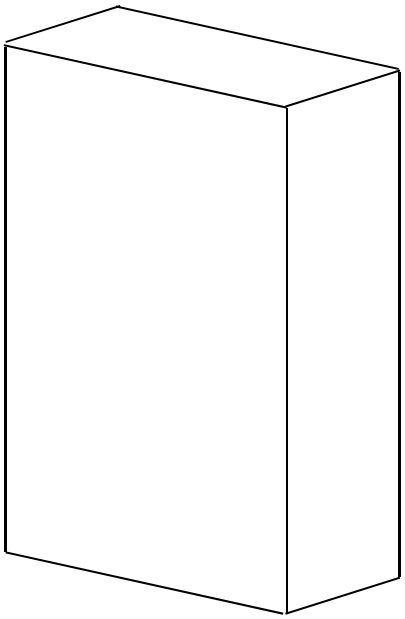
Step 1: Decide your line of sight. The line of sight refers to an imaginary line from the eye to the object. In other words, "Which way will you be looking at it?" On the top view on your working drawing, decide the line of sight. The illustration to the right shows the line of sight as indicated by the arrow.



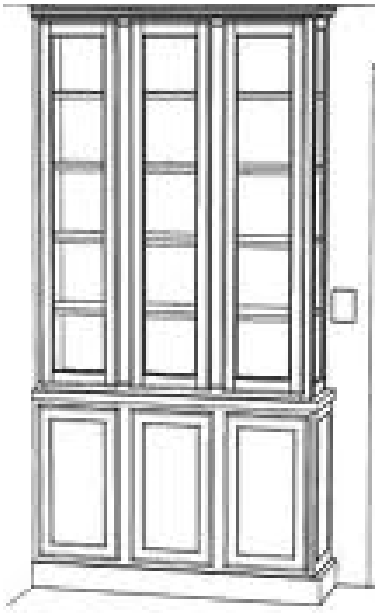
Step 2: Draw the front corner of the object. This is done by drawing one vertical line (90°), and two bottom lines (30° and 150°). See illustration below.



Step 3: Draw an outline of the object. See illustration below. Remember to keep the lines of each view (top, front, right side) parallel to one another.



Step 4: Complete the details of the drawing.



Chapter 3

WORKING PLANS

Introduction:

Before you begin any construction project, you should *think it through.* Thinking a project through means that you take the time to anticipate problems, solve assembly solutions, and determine the exact size and location of materials. During construction is not the time to think about such things. In other words, *plan the work and work the plan.* Plan ahead for everything, and once it is fully planned, follow the plans. To help do this, you will need to complete a set of working plans.

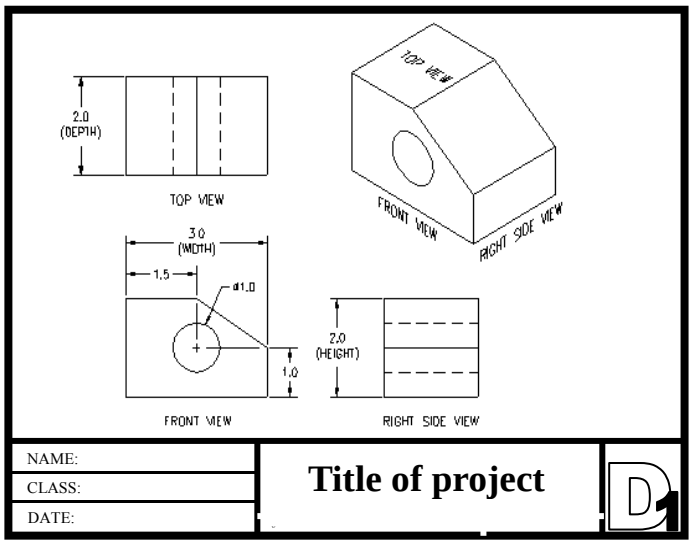
Working plans, sometimes called working drawings, are two-dimensional drawings of how an object is built. They are the visual instructions. While pictorial drawings communicate what the object will look like, the working plans communicate how it will be fabricated or constructed. Working plans, therefore, contain: (1) images of the object in different views; (2) the measurements (called dimensions) of all necessary lengths, heights, depths, angles, and locations; (3) detailed drawings, such as sections and enlargements; and (4) important notes.

Plan Elements:

The information you incorporate into your working plans is important. Done incorrectly and the process of building a project will produce frustration and mistakes, possibly even failure. To properly think through a project while developing the working plans, you will need to know the elements to incorporate into your drawings. The elements listed below make up what we call a *set* of working drawings.

Before you begin drawing, first think of your project in separate parts, such as the body of the cabinet, the drawers, and the doors. Simply put, if any part of your project can move, slide, or rotate consider it a separate part. Each part will have its own set of drawings.

You will first draw a *rough layout,* or a scaled sketch, of your project incorporating the elements listed below. Think of the rough layout as the first draft of a writing exercise. It gets your thoughts on paper, but it will not be as perfect as the final draft. Therefore, drawing clean, straight lines is not important at this time. Simply think through the construction of your project and draw it on paper. This will allow you to consider all aspects of the project and discover any problems before you get started. Finally, once the rough draft is complete, draw your final set of working drawings. Both your rough layout and your completed set of working drawings will contain the following:



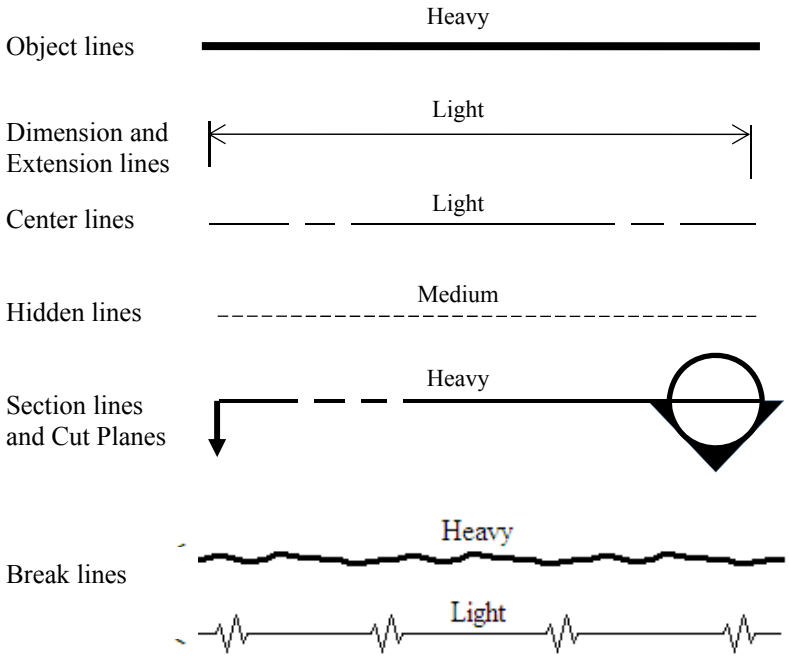
1. **Title block**: Begin with your title block. The title block borders the area on your paper where you will draw. It is drawn with thick lines just inside the boundaries of your paper, and will be the same on every page. Moreover, the title block contains important information about your drawing, such as the title/name of the project, the scale, your name, date, and drawing number.
2. **Front view**: Draw the front view first. The *front view* is the view you would see when standing in front of the object. Begin drawing near the bottom left corner of your paper. Make certain to leave space for notes and dimensions. All other views will "fold out" from your front view. Note, in rare cases a left side view or a bottom view will be required. In this case plan accordingly.
3. **Right side view**: As the name implies, the right side view is the image of the object when looking at the right side of your front view. The drawing will be the exact height as the front view. On smaller projects, this view is drawn directly to the right of the front view. On larger projects, the right side view may have to be placed on the second page.
4. **Top view**: The top view is the view looking down on your object. On smaller projects, this view is drawn directly above the front view. It will be the exact width of your front view. On larger projects, the top view may have to be drawn on the third page.

5. **Sections:** A section is a cut away of the object. In other words, it is what you would see on the inside if the object were to be cut open. This allows the builder to see how the object is constructed, what type of cuts to make (dado, rabbet, dowel, etc.), where joints are located, and how the project is assembled.
6. **Details:** Detail drawings are enlarged drawings of complex joints and/or assemblies, which make it easier to understand exactly how something is to be constructed. These might include how door hinges are attached, the size and location of a mortise and tendon, or the shape of a beveled/contoured edge.
7. **Dimensions:** All measurements for cutting and constructing your project must be included in the drawing. Your dimensions not only communicate the height, depth, and length of an object, but also the location of each attached piece of lumber, special cut-outs, hole location, and hole size.
8. **Special notes**: In some cases, special notes may be required, such as the types of material used or the name of hardware being used. These are indicated on the drawing with an arrow beginning either at the first or last word of your note and pointing to the location referenced.

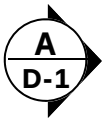
Line types and drafting symbols

When drawing a set of working plans, it is important to use correct lines and drafting symbols. These will help you read your plans easily and understand the instructions clearly. Below are basic drawing standards used throughout the world.

Line types and thicknesses



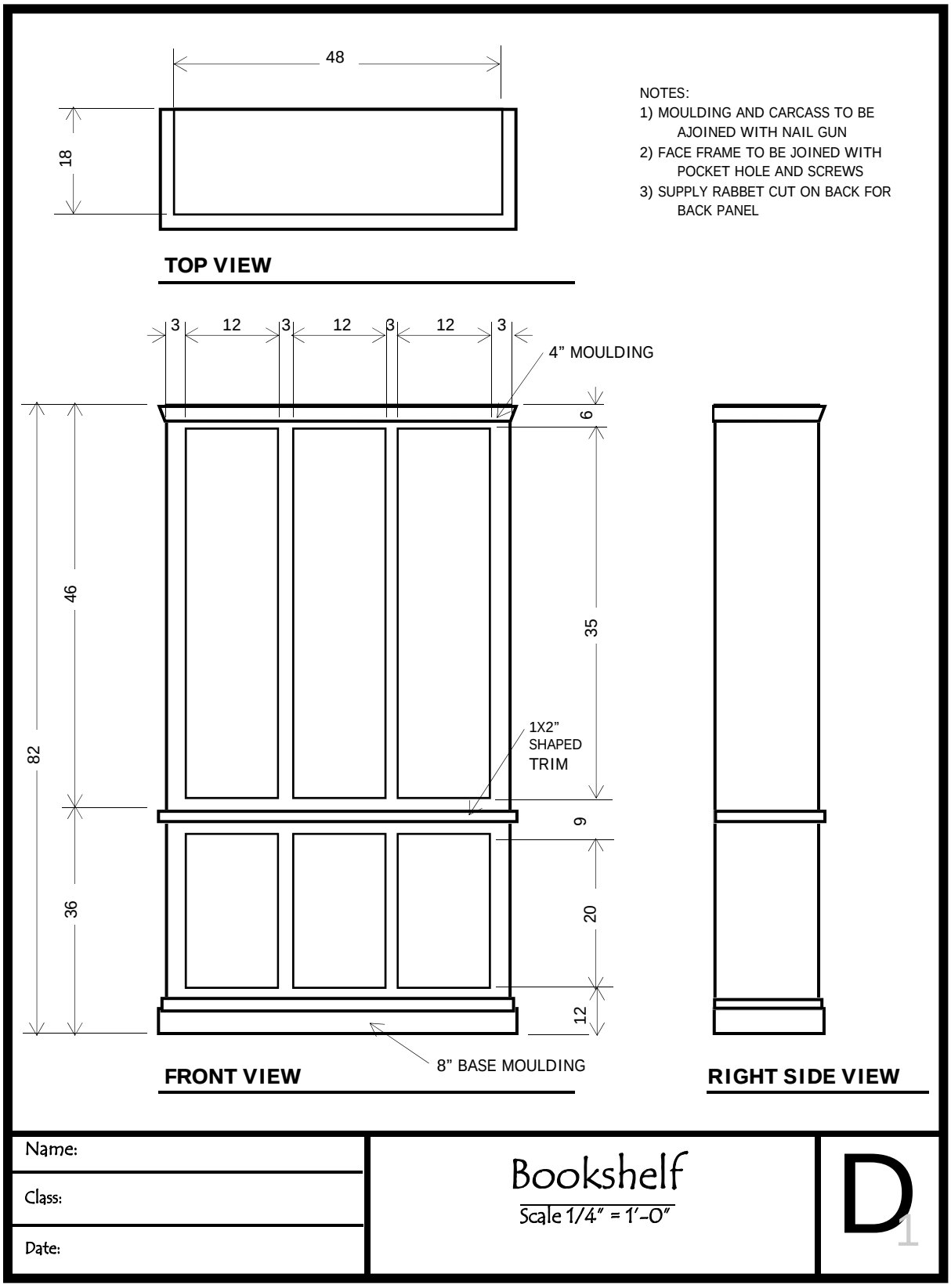
Drafting symbols



Section Symbol

Detail Symbol

Drafting Sample:



Chapter 4

Cutting Schedule

Introduction:

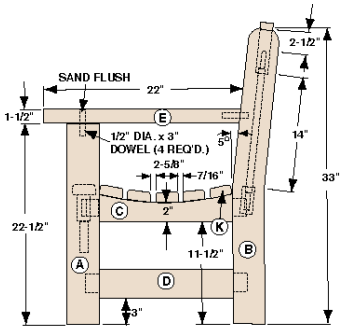
Effective project preparation does not only involve drawing a set of usable, easy to read working plans. It also involves developing a plan for cutting lumber. This plan is called a *cutting schedule*, or sometimes referred to as the cutting list. The cutting schedule lists each part of your project, the number of pieces you will need, the finished cut size, the type of lumber, and the identification of purchased lumber from which the part will be cut. In cases where plywood is used, a drawing of each sheet of plywood and how it will be cut is also included.

Developing a Cutting Schedule:

Once you have completed your working drawings, you will need to determine the final cut-size of each piece. First, create a table with six columns labeled as follows:

Key	Parts	Pcs.	Size	Material	Cut from

1. **Key**: Begin by assigning each piece of your project a letter (A, B, C, etc.). Use the letter to label each part on your rough layout as shown on the illustration to the right.
2. **Parts**: Next, name the piece (Back, front, top, leg, etc.)
3. **Pieces**: If the part to be cut is duplicated, number the amount of pieces you will need to cut. For instance, if you are making a dining room table, you will need 4 legs. If you are making a nightstand, you will need two sides. Since these parts are the exact same size, you need only write the part once and label the amount of pieces.
4. **Size**: Determine the exact size of your final piece after you cut it. Record the dimension. This will tell you the size to cut your wood.
5. **Material:** List the type of material you will use (oak, pine, redwood, etc.). This is particularly important if you are using more than one type of lumber.
6. **Cut from:** List the lumber in its store-bought size from which you will cut the part (1x4x8; ¾" plywood; 2x6x4; etc.). This will tell you from which piece of store bought lumber to cut.



SIDE VIEW

When finished, your cutting schedule will look something like this:

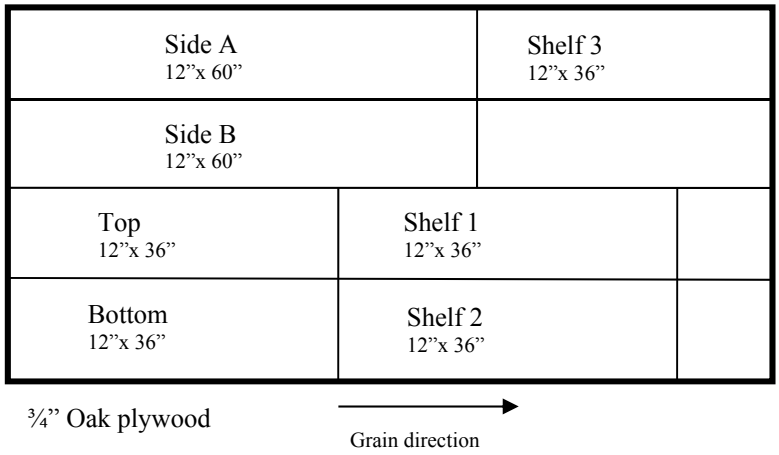
Key	Parts	Pcs.	Size	Material	Cut From (buy) *see Notes
A	Top	1	3/4 x 26-3/4 x 47-7/8" (OA)	Pine	4/8, 1 x 4
B	Edging, ends top	2	3/4 x 1 x 27-3/4"	Pine	All edging from 1/5, 1 x 6
C	Edging, front top	1	3/4 x 1 x 49-7/8"	Pine	"
D	Legs	4	2 x 2 x 28-1/2"	Pine	1/5, 8/4 x 6
E	Top rails, front and rear	2	3/4 x 1-1/2 x 47-1/8"	Pine	All rails from 1/7, 1 x 4
F	Top rails, ends	2	3/4 x 1-1/2 x 24-3/4"	Pine	"
G	Rear stretcher	1	1-3/4 x 1-5/8 x 47-1/8"	Pine	All stretchers cut from 1/7, 8/4 x 8" board
H	End stretchers	2	1-3/4 x 1-5/8 x 24-3/4"	Pine	"
I	Dividers	3	3/4 x 4-1/4 x 26-1/2"	Pine	1/8, 1 x 6
J	Cleat	1	3/4 x 1-1/2 x 22-3/4"	Pine	Scrap box
K	Drawer shelf	1	3/4 x 12-1/4 x 26-1/4"	Pine	1/5, 1 x 8
Drawer					
L	Drawer sides	2	1/2 x 2-5/8 x 12-1/2"	Pine	1/5, 1 x 4
M	Drawer back	1	1/2 x 1-7/8 x 10-5/8"	Pine	1/1, 1 x 4
N	Drawer front	1	3/4 x 4-3/16 x 12-1/4"	Pine	1/18, 1 x 6
O	Drawer bottom	1	1/4 x 10-1/16 x 11-15/16"	Plywood	1 sq. ft.
Keyboard Platform					
P	Keyboard platform	1	3/4 x 14-5/8 x 30-7/8"	Pine	1/5, 1 x 4
Q**	Hand rest	1	3/4 x 2 x 30-7/8"	Pine	1/1, 1 x 4
R	Stop blocks	2	3/4 x 3/4 x 3-1/2"	Pine	1/18, 1 x 6

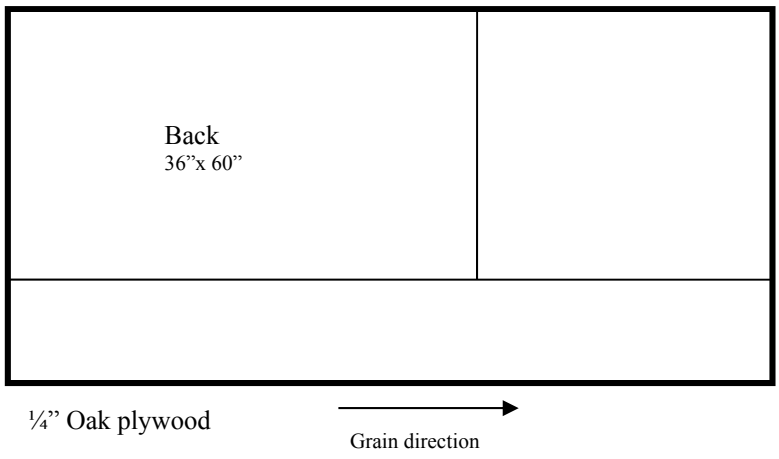
When cutting plywood, it is important to plan your cuts so you don't waste wood. Moreover, careful attention to the direction of the grain and how it relates to your project is equally important. Having one side panel with the grain running horizontally and another side panel with the grain running vertically would be poor craftsmanship.

Simply draw a sheet of plywood to *scale* (a smaller version of the plywood). Then, draw the parts of your project and the location from which they will be cut out of the plywood – make certain these parts are also drawn to scale. Also, be sure to pay attention to the direction you want the grain to go on each part.

Because plywood is large and difficult to maneuver, when cutting out your parts it is best to make your first cut oversized (cut bigger than you need). Later, you will cut the pieces to the exact dimension. For example, the exact size of the finished side panels we need for our bookcase is 11¼" x 59¼". When we cut our shelves out of the plywood, however, we will make our first cut 12"x60" (see side A below). Then, when the oversized pieces are all cut, we will set our table saw fence and cut our shelves to the exact size we need.

When all is said and done, your drawing will look like this:





Chapter 5

List of Materials

Introduction:

The importance of preparing properly for a woodworking project cannot be understated, and it goes much further than simply drawing a set of plans. Not only should you know how you will build your project. You must also know the specific elements required to complete it and the expense. In other words, you should calculate the cost before you begin. Foolish is the person who builds only to find out that the cost is too high to complete. Knowing ahead of time the type of materials, the required hardware, the finishing supplies, how much lumber you will need, and the cost of each will protect you from wasting material, making design mistakes, and falling short on finances. All of this information is included in your *list of materials.* The list of materials is a shopping list. Every item you will need to complete your project should be included on this list, from the size of screw fasteners to the color of stain. Below are the required elements of an effective list of materials.

Items:

1. **Type and size of lumber**: Decide what type of lumber you will use to build your project. This is covered more fully in *Unit Two: Understanding Wood*, but for now consider the purpose of your project (what it will be used for), the desired beauty, and the necessary strength. Then, choose the wood that will best suite your needs. Remember, if you are going to paint your project, consider using press board or a medium density fiberboard (MDF). Finally, list the size and type of each piece of lumber as it is sold in the store. Simply refer to your cutting schedule and find the pieces of common size. Next, ask yourself how many pieces you can get out of a standard eight foot long piece of lumber. For instance, if you will cut four pieces of 3 1/2" lumber 20" long, you will only need to purchase one eight foot piece from the store. Note: Even if the woodshop has your lumber in storage, you must include it in the list of materials as needing to be purchased.
2. **Hardware**: Hardware is the term used to describe metal ware (handles, shelf pegs, shelf supports, etc.) or mechanical equipment (hinges, drawer slides). List the type, item number, and color of each.
3. **Fasteners**: Fasteners are used for joinery. On your working drawings you should have already listed the type of joinery you will use for every joint of your project. List the type and size of the fasteners you will use.
4. **Finish**: Choose the type of finish you will use (oil, wax, paint, stain) and the color
5. **Other**: Include such items as glass, mirrors, pre-fabricated feet, and whatever else your project requires to be completed.

Cost Calculation:

1. **Quantity**: Decided exactly how many of each store bought item you will need to purchase.
2. **Cost per item**: Go to the store and get the prices for each item.
3. **Total**: Multiply the needed quantity by the individual price to determine the amount the item(s) will cost.
4. **Sub Total**: Add up the cost of materials and include it in the space provided.
5. **Tax**: Multiply the sub total by the local sales tax (if %15, multiply by .15).
6. **Total**: Add the sub total and the tax together to determine the total cost.

A sample of a list of materials is provided on the following page. You may not begin building your project until your material list is completed and approved by the teacher.

Materials List

Builder: Joe Smith

Estimated Cost: $294.45

Materials	Quantity	Cost per item	Total
¾x4x8 Oak plywood	2	$58.62	$117.24
1x2x8 Oak	10	$8.44	$80.44
1 ½" Course Pocket screws	1 box	$5.89	$5.89
Stain: Golden Oak	1 qt.	$11.14	$11.14
Poly urethane	1 qt.	$9.78	$9.78
22" Drawer guides	4	$7.89	$31.56
		Tax	$38.40

Total	$294.45

Valley Oaks Woodworks

Name of Client:
Address
Address
Date

Bookshelf
Scale 1/4" = 1'-0"

M1

Unit 2

Understanding Wood

Wood Types

Physical Properties of Wood

Figure and Grain

Ever-moving Wood

Construction Alternative:
Veneers, Particleboard, MDF, Masonite

Advanced Woodworking

Writing Prompts

Answers to prompts must include one quote from the class text and one quote from the internet (dictionary and encyclopedia resources will not be accepted). Use footnotes to cite location of material.

Prompt 6: In 150 words, explain the difference between hardwood and softwood. List and describe five popular hardwoods and the unique characteristics of each, such as color and grain pattern. Also, list and describe five popular softwoods and the unique characteristics of each, such as color and grain pattern.

Prompt 7: In 150 words, describe the four different parts of a tree (bark, sapwood, heartwood, and pith). Explain the difference between heartwood and sapwood.

Prompt 8: In 150 words, explain the difference between grain and figure. In your opinion, what three woods have the most attractive grain? Why? What figure would you like to have in your next project? Why?

Prompt 9: In 150 words, describe two methods used for drying wood and how each one works. Explain why wood needs to be dried and what happens to it if it is not properly dried.

Prompt 10: In 150 words, explain how each of the following is made: plywood, MDF, particle board, and Masonite. Be sure to share where each might be used or applied in a construction project.

Chapter 6

WOOD TYPES

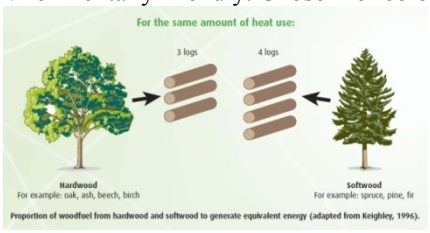
Introduction

To simply grab a piece of lumber and begin building a project before understanding a little about wood is not wise. The environmental effects on your project, the desired strength of your product, the workability of the lumber, and the overall appearance you want to achieve all must be considered. This unit is devoted to help you understand wood, the process by which it is fashioned, and the specific characteristics and properties of different wood types.

First of all, it is important to understand how wood is classified. Wood is categorized into two distinct groups: Hardwood and Softwood. Though one would think this identification has something to do with how hard a piece of lumber is, that is not the case. The characteristics of each are listed below.

Hardwood

- Come from broadleaf trees (typically lose their leaves in the winter)
- Reproduce through seeds inside a shell or covering (i.e. fruits and nuts)
- Typically more dense than softwood
- Usually harder than softwoods, but not always
- Hardwoods have pores, vessels
- Typically harder to work with (i.e. cut, sand, drill, etc.)
- Great variety in range of colors: purple, red, green, orange, brown, black
- Key difference: Grows slower than softwood, and is hard to replenish. Is, therefore, costly and considered less environmentally friendly. Chosen for color and beautiful grain patterns.



Proportion of woodfuel from hardwood and softwood to generate equivalent energy (adapted from Keighley, 1996).

Softwood

- Comes from conifer trees (usually needle trees, or evergreens)
- Reproduce through seeds that fall to the ground as is
- Typically less dense than hardwood
- Usually softer than hardwoods, but not always
- Softwoods have open cells through which food passes to the leaves
- Typically easier to work with (i.e. cut, sand, drill, etc.)
- Little range of color: pale yellow and browns
- Key difference: Grows faster than hardwood and is therefore less expensive. As a result it is considered more environmentally friendly. Chosen because of plain color and long, simple, non-distracting grain patterns

Lumber selection

When selecting the type of lumber you will use, consider the following questions:

- Grain selection: What type of pattern do you want (simple, busy, long, circular, etc.)?
- Color: What type of color do you want?
- Durability selection: What will your project be used for? Does it need to be durable? Hardwoods are typically more durable than softwood, and therefore don't break or split as easily. Douglas fir, however, is one of the strongest woods and it is softwood.
- Cost: How much do you want to spend? Hardwoods are typically more expensive.
- Environment: Will your project be used indoors or outdoors? Certain woods stand up to moisture better than others. Redwood, for instance, has long been used for outdoor applications.

Wood Characteristics

The following chart, adapted from http://www.hoovedesigns.com/woods.html, will help you better understand the different properties and uses of wood types.

PINE:

Pine is a softwood which grows in most areas of the Northern Hemisphere. There are more than 100 species worldwide.

Properties: Pine is a soft, white or pale yellow wood which is light weight, straight grained and lacks figure. It resists shrinking and swelling. Knotty pine is often used for decorative effect.

Uses: Pine is often used for country or provincial furniture. Pickled, whitened, painted and oil finishes are often used on this wood

ALDER:

Alder wood exhibits a straight grain and fine texture known for ease in staining. Alder possess the ability to mimic the appearance of other hardwoods, based on the color of the stain applied.

Properties: Alder often is orange, brown or reddish in hue. Types include common alder, gray alder and red alder. Alder is softer than staple hardwoods--such as oak, maple and cherry--and dents easily.

Uses: The softness of alder makes it a popular carving wood. Broom handles, toys, clogs, textile rollers and cabinetry are among its common uses, according to WoodBin Woodworking.

OAK:

Oak is the most widely used hardwood. There are more than 60 species of oak grown in the U.S., which can be separated into two basic varieties; white and red. The red variety is also known as black oak (a reference to its bark).

Properties: Oak is a heavy, strong, light colored hardwood. It is ring porous, due to the fact that more and larger conductive vessels are laid down early in the summer, rather than later. Prominent rings and large pores give oak a course texture and prominent grain. Oak also has conspicuous medullary rays which can be seen as "flakes" in quarter sawed oak lumber.

Uses: Oak is the most popular wood used to craft American and English country designs. It is also used for Gothic and William & Mary reproductions, as well as many transitional and contemporary pieces.

MAPLE:

There are 115 species of maple. Only 5 commercially important species grow in the U.S. Two of the five are hard rock maple and sugar maple.

Properties: Maple is so hard and resistant to shocks that it is often used for bowling alley floors. Its diffuse evenly sized pores give the wood a fine texture and even grain. Maple that has a curly grain is often used for violin backs (the pattern formed is known as fiddleback figure). Burls, leaf figure, and birds-eye figures found in maple are used extensively for veneers. The Birds eye figure in maple is said to be the result of stunted growth and is quite rare.

Uses: Maple is used extensively for American colonial furniture, especially in medium and lower priced categories. It can also be stained to simulate cherry wood, which it resembles.

WALNUT:

Walnut is one of the most versatile and popular cabinet making woods. It grows in Europe, America and Asia. There are many different varieties.

Properties: Walnut is strong, hard and durable, without being excessively heavy. It has excellent woodworking qualities, and takes finishes well. The wood is light to dark chocolate brown in color with a straight grain in the trunk. Wavy grain is present toward the roots, and walnut stumps are often dug out and used as a source of highly figured veneer. Large burls are common. Walnut solids and veneers show a wide range of figures, including strips, burls, mottles, crotches, curls and butts. European walnut is lighter in color and slightly finer in texture than American black walnut, but otherwise comparable.

Uses: Walnut is used in all types of fine cabinet work, especially 1 8th century reproductions.

CHERRY:

Cherry is grown in the Eastern half of the U.S.. It is sometimes called fruitwood. The term fruitwood is also used to describe a light brown finish on other woods.

Properties: A moderately hard, strong, closed grain, light to red-brown wood, cherry resists warping and checking. It is easy to carve and polish.

Uses: Cherry veneers and solids are used in a variety of styles. Cherry has been called New England mahogany and is often used to craft 18th century, Colonial and French Provincial designs.

REDWOOD:

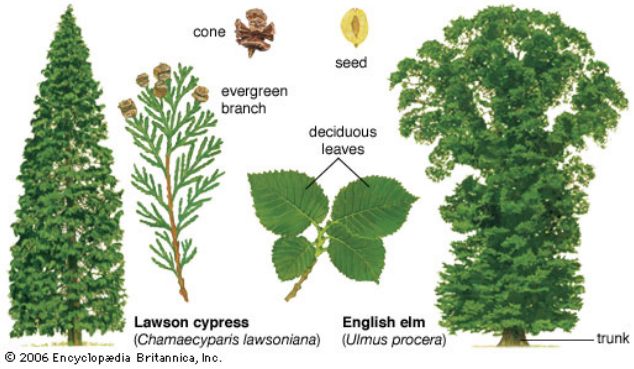
Indigenous to the Pacific United States, redwood trees grow to more than 300 feet tall and 2,500 years old.

Properties & Uses: The best quality redwood comes from the heartwood which is resistant to deterioration due to sunlight, moisture and insects. It is used to craft outdoor furniture and decorative carvings. Redwood burls have a "cluster of eyes" figure. They are rare and valuable.

CEDAR:

Several species of cedar grow in the southern United States, Central and South America.

Properties & Uses: Cedar is a knotty softwood which has a red-brown color with light streaks. Its aromatic and moth repellent qualities have made it a popular wood for lining drawers, chests and boxes. Simple cases and storage closets are also constructed from this light, brittle wood.



MAHOGANY:

Mahogany, also known as Honduras mahogany is a tropical hardwood indigenous to South America, Central America and Africa. There are many different grades and species sold under this name, which vary widely in quality and price. Mahogany which comes from the Caribbean is thought to be the hardest, strongest and best quality. Logs from Africa, though highly figured, are of slightly lesser quality. Philippine mahogany has a similar color, but is not really mahogany at all. It is a much less valuable wood, being less strong, not as durable or as beautiful when finished.

Properties: Mahogany is strong, with a uniform pore structure and poorly defined annual rings. It has a reddish - brown color and may display stripe, ribbon, broken stripe, rope, ripple, mottle, fiddleback or blister figures. Crotch mahogany figures are widely used and greatly valued. Mahogany is an excellent carving wood and finishes well.

Uses: Mahogany is used extensively in the crafting of Georgian, Empire and Federal reproduction furniture. Mahogany is also used in styles ranging from Victorian furniture reproductions to Contemporary.

TEAK:

True teak is indigenous to Southeast Asia, but similar wood species also grow in Africa.

Properties & Uses: Teak is a yellow to dark brown hardwood which is extremely heavy, strong and durable. Often strongly figured, teak may show straight grain, mottled or fiddleback figures. It carves well, but because of its high value, is often used as a veneer. Scandinavian modern, and oriental furniture styles are often crafted of teak.

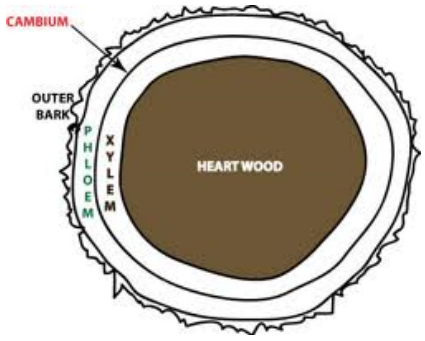
Chapter 7

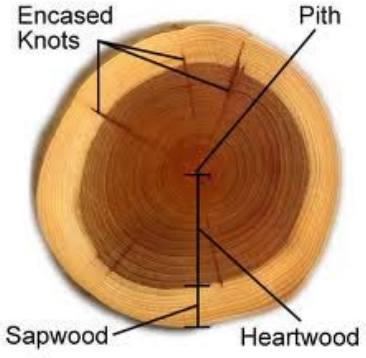
PHYSICAL PROPERTIES OF WOOD

Introduction:

Lumber comes from trees – no surprise there – and the type of tree it comes from determines whether the lumber is hardwood or softwood, which, you will remember, has nothing to do with the hardness of the wood but the color, grain pattern, and cost. Whether you choose to use hardwood or softwood, it is important to know that the physical properties of all wood are the same. In every tree trunk and branch there is ***sapwood*** and ***heartwood***. Sapwood is the soft part of the tree's trunk used for transferring sap and water to the branches and leaves. When sapwood is retired (i.e. it is no longer working for the tree), it hardens and new sapwood is formed. This hardened sapwood is called heartwood. To better understand how this works, you must understand how a tree lives and grows.

The outer skin of a tree is called ***bark***. It protects the tree from insects, disease, storms, and/or extreme temperatures. When milling a tree for lumber, this outer skin, or armor, is removed and discarded. Inside the tree, the wood is made of long cells. These cells are made of cellulose (the same material used for making a household sponge). These cells are bounded together by lignin. To better understand this, think of a bundle of straws (representing cells) attached together with glue (representing lignin). They may be easy to peel apart, but not so easy to break. Wood is much the same. Long cells, like straws, carry food and water up and down the tree.[1] This all takes place in the ***sapwood***. So, you can imagine, lumber formed from this part of the tree is softer and weaker. The ***heartwood***, however, is hard and strong. It is formed from old layers of sapwood, and has dried, darkened, and hardened with age. Finally, the ***pith*** is located in the center of the tree. When the tree was young, the pith was the first layer of sapwood, and it carried and stored food. As future layers of sapwood formed, the pith was no longer used, so it hardened and became part of the heartwood. Being the oldest element of the tree, the pith is used to form the strongest lumber.





Harvesting Trees for lumber:

When trees are harvested for lumber, both the heartwood and the softwood are used. Following are the characteristics of both:

Sapwood:

- Is less durable and more permeable than heartwood.
- Many times, sapwood is graded a higher quality than heartwood because it is smoother and less prone to knots and blemishes formed by encased knots (see above right illustration). The highest-grade sapwood is virtually free of any imperfections.
- Coloration of sapwood ranges from white to light yellow tones.
- Sapwood is best used for planks, siding, partition wall studs, and other building components not subject to lots of stress.
- Unless treated sapwood is more susceptible to decay
- You can identify lumber made of sapwood simply by looking at the end grain of the board. If the grain pattern is virtually straight, chances are it has been cut from the outer sapwood layer where the growth rings of the tree are a greater diameter.

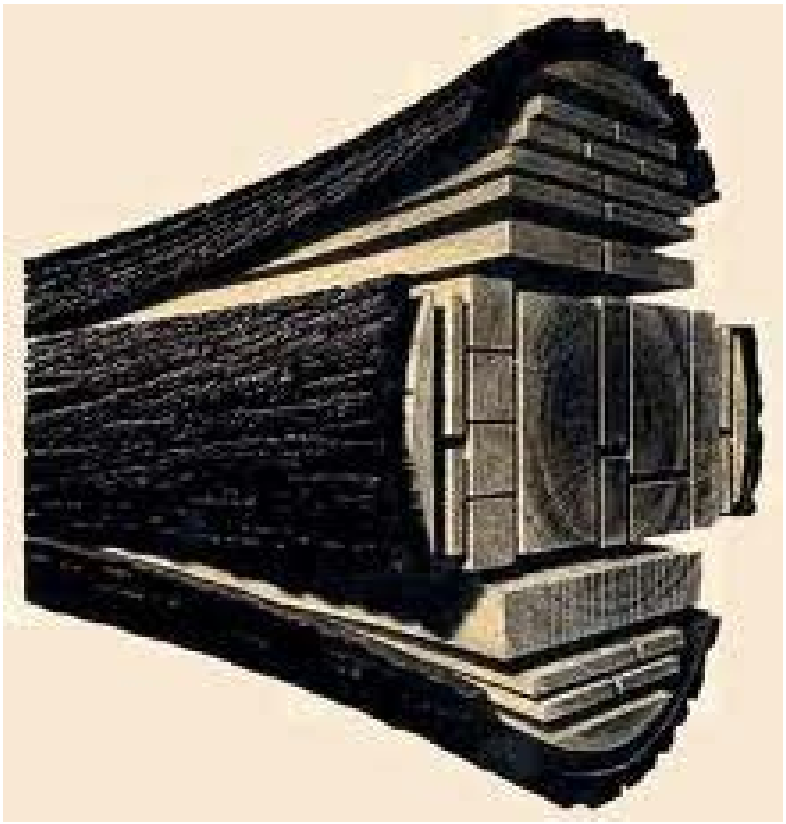
[1] Note: These, cells, by the way, form the lines we call grain. The reason we have to work extra hard on board ends is because these open cells must be closed properly to prevent stain from soaking into the straw like material and discoloring our wood.

Heartwood

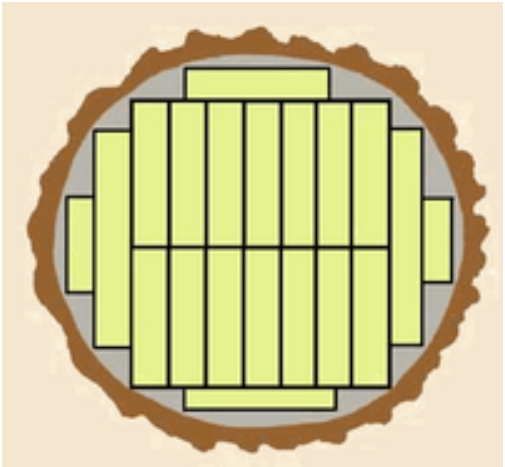
- Heartwood is usually graded lower than sapwood because it retains more imperfections and knottiness than sapwood.
- Best used for exposed conditions or as structural members because it is stronger and more durable
- You can identify lumber made of heartwood simply by looking at the end grain of the board. If the grain pattern has tight arcs, chances are it has been cut from the inner layer where the growth rings of the tree are a lesser diameter.

Milling Lumber:

As illustrated below, wood is milled from a tree longitudinally (i.e. the full length of the tree). Notice the growth rings. The heartwood growth rings form smaller, tighter circles than the sapwood. Now, notice how the larger beams are milled from the center of the tree, while the thinner boards used for veneer or decorative pieces are cut from the out layers.



The illustration on the right shows how lumber is milled from a tree to get the most use of the wood.



Chapter 8

FIGURE AND GRAIN

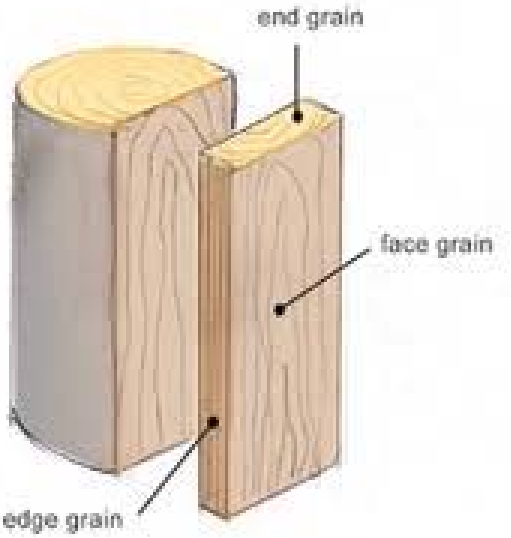
Introduction:

At some point in your woodworking career you will need to identify lumber. How this is done is similar to the method by which you can be identified: your finger print, skin pigmentation, and identifying scars or marks. You are unique and special, so much so that not even your finger print is the same as any other human being. Wood is unique as well (though not as special as you), and also has unique characteristics by which it can be identified. Like you, it has a uniquely patterned "finger print," a certain color pigmentation, and identifying scars and marks. These identifiers are known as grain and figure.

Understanding Grain:

Grain is the term used to describe the pattern of lines found in lumber formed from the cells that make up wood. Simply put, grain is the appearance of the wood resulting from growth ring structure, much like a human finger print. These lines can be found in the three different surfaces on which grain appears: the End Grain, the Face Grain, and the Edge Grain

- ***End Grain***: End grain is at the end of the board, the part through which the cross cut is made. It looks and acts differently than the other two grain surfaces. As we saw in the last chapter, inside the tree the wood is made of long cells running longitudinally up the tree, which we compared to a bundle of straws. When a cross cut is made, then, the end of the board is nothing more than a series of small open pores. This means that whatever is put on the end grain is absorbed very quickly and pulled deeply into the wood, much like straws or a sponge sucking up water.



- ***Face Grain***: The widest side of the board where we see the grain pattern and determine the figure of the wood is called the lumber face. The grain here runs from end –to-end and is called the face grain. Joints made by adjoining face grains are for the purpose of creating thicker wood, such as beams, or for creative decorative layers for as bowls and goblets.

- ***Edge Grain***: The longitudinal edge of the board contains the edge grain. It, too, runs from end to end. Joints along the edge grain are for creating planks (wider boards such as table tops, drawer fronts, etc.)

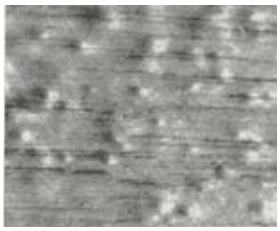
Understanding Figure:

In woodworking, when we speak of what wood looks like (i.e. color variations, grain pattern, rays, knots, etc.), we use the term ***figure***. Figured wood is not plain. The surface appearance has illusory movement, distinct patterns, and unique character. Yes, the grain has much to do with figure, but the natural properties of the wood and how it is cut also contribute. Below is a list of figure types.

Types of figure include:

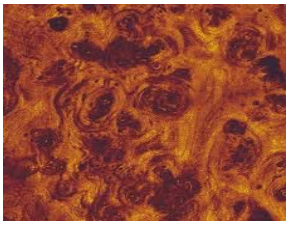
- Bear scratches: Marks left behind by the deep penetration of bear claws.
- Bird's eye: Patterns of small dark, swirling dots, called "eyes," in the wood.
- Blister: A figure that resembles three-dimensionally painted storm clouds, or blisters.
- Burl: Similar to bird's eye, only the dark dots are much larger and dense.
- Curl: Also called tiger stripe or ripple, this pattern forms alternating lines of dark and light colors.
- Dimple: Small dent-like patterns, similar to bird's eye, only they do not swirl.
- Fiddleback: A curly figure achieved by quarter sawing, with nearly straight lines and perpendicular curls.
- Flame: Distortions in the wood produce wavy lines, like flames.
- Ghost: Phantom-like dark lines in wood in no discernible shape or pattern
- Quilted: A wavy "quilted" pattern resembling ripples on water
- Spalted: Wood coloration caused by fungi.

Bird's Eye



Dimple

Ghost



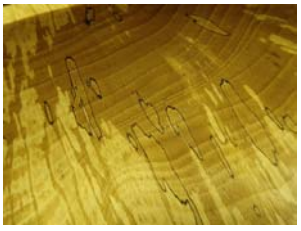
Burl

Fiddleback

Quilted

Blister

Flame



Spalted

Curl

Chapter 9

Ever-moving wood

Ever-moving wood:

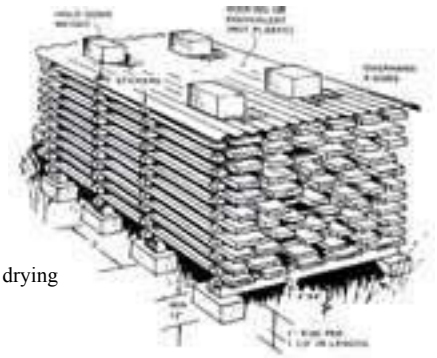
As we have seen, the fibers in wood resemble straws. These straw-like fibers carry water and minerals up the tree in what we call ***free water***. This free water moves into the branches and into the leaves. There, photosynthesis takes place and produces food for the tree and oxygen for us. To say nothing of water that is simply absorbed from outside the cell walls, which we call ***bound water***, you can imagine how moist the inside of a tree is. In fact, this "free" and "bound" water weight can be heavier than the wood itself.

Moisture and wood:

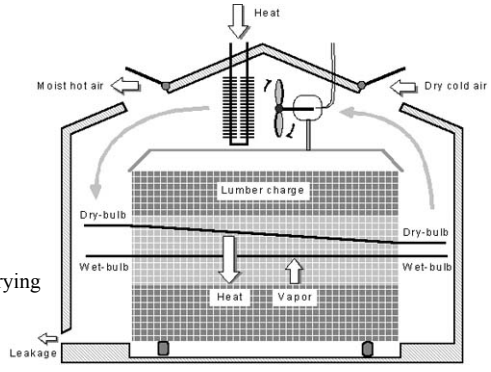
Because the moisture content in a tree is so high, it should be dried before it is used for construction. If it is not, as the wood loses moisture, it will warp. A ***warp*** is when the shape of a piece of lumber deviates in any way from its true or plane surface. Although warp, regardless of how severe, has no effect on the strength of a board it does limit its usability. Types of warp include: bow, crook, kink, cup, and twist.

- Bow - *Flatwise warp*: A deviation from the true shape of a board from end-to-end when it is laid flat on its face. In other words, if the board is laid flat, the board ends touch the surface while the middle does not. Or, conversely, the board rocks back and forth from the middle on its face.
- Crook or Crown – *Edgewise warp*: A deviation from the true shape of a board end-to-end when it is laid on the edge. In other words, if the board is set on its edge, the corners of the board ends touch the surface while the middle does not. Or, conversely, the board rocks back and forth from the middle on its edge.
- Kink or Dog leg – *Edgewise end warp*: Think of it as one-half the crook or crown warp. This edgewise deviation is only on one end of the work piece. The edge is no longer perfectly straight.
- Cups – *End warp*: A deviation from a flat plane, edge to edge. In other words, if you looked the board from the end, the warp would resemble a cup or bowl.
- Twist – *Corner warp*: A deviation from the true shape of a board from corner to corner in a twisting or spiraling fashion.
- Split: A separation of the wood completely through a piece of lumber.

Wood warps because it shrinks as it loses moisture. If it shrinks evenly on both faces and both edges of the board, it remains flat, but if it does not the board warps. It is not selective as to how. Wood can cup, split, and twist all in the same board. To control this, the removal of moisture from the cut lumber must be controlled, or at least monitored, so that it shrinks evenly. This is done in two ways: Air drying and kiln drying.



Air drying



Kiln drying

Drying wood:

When a board is sawn from a log, it must be properly dried to prevent warp. You see, the freshly sawn board is saturated with moisture, having at times a moisture content as high as 100 percent. That is to say that there is as much weight of water in the board as there is weight of dry wood tissue; the water inside weighs as much as the wood itself. There are two popular ways of drying wood: Air dry and Kiln dry

- ***Air drying***: Air drying is the drying of timber by exposing it to the air. The technique of air drying consists of stacking sawn timber on a raised foundation in a clean, cool, dry, and shady space. Each column of timber is spaced equally, and each layer is separated by small dividers called stickers. The empty "air space" allows air to flow completely around the board and pull out the moisture. As you might think, this is a time consuming process.
- ***Kiln drying***: Kiln drying is much quicker. It is done by stacking lumber in a wood drying kiln and introducing heat. This introduction of heat may be done either directly with the use of natural gas and/or electricity, or indirectly through some sort of heat exchanger, such as steam or solar energy. At each stage of the drying process, the temperature, relative humidity, and air circulation are controlled by the operator.

Moisture and Wood:

Moisture, such as water, liquid, or humidity, has a continual effect on wood. Simply because it has been dried, does not mean it is immune from distortions. Because the walls around wood cells are made of a sponge-like material (remember, sponges are made from this stuff), lumber continually absorbs moisture. Just put a wet glass on your mother's dining room table and see how angry she gets for "staining" her furniture. The mark left behind is from the wood absorbing the moisture. This constant absorption of moisture causes continual shrinkage and swelling to wood, especially in high humidity areas. Careful attention must be paid when adjoining lumber pieces in order to prevent unsightly and damaging deviations.

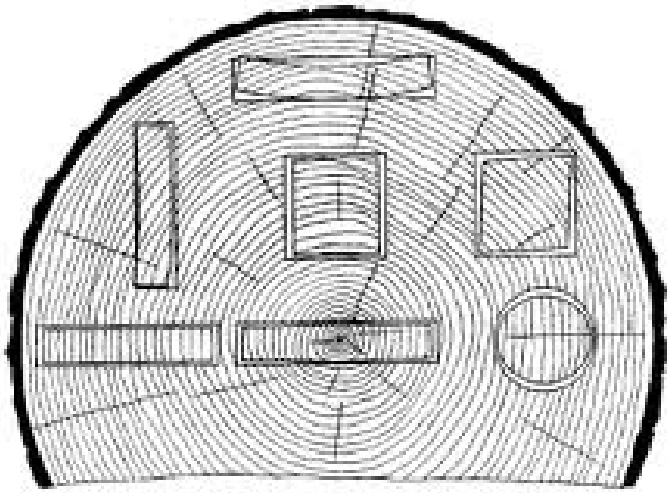


Figure 3–3. Characteristic shrinkage and distortion of flat, square, and round pieces as affected by direction of growth rings. Tangential shrinkage is about twice as great as radial.

Chapter 10

CONSTRUCTION ALTERNATIVES: VENEERS, PRESSBOARD, MDF, MASONITE

Introduction:

When selecting wood for a project, it is important to choose the right lumber. For panel construction –used for large, flat surfaces such as cabinet sides, table tops, flooring, or even door panels - there are construction alternatives to gluing planks of wood together. Manufactured lumber, such as a *veneer* or *fiberboard* panels, is also an option. The term *veneer* refers to the process of gluing thin sheets of wood together in layers alternating the grain direction in each layer. This provides a strong surface with less chance of distorting. *Fiberboard*, on the other hand, is created by gluing wood fibers or wood chips together using heat and pressure. Both are typically found in 4 foot by 8 foot sheets of varying thickness. Four types of veneers and fiberboard panels popular today are:

- Plywood
- MDF
- Particleboard, pressboard, or chipboard
- Masonite

Plywood:

When constructing a wood project requiring large panels (flat surfaces) you have many options. But if you plan on staining that project, you only have two: Glue wood planks together or use plywood. Plywood, by far is the cheaper and more practical way to go. Plywood is a type of manufactured timber made from thin sheets of wood veneer, or thin sheets of lumber. Because the outer "visible" veneer can be of any type of wood you desire (oak, maple, walnut, etc.), you are not limited to the type of lumber you can use for your project.

Plywood is one of the most widely used wood products today. It is flexible, inexpensive, workable, and re-usable. It is used instead of plain wood because of its resistance to cracking, shrinkage, and twisting/warping. Moreover, plywood has a general high degree of strength.

Plywood layers (called veneers) are glued together. Each layer is called a ply. When gluing the plies together, the grain pattern of each alternating layer is placed at a right angle to the layer before it. This adds to the strength. There are usually an odd number of plies so that the sheet is balanced—this reduces warping.

Advantages:

1. Allows you to keep the wood look of a project.
2. Can be stained
3. Is strong and resistant to distortions
4. Cheaper than wood planks

Disadvantages:

1. Splinters when routered
2. Exposed edges show veneers
3. Feathers, sheaves, or splits when screw fasteners are used or when hinges are applied

MDF

If you are constructing a large panel project and do not intend on staining the project, by far the best choice is to use MDF, medium density fiberboard.

MDF is an engineered wood product formed by breaking down hardwood or softwood "left-overs" (the wood material left behind after milling) into wood fibers. These left-overs are combined with wax and a resin binder, which are then formed in panels by applying

high temperature and pressure. MDF is more condensed and more compressed than plywood. Edges, therefore, may be routered cleanly and sanded with little effort. Entire projects can be made from MDF, the tops, the shelves, the face frames, the drawer fronts, and more.

Advantages:

1. Edges are easily routered and sanded.
2. Easily painted
3. Minimal sanding
4. Can use for the entire project
5. Cheaper than wood

Disadvantages:

1. Cannot be stained
2. Does not look like wood

Particleboard or Pressboard

For projects where beauty and strength is not a concern and price is a factor, particleboard is an option. Particleboard, sometimes called pressboard or chipboard, is an engineered wood product manufactured from wood particles, such as wood chips, sawmill shavings, or even saw dust. These materials are combined with a synthetic resin or some other suitable binder and pressed together, forming what we call a composite material.

Particleboard is rated according to its density, or how compressed the composite material is, the higher the grade, the denser the particles. This is important for determining strength and the ability of the particleboard to hold tightly to a screw fastener. Though particleboard is denser than conventional wood, it is the lightest and weakest type of fiberboard used for construction. On the other hand, medium-density fiberboard and high-density fiberboard (hardboard) are stronger and denser than particleboard.

A major disadvantage of particleboard is that it is very prone to expansion and discoloration due to moisture, particularly when it is not covered with paint or another sealer. Therefore, it is rarely used outdoors or places that have high levels of moisture, with the exception of some bathrooms, kitchens and laundries, where it is commonly used as an underlayment beneath a continuous sheet of vinyl flooring. It does, however, have some advantages when it comes to constructing the cabinet box and shelves. For example, it is well suited for attaching cabinet door hinges to the sides of frameless cabinets. Plywood has the potential to feather off in sheaves when extreme weight is placed on the hinges. In contrast, particle board holds the screws in place under similar weight.[1] Additionally, particleboard is favored for cabinet shelves that need to span a long width (30"or more) since it will not bow under the weight like plywood.

Advantages:

1. Cheap.
2. Good underlayment for vinyl or tile backer board
3. Holds screws in place
4. Good for shelves spanning 30” or more

Disadvantages:

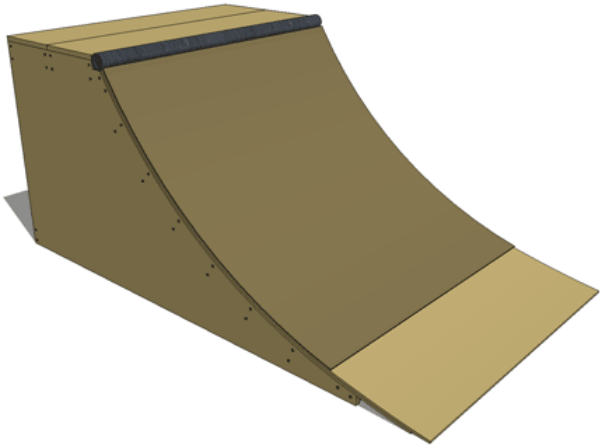
1. Chips when routering
2. Prone to expansion and discoloration due to moisture
3. Does not look like wood

Masonite

Masonite is a type of hardboard similar to particle board and medium-density fiberboard, but is denser, much stronger, and harder. Thus, it is also called “hardboard.” Because it is made out of exploded wood fibers that have been highly compressed, it offers some valuable characteristics. It differs from particle board in that the bonding of the wood fibers requires no additional materials, although resin is often added. Unlike particle board, it will not split or crack. It is used in construction and furniture. Hardboard is

produced in either a wet or dry process. The wet process leaves only one smooth side while the dry processed hardboard is smooth on both sides.

Masonite is a popular choice for skateboard ramps and ping pong tables or any such exterior material where strength and flexibility are required. Other such uses as drawer bottoms, cabinet backs, stage floors, artistic paint supports, and even chessboards make Masonite a versatile and beneficial product.



Advantages:

1. Hard
2. Flexible
3. Durable
4. Weather resistant

Disadvantages:

1. Expensive
2. Does not look like wood

Unit 3

Project Construction

Plan the work, work the plan

Measurements and Layout

Squaring Wood

Advanced Joinery

Making corrections

Advanced Woodworking

Writing Prompts

Answers to prompts must include one quote from the class text and one quote from the internet (dictionary and encyclopedia resources will not be accepted). Use footnotes to cite location of material.

Prompt 11: In 150 words, list the steps that should be taken when cutting material for a project. Be certain to include the importance of the cutting list, the cutting schedule, the grain direction, how to lay out cuts, and the order of cuts.

Prompt 12: In 150 words, explain the following terms: width, depth, and length of a piece of lumber; rip-cut and cross-cut; and the direction wood grain should run on the sides, front, and top of a woodworking project.

Prompt 13: In 150 words, illustrate each of the following joints: dado, rabbet, lap, mortise and tendon, tongue and groove, and dovetail. Also, explain when and how a person should decide which joinery they should employ for the joints in their project.

Prompt 14: In 150 words, explain when it is necessary to use a planer and a jointer on a project. What would these tools be used to accomplish?

Prompt 15: In 150 words, define the terms square, symmetrical, and round. Be sure to list the tools and/or methods that can be used to assure these are accomplished.

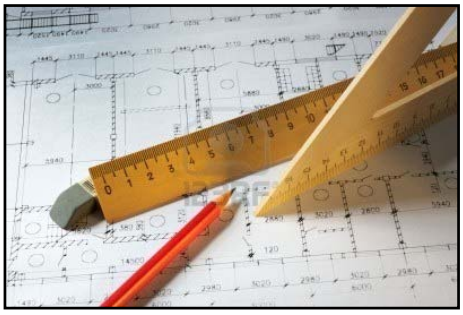
Chapter 11

WORK THE PLAN

Introduction

In Unit I, *Project Preparation,* we discussed the necessary process for planning a woodworking project. In Unit II, *Understanding Wood,* we studied the different characteristics and types of wood. Now, it's time to begin! You have heard it said, *Plan the Work, Work the Plan.* Well, with the plan in place and the type of wood chosen, it's time to work the plan.

Steps to beginning a project:



1. Read your plans: If you have planned poorly, you're project will suffer. At the very least you will be frustrated. You will also waste time, energy, and materials. It cannot be overstated, "Take the time to plan your work effectively." Before ever beginning a project ask yourself the following questions:
    a. Is everything you need to know about how your project will be built answered on your plans?
    b. Do you know what you are going to do?
    c. Do you know what type of wood you are going to use?
    d. Do you know how to build your project?
    e. Do you know the exact size of each cut?
    f. Do you know what type of joinery you are going to use (see below)?
    g. Do you know how everything is going to go together?

    If you cannot say yes to each of these questions, you have not properly planned your work. You should review Unit I and take the time to get this step right. I am constantly amazed as to how students can spend time drafting plans for their project and not know how it will go together, what size to cut something, or what joints they will be using.

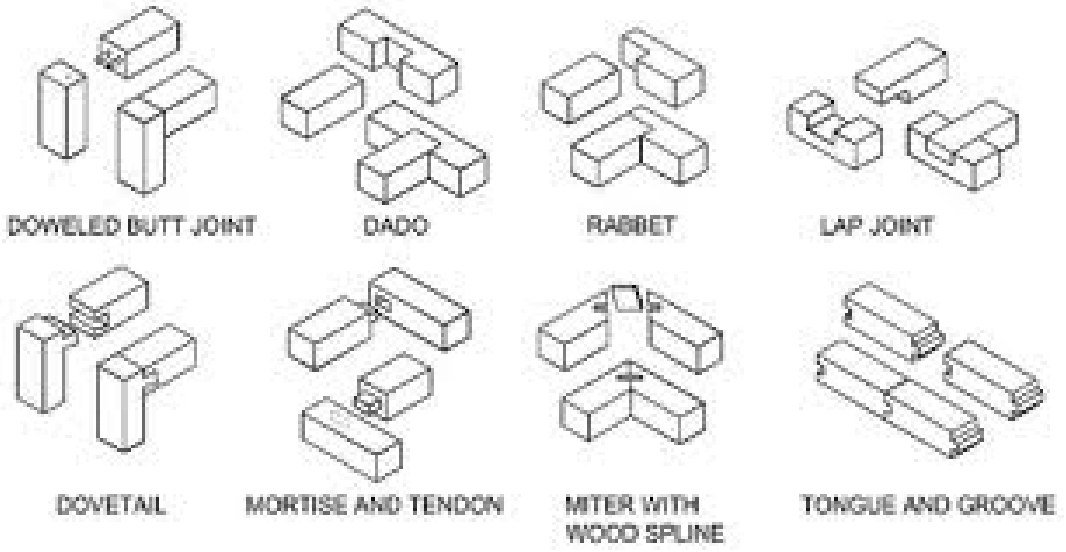
2. Purchase your materials: You wouldn't go to the grocery store without a shopping list, would you? Not especially if you wanted to cook a certain, special meal. Woodworking is the same. As we discussed in Unit I, you should know what you're going to buy and have an idea of how much it is going to cost BEFORE you go shopping. Cutting should not begin until all material is purchased. Ask yourself the following questions:
    a. Is your *List of Materials* complete? It is your shopping list.
    b. Do you know where to purchase everything?
    c. Do you have an idea of cost?

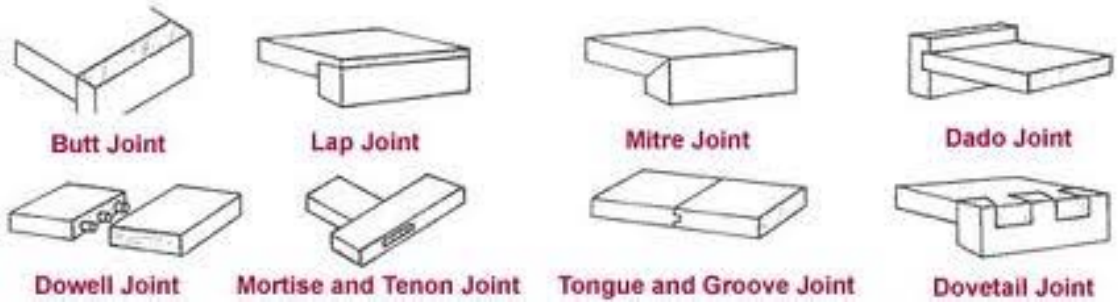
3. Work the Plan: Simply getting started is often the hardest thing for people to do. This often occurs because people don't really understand their plans and what to do first. Also, inexperienced or insecure woodworkers are timid and fearful of making mistakes before they ever begin. Don't worry. Mistakes happen; we'll talk about that later. For now, just think of every possible mistake that could happen as being nothing more than an opportunity to try something new. The big mistakes only happen if you haven't prepared properly or if you haven't asked the right questions. Don't start working the plan if you haven't properly planned the work. But, if you've prepared, then just take a deep breath and get started. To help with this, some people will make a list of things to do, or write down the steps they need to take to complete their project. Either way, ask yourself the following:
    a. Do you know how to get started?
    b. Do you know what you are going to do first, second, third, and so on?
    c. Do you have everything necessary to get started and finish your project?

    If you answered *yes,* it's time to get cutting…

4. Cut your wood: The first plan of attack is to cut all of the pieces of your project first, like creating the pieces of a puzzle. When you are done, you will put everything together. We will discuss layout wood cuts in the next chapter.

5. Know the joints you will use: Much of knowing how you will cut your lumber depends upon which type of joint you will use. The joinery you will use is determined in the planning stage, not the construction stage. Joints should be called out on your plans, either with an arrow note or a listing in the legend. Below are commonly used woodworking joints:





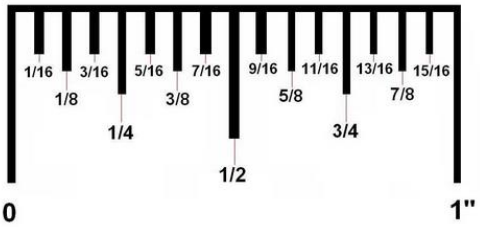
Chapter 12

MEASUREMENTS AND LAYOUT

Introduction

Okay, so you've read your plans, chosen your wood, familiarized yourself with the required joinery, and purchased all of your building materials. Now, at last, it's time to cut. Typically, the order in which you cut your lumber is not important. You are simply cutting out the pieces of your project so that like a model or a puzzle you can put them together. It's not some much that you have the right order of the cuts in mind, as much as it is that you have the right mind to cut in order. That being said, you should always first think through your project and determine a plan of action. If you are building a cabinet, for instance, you should consider cutting and assembling the carcass, or cabinet box, first. Then, cut and assemble the face-frame to fit. After the face-frame has been mounted to the carcass, then you would build your drawers and cabinet doors.

If you do not know how to measure to the nearest 1/16" take some time to learn before you get started. Woodworkers have a golden rule to *Measure twice, and cut once.* Keep this phrase in mind at all times while working on your project. If you cannot measure well, you cannot cut accurately. To measure twice and cut once means to 1) measure the size of your cut, 2) make a mark on the wood, and 3) take the wood over to the machine and measure it again before cutting. Match your measurement to the plan or the cutting schedule and make sure it is correct. Then, at last, make your cut.




Fastener →

When measuring, make certain your tape measure fastener (sometimes called a latch bracket, tang, lip, or metal hook) is securely placed against the edge of the wood. This marks the beginning of your measurement, or 0". If it is not firmly against the wood, your measurement will be off. Also, examine this fastener before you get started. It should be not be loose. If it is loose, 0" will not be a true 0". Finally, keep your tape tight and straight. A loose or angled measurement is longer than a tight and straight one.

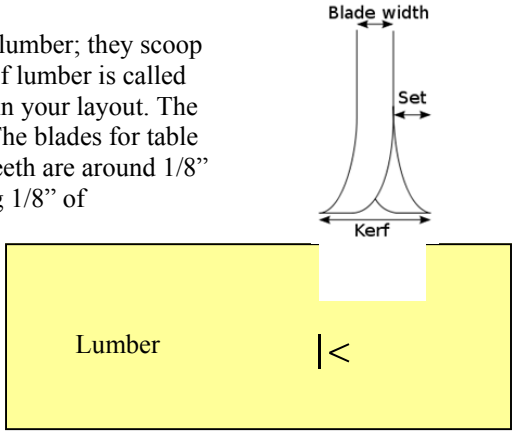
Keys to measuring and layouts:

1. **Material List…use it:** Using your material list, assemble the raw material together. The raw materials are the pieces of lumber or boards from which you will be cutting; the store bought wood. Check the lumber for knots, splits, warps, nails, and staples and plan your cuts accordingly. In other words, remove the nails and staples, cut around loose knots, cut off splits, and determine if you can work with any warps.
2. **Cutting Schedule…follow it:** Following your cutting schedule, cut each piece of lumber to the desired size (i.e. the size written on the schedule). Begin by cutting off the ends of each workpiece. This will assure that the end is square. Moreover, often the end of store bought lumber is rough, chipped, or damaged. By removing the end, you will save yourself a lot of work during the sanding and finishing stage.
3. **Determine your Cut…Final cut or Rough cut?** Two types of cuts are employed when sizing wood for your project, a final cut and a rough cut. A *final cut* is the last cut you will make to that piece of lumber. The size will match the dimensions found on your cutting schedule. A *rough cut* is made slightly larger than the finish size of the workpiece. This is often done to make larger pieces of lumber smaller and more manageable, or because the stock will be planed down to size and made square. We will discuss squaring wood in the next chapter. For now, remember not to do any final cuts on wood yet to go through the squaring process. If you will be squaring your wood, only make rough cuts. So, before you begin cutting, decide if your cut will be the final cut or the rough cut.
4. **A Simple Mark…No Lines, please:** Because you are using machinery, there is no reason to draw lines on your wood. Lines are only necessary if freehand cuts are being made and you need to follow the lines with your blade, such as cutting curves. Pencil marks are nothing but a nuisance later on when sanding and staining. Do not draw lines. Measure the distance of your cut and make a short,

thin mark on the wood. Don't scribble it, color it, or circle it. One clean, straight, little mark matching in line with the measurement on your tape measure is all you need.

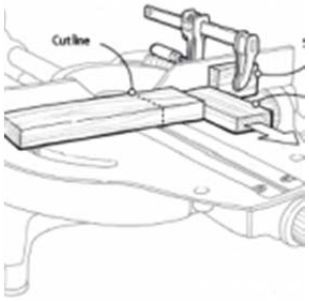
5. **Measure and Mark you Lumber…Placement is everything:** Knowing where the blade will first make contact with the wood is helpful. Measure and make your mark at that spot. That way when you line up the mark with the blade the two will touch, making it easier to line up your wood accurately. Miter saws, for instance typically hit the wood 2" to 3" away from the fence. When using the miter saw, then, mark your lumber in that location. When using the table saw, however, the blade will first make contact with the workpiece on the leading edge of the lumber. Therefore, you will need to measure along the edge of your wood and place your cut mark so that when you slide it into place the mark will touch the blade. Finally, when marking out the center of a circle, thin clear crosshairs locating the horizontal and vertical center will do. Do not draw the circle, only the center point.

6. **Know the Kerf…Take the Mark of Edge it?** Blades don't slice lumber; they scoop out a section of it and turn it into sawdust. This removed section of lumber is called the cut line, and the width of that cut line plays an important role in your layout. The total width of the cut line made from the blade is called the *kerf*. The blades for table saws and miter saws, for instance, with the alternating set of the teeth are around 1/8" thick. This means that when you cut your wood, you are removing 1/8" of material. When making a cut, then, you must decide if you are going to cut to the left of your layout mark, take out the layout mark, or cut to the right of the layout mark. Cutting on the wrong side of the layout mark makes a big difference. After measuring the distance of your cut, place a thin, clean mark (not a line) on your piece of stock. Then, if you need to remind yourself which side to cut on, place a < pointing to the side on which your blade should go (see illustration).



7. **Stop blocks…A Secret to Success and Speed**: If it is important for multiple pieces of lumber to be cut the same size, consider using a *stop block* rather than measuring each piece separately. A stop block is a piece of scrap wood clamped to a fence, sled, or table, and is used for stopping your workpiece the required distance from the blade. The cut piece of wood between the blade and the stop block is called the *keeper* workpiece. It is the wood you will use for your project.

   Simply measure the desired distance of your cut from the blade tooth to the stop block and clamp it. Then, slide your workpiece in place by pushing it against the stop block. If proper care is taken to remove sawdust buildup, being "stopped" in place, each piece will be cut the same every time. Warning: Never use the table saw fence as a stop block on the table saw. It will jamb and throw your wood, possibly injuring you or someone else. Also, if cutting smaller pieces of lumber on the miter saw it is best to use a spacer between the end of your workpiece and the stop block, as shown in the diagram on the right. This spacer prevents your cut-off piece from binding and being thrown violently.



9. **Laying out plywood**…: How plywood is laid out to be cut should have already been determined on your cutting schedule. If you have not done so, do so at this time. Because plywood is bulky and difficult to maneuver, it is best to begin with a rough cut. By cutting the plywood slightly larger than necessary, you will be able to cut down to your final size with greater ease and accuracy. It is best to rough cut your workpiece 1" to 2" wider or longer than what you need, but make certain you have the room to do so. If you need two pieces 24" wide, for instance, you will not be able to do so since plywood is 48" wide and your kerf will remove 1/8". One piece will end up being smaller than the other. Once all of the rough cuts have been made then set up your fence for your final cut and cut all of the same size pieces at once. This will assure that each piece will come out the same. Every time you move the fence, the measurement will be slightly different.

Chapter 13

SQUARING WOOD

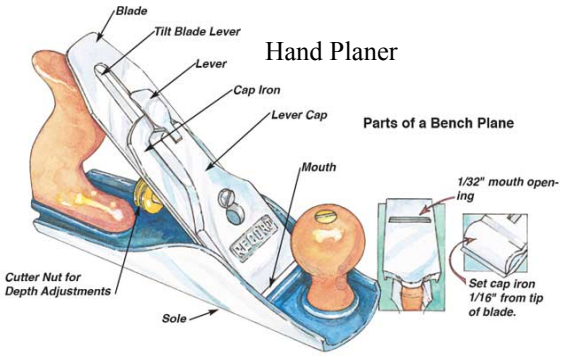
Introduction:

Lumber does not come to you *square*. In other words, not all of the sides are at perfect 90˚ angles to one another. This occurs because the milling process is not intended to produce perfectly square boards, and because the moisture effect on wood can cause it to warp. Good craftsmen will always square their wood before they begin assembling or adjoining. If they do not, they know their project will suffer for it. Simply put, if your wood is not square, your project will not be square. Cabinets will rock, doors won't shut properly, drawers won't seal, chairs will teeter, and knick-knacks will wobble. Therefore, lumber must first be squared with a machine called the *jointer*.

The Jointer:

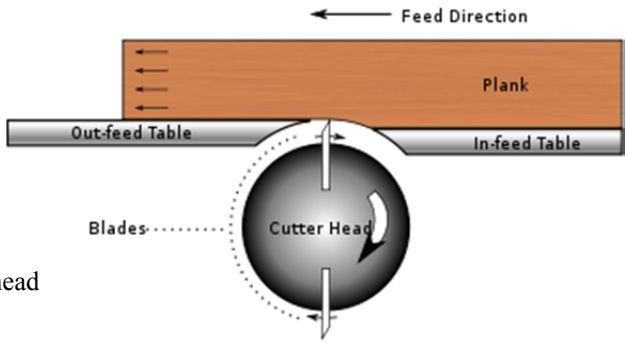
Squaring wood is the process of planing or shaving material off lumber pieces so that the face and sides are at 90˚ angles. The jointer gets its name because it is used to prepare wood to be joined together. It flattens distorted wood faces and straightens curved edges along the length of a board. Do not try to square board ends. Only run stock lengthwise through the jointer.

Before the jointer was invented, woodworkers used a hand planer, which had a single, wide blade for shaving wood. Replaced by the jointer, the machine used the same concept of using the blade to remove wood material, but added a second blade for cutting rapidly, and a squaring table and fence to assure accuracy.



Hand Planer

Lumber is placed on the table face down and pushed through the jointer repeatedly until the board is evenly cut, flattened, thinned, or smoothed. This process is called *planing*. After the first face of the board is completely planed (i.e. it is smooth and flat from end to end), it is then flipped over and the second face is then planed until the board has reached the desired thickness. Once the two faces have been planed, the board is stood upright on its edge with one of the faces against the fence. The edge is then planed. When complete, the two faces and one edge will be square. Finally, the remaining uncut edge is then cut off on the table saw. By guiding the planed edge along the fence, this final cut assures each side is parallel. Now, use the miter saw to cut the ends and the board will be completely square.

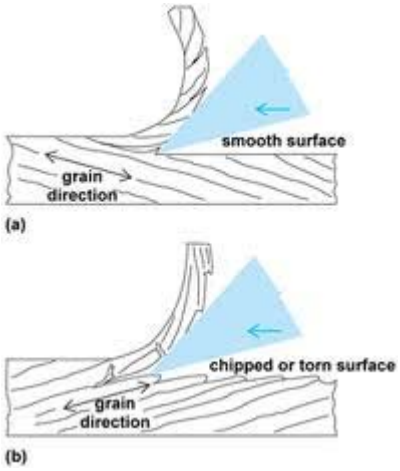


Jointer cutting head

To square wood properly, it is important that you learn to read the grain properly and read the distortions clearly.

Reading the grain:

Determine the slope of the grain. Plane with the grain, not into the open grain. Planing into the grain may cause "blow out", chips, or at the least a rough surface. All of these make your finish work more difficult. Planing with the grain (i.e. in the same direction as the cutter), produces a smooth surface and decreases your finish work sanding time and effort.



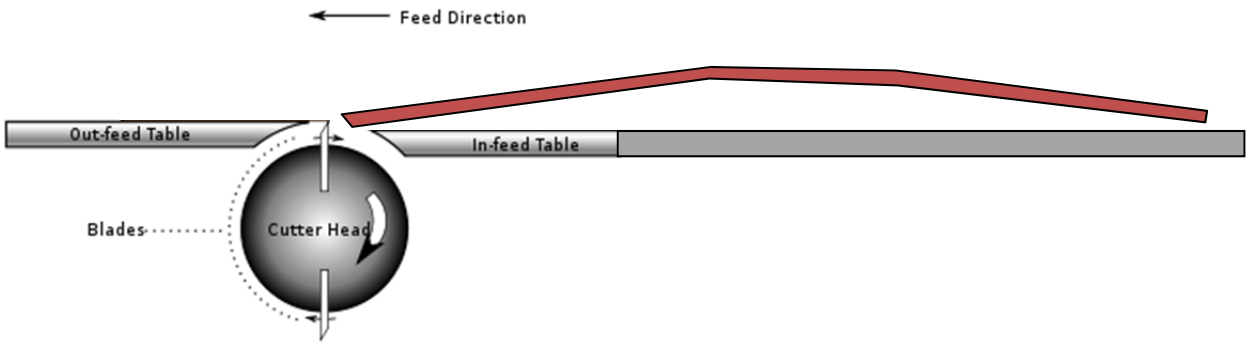
Reading the Distortions:

Distortions were discussed in chapter two, *Understanding Wood.* Below is a quick review of common warps:

- Bow: A deviation flatwise from a straight line drawn from end to end of a piece. It is measured at the point of greatest distance from a straight line.
- Crook or Crown: A deviation edgewise from a straight line drawn from end to end of a piece. It is measured at the point of greatest distance from a straight line.

- Cups: A deviation from a flat plane, edge to edge.
- Kink or Dog leg: A deviation edgewise from a straight line towards one end of the lumber.
- Twist: A deviation from the flat planes of all four faces by a spiraling action, usually the result of seasoning.

When squaring warped wood, place the portion of the board face down in the direction of the warp so that the lumber is not rocking on the table as illustrated below.



Unit 4

Cabinetry

Construction

Introduction to Cabinetry

Construction Methods

Shelving

Fasteners and Joinery

Casing and Face-Framing

Advanced Woodworking

Writing Prompts

Answers to prompts must include one quote from the class text and one quote from the internet (dictionary and encyclopedia resources will not be accepted). Use footnotes to cite location of material.

Prompt 16: Provide pictures of the type of kitchen cabinets you would like for your kitchen. In 150 words describe the characteristics you like about the cabinets and why you chose the style.

Prompt 17: In 150 words, describe box and case construction in cabinetry.

Prompt 18: In 150 words, describe at least three different methods of mounting shelves in a cabinet without using metal fasteners.

Prompt 19: In 150 words, describe the different ways of fastening wood to construct a cabinet (i.e. pocket screws, dowels, dovetail, nails, etc.). Describe at least five different fasteners.

Prompt 20: In 150 words, describe the purpose and construction of casing and face framing cabinets.

Chapter 16

INTRODUCTION TO CABINETRY

Introduction

Cabinetry is the term we use to describe the craft of making cabinets, shelving, and furniture. In this unit, we will focus primarily on cabinet making. A cabinet, when all is said and done, is simply a box. Different schools of design vary in style and quality, but it is still a box.

Understanding the schools of design, however, is important to planing, designing, and constructing a cabinet. Space utilization, aesthetics, color, texture, style, and more are all a part of cabinetry design. Mixing artistic shape and whimsical scroll work with the cold, sterile cuts of contemporary art, for instance, simply does not work. The human eye is confused and the emotional response to the interior design of a home is muddled. Moreover, when you know the style you want, the design phase goes a lot smoother because you know ahead of time the look you will be shooting for.

Schools of Design[2]:

- **Scandinavian:** This style of design is typified by clean horizontal and vertical lines. Compared to other designs there is a distinct absence of ornamentation. While Scandinavian design is easy to identify, it is much more about the materials than the design. Sometimes Scandinavian styles are called “Modern” and “Contemporary” though some differences exist.

- **French Provincial**: This style of design is very ornate. French Provincial objects are often stained or painted leaving the wood concealed. Corners and bevels are often painted with a gold leave or given some other kind of gilding. Flat surfaces often have artwork such as landscapes painted directly on them. The wood used in provincial varied, but was often originally Beech.

- **Early American Colonial:** This design emphasizes both form and materials. Early American chairs and tables are often constructed with turned spindles and chair backs often constructed with steaming to bend the wood. Wood choices tend to be deciduous hardwoods with a particular emphasis on the wood of edible or fruit bearing trees such as Cherry or Walnut. Sometimes people refer to this style of furniture as “County Furniture.”

- **Rustic**: The rustic style of design sometimes called "log furniture" or "log cabin" is the least finished. Design is very utilitarian yet seeks to feature not only the materials used but in as much as possible, how they existed in their natural state. For example a table top may have what is considered a "live edge" that allows you to see the original contours of the tree that it came from. It also often uses whole logs or branches including the bark of the tree. Rustic furniture is often made from Pine, Cedar, Fir and Spruce.

- **Mission Style**: Mission Design is characterized by straight, thick horizontal and vertical lines and flat panels. The most common material used in Mission furniture is oak. For early mission cabinetmakers, the material of choice was white oak, which they often darkened through a process known as "fuming".[4] Hardware is often visible on the outside of the pieces and made of black iron. It is a style that became popular in the early 20th century; popularized by designers in the Arts and Crafts and Art Nouveaux movements.

[2] Descriptions of schools of design cited from http://en.wikipedia.org/wiki/Cabinetry

- **Oriental**: Also known as Asian Design, this style of furniture is characterized by its use of materials such as bamboo and rattan. Red is a frequent color choice along with landscape art and Chinese or other Asian language characters on the pieces.

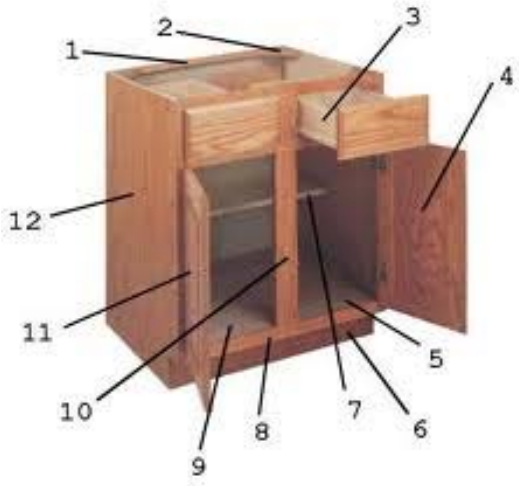
- **Shaker:** Known for its simplistic design, creative joinery, high quality, and practical functionality, shaker furniture has long been admired as a truly American creation. The originators of this style believed in equality, peace, and devotion to God. Therefore, all they did reflected that, even the making of furniture. As a result, emphasis was put on simple designs, perfection of creation, and usefulness. Beautifying the home was not necessary. Rather, orderliness and utility were important. Understanding the culture of the creators help to identify the style. The type of wood is no exception. Shakers would not import exotic woods. They used what was around them. Therefore, true shaker furniture is made of maple, birch, cherry, walnut, poplar, and honey pine. Also, the lines of shaker furniture are straight, no curves will be found.

Types of Cabinets

- Built-in or Free standing
- Face frame or Frameless

Cabinet Parts and Terminology

1 - Hanging rail - secures cabinet to the wall
2 - Corner blocks add strength and stability
3 - Drawer & drawer guides or false front
4 – Door
5 - Cabinet floor
6 - Toe Kick
7 - Shelf
8 - Face Frame
9 - Cabinet Floor
10 - Center Stile
11 - Exterior Style
12 - Exposed Side (End)



Chapter 17

CONSTRUCTION METHODS

Introduction

Regardless of whether you build a stereo cabinet or dresser, a kitchen cabinet or bathroom vanity, basic cabinet construction is the same. A cabinet or furniture piece consists of the carcass or case with two sides, a bottom, a top, a back, and a front. The front may contain drawers, doors, or shelves, or combinations of the three. Several variations may be used in the construction.

Carcass construction can be separated into three types: leg-and-rail, frame-and-panel, and box or case.

Leg-and-rail

Leg-and-rail construction, consisting of vertical legs and horizontal cross-members connecting the legs, can be found on chairs, tables, benches, stools and on some types of furniture, such as chests.

Frame-and-panel

Frame-and-panel construction is made of vertical side members called styles and horizontal pieces called rails, which frame in a panel of some sort (i.e. glass, wood, cardboard, etc.), much like a picture frame. These panels are made separately and then connected together to build the carcass. These "component parts" may be found in many types of furniture including the sides of cabinets, cabinet doors, and interior web frames between drawers to function as dust panels.

Box, or case, construction is the basic design of dressers, buffets, desks and chests, as well as kitchen cabinets and bathroom vanities. Sides and backs are constructed of wood while the front is fabricated with rails and styles.

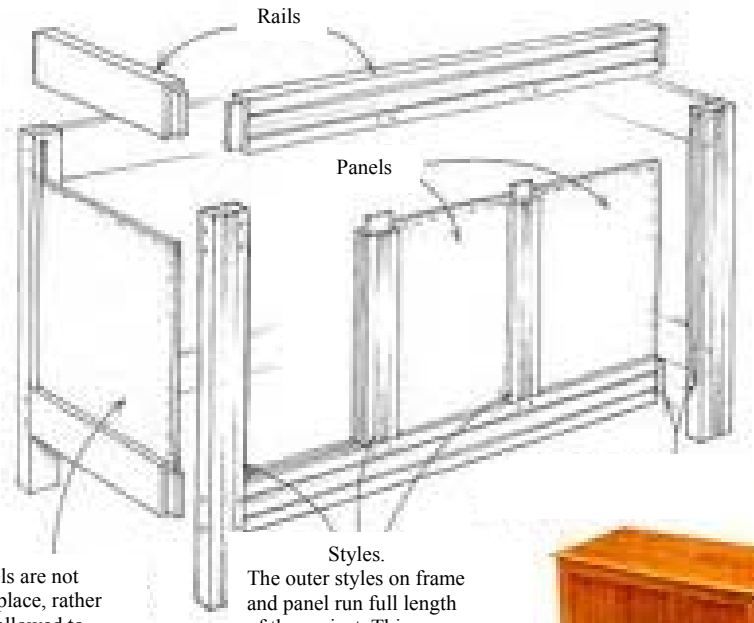
A simple cabinet fabricated with case construction is a box made of plywood, either softwood or hardwood. To keep the cost low, particle board, laminated on one or two sides, is commonly used, especially in cases where a finished look inside the cabinet is desired. Cases can also be constructed of solid wood, though the cost of doing so is much higher.

Box or case

The type of joint used to construct the carcass will vary.

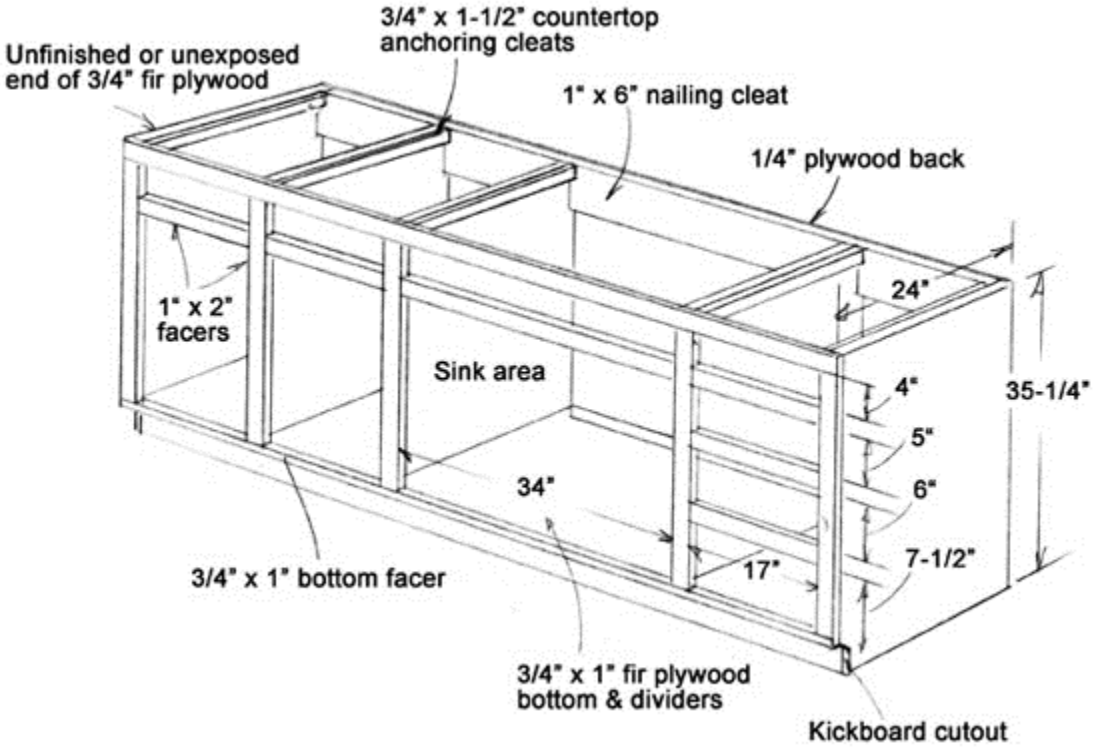
Leg-and-rail Construction

Frame and Panel Construction



Box or Case Construction:

Typical kitchen (built-in) cabinet



Chapter 18

SHELVING

Introduction

Incorporating shelves in your cabinet work is important to the overall design and function of your project. The first thing you must consider is the required strength. That is: How much weight will it need to carry? There are three factors that play an important role in shelf durability: Type of wood, thickness of material, and shelf support.

Type of wood:

As we learned in *Unit II: Understanding Wood*, different types of wood are stronger than others. Softwoods are typically understood as less durable, while hardwoods are considered stronger. Though this is not always the case, and some softwoods truly are harder than hardwoods, for the most commonly built cabinets woods like oak, walnut, and mahogany will provide a more durable shelf.

The problem with wood shelves is their tendency to warp. To avoid this, many choose to use plywood rather than milled lumber. Plywood gets its strength from being formed with sheets of wood called "plys," which are layered in such a way that the grain direction in each ply run perpendicular to the previous layer. Plywoods, as well, are much stronger than press board or MDF with a greater capacity for holding fastners. When using plywood, decorative molding should be attached to the front edge to hide the unsightly layers of ply.

Shelf thickness:

As a standard rule, wood shelves should be ¾" thick, anything smaller than that and you're asking for trouble down the road. Thin shelves simply do not hold the weight and bend under the pressure.

Shelf support:

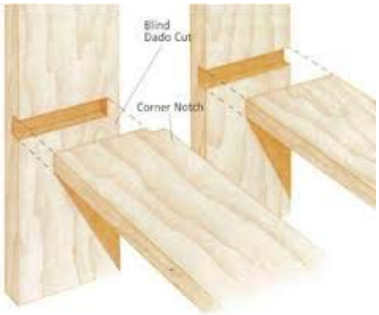
Shelves may either be:

- Fixed Shelves: Shelves are secured in place in such a way that they cannot be removed
- Removable Shelves: Shelves are "loose" and can be removed, but not adjusted.
- Adjustable Shelves: Shelves are "loose" and can be adjusted to different heights
- Sliding/rotating Shelves: Shelves are fixed on a sliding or rotating mechanism and can be pushed in and out, or rotated.

Fixed shelves:

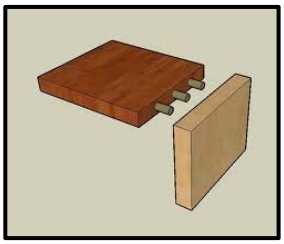
There are many ways to install fixed shelves. The most popular methods are by using a:

- Dado joint: Dados are cut into the side panels and the shelf is inserted.



- Nailer: A nailer is a piece of wood attached to the side and backs of the cabinet (sometimes called a ledger), which acts as a support to the shelf. Shelves may be nailed to the nailer or kept free/removable.

- Butt joint: Some choose to simply fasten their shelves with screws or nails to the sides of the cabinet using a butt joint. Though this is a quick and inexpensive way to install shelves, it is not as clean (nail holes need filler, and screws need plugs or caps).



- Wood dowels: The most time consuming way to install shelves is by using wood dowels.

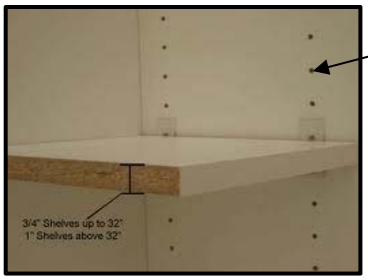
Removable shelves:

Wood ledgers are employed to mount removable shelves, much like a nailer, only the shelf is not nailed in place.

Adjustable shelves:

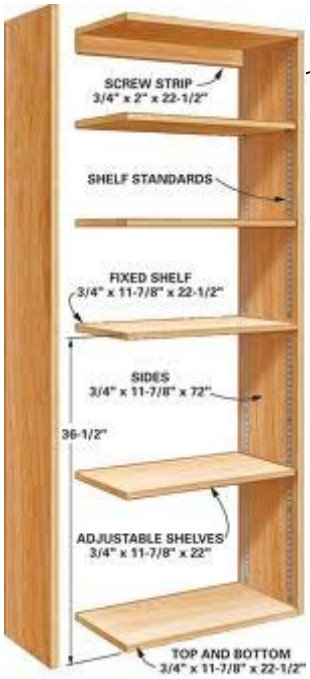
The most popular method of installing adjustable shelves in a cabinet is by using pins, which are inserted into predrilled holes or hardware.

Using a template is the most accurate way to drill pin holes into the side walls of a cabinet. Simply set up the template with pre-marked holes matching the size of your pins and drill with the appropriate bit size, as illustrated on the right. If a template is not available, simply mark your wood and drill carefully.



Pin holes

The cleanest method for mounting shelf hardware – a metal strip "shelf standard" with equally spaced slots designed to hold formed brackets - is to cut a dado in the wood and insert the shelf standard flush. Of course, the standard may also simply be mounted to the inside of the cabinet walls.



Shelf Hardware

Sliding or revolving shelves:

In situations where a sliding or revolving shelf is desired, appropriate hardware is available. In most cases, installing sliding shelves is no different than installing drawer hardware. Of course, sliders are available just for shelves as well. Comparatively, a lazy susan (see below) is used for installing revolving shelves.

Chapter 19

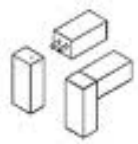
FASTENERS AND JOINERY

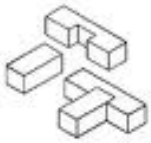
Introduction

There are many different types of fasteners and joinery used for constructing a cabinet-box or carcass. The method you will use should be determined and noted during the design phase of your project. If you wait to decide later what method you will use, it will be too late. Begin by considering the required strength and desired beauty of the project. Before we begin, let's quickly review the basic fasteners and joints used in woodworking.

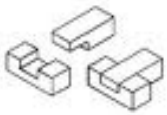

NAIL


POCKET SCREW


DOWELED BUTT JOINT

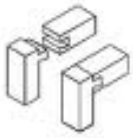

DADO

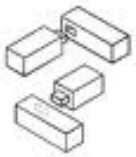

RABBET

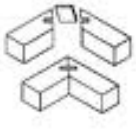

LAP JOINT


SCREW


CORNER BLOCK


DOVETAIL


MORTISE AND TENDON


MITER WITH WOOD SPLINE


TONGUE AND GROOVE

Required strength:

The required strength of the cabinet is an important factor to consider. If the piece you are constructing will need to carry a lot of weight or will be moved often, the use of nails should be avoided, unless accompanied with glue. All other joints offer strong construction possibilities.

Desired beauty:

Beauty can be enhanced or destroyed by joinery. Choose an appropriate method that fits your desired outcome. Some of the most beautiful joints commonly used today are 1) the exposed mortise and tendon, 2) the dovetail, 3) the exposed spline, and 4) the exposed dowel joint.


1


2


3


4

Another option is to use metal fasteners, but keep in mind that metal fasteners mounted from the outside of the cabinet will be exposed, plugged, or filled with wood filler. Though screws provide for strong joints (except when used in particle board or plywood), they can be unsightly. If you choose this method, when installing pay careful attention to the equal positioning, balance, and centering of screw patterns. This will help add intentional beauty and conformity to your project.

Hidden screws, such as pocket screws, inserted from inside the carcass do not affect the beauty of the project and leave wood panels unobstructed (see below).

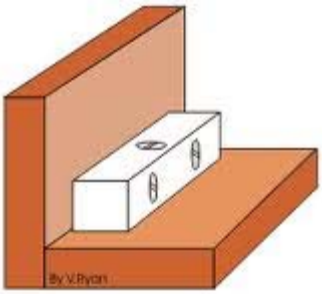
Wood joinery, and combinations thereof, can add tremendous character to your project. A skilled and consciences craftsman will consider this option carefully.

Illustrations of joinery methods:

POCKET SCREWS

DOWELED CARCASS

DOVETAIL



CORNER BLOCKS

MORTISE AND TENON

Chapter 20

CASE AND FACE-FRAMING

Introduction

Simple or complex, plain or decorative, cheap or costly, cabinets are all simply a *case,* or sometimes called a *carcass.* Case construction is simply a box, and though there are different ways in which it may be constructed, there's no getting around the fact that it is nothing more than a box. It's what you do to the case that makes the difference.

Face-framing is one of those differences. A *face-frame* covers the front of the case. It is the most visual element of the cabinet and, besides the type of door or drawer fronts used, it is what determines the quality and beauty of a project.

Face-Framing:

The face-frame consists of horizontal members called *rails* and vertical members called *stiles*, which frame both the larger opening of the case and the smaller openings for drawers, doors, and shelves (see below).

Rails:

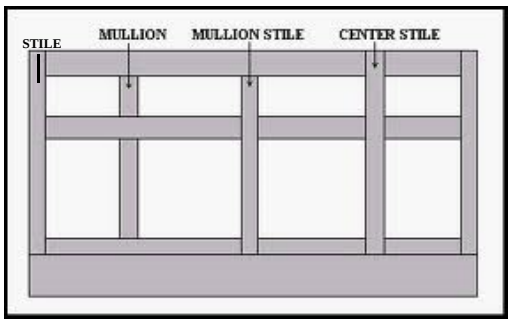
The horizontal rails, like the railing on a staircase, run parallel with the floor. In cabinetry, there are top rails, bottom rails, and intermediate rails, which frame compartments or openings. The purpose of the cabinet will determine the size and type of wood you choose to use. Below are samples of bottom and top rails that have been shaped in such a way as to give character to the cabinet.

Decorative bottom rails

Arched top rails

Stiles:

Stiles run vertical to the rails (up and down). To cover or hide the end grain of the rails, the outside stiles run from the top to the bottom of the cabinet, sometimes even forming the legs. Intermediate stiles are called mullions (as illustrated on the right).



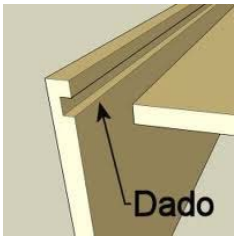
Face-frame construction:

Depending on the style and function of your project, face-frames will be constructed differently. The elements, however, remain the same: Stiles run vertically, top to bottom, and rails run inside the outside stiles. Intermediate mullions vary.

The key to constructing a good face-frame is squaring. Regardless of the method you choose to assemble your face-frame (mortise and tenon, dowels, pocket screws, etc.), make certain the corners are at 90° of one another. Two methods for squaring a project are as follows. You may use a woodworking square (below left) and simply press each edge of the tool into the corner of your frame. If each edge is flush to the wood, the corner is square. You may also square a cabinet or face frame by measuring diagonally from corner to corner (below right). If the measurement to each diagonal corner is equal, your object is square.

Attaching face-frames to the case:

Face-frames may be attached to a case in a number of different ways. From pocket screws or dados, to dowels or nails, the choice is up to you; just have the method decided before you begin construction. Once you cut all of the pieces of your cabinet and have dry clamped it together to insure proper fitting, you may begin with final assembly. On a flat surface, build everything off of your face-frame. It is your "corner stone." Being perfectly square, the face-frame determines the rest of your case will be square as well. Below are some methods for mounting face-frames.



Nail gun

Unit 5

Cabinetry

Craftsmanship

Moldings and Trim

Drawer Construction

Cabinet Doors and Hinges

Cabinet Feet and Bases

Building Furniture

Advanced Woodworking

Writing Prompts

Answers to prompts must include one reference from the class text and one reference from an internet article (dictionary and encyclopedia resources will not be accepted). Be sure to put quotation marks around your citations, number them, and place footnotes at the bottom of your paper to reference where your material came from.

Prompt 21: Sketch the cross section of five different molding styles. In 150 words, explain how molding can be incorporated into the design of a cabinet.

Prompt 22: In 150 words, explain how drawers are constructed (you may use pictures along with your explanation). Name the different parts of the drawer, how fronts are attached, and the different slides available.

Prompt 23: In 150 words, describe five different cabinet door styles and how they are constructed.

Prompt 24: In 150 words, describe five different feet or stand styles used in cabinetry and how each are constructed.

Prompt 25: Include a picture of the most artistically styled cabinet you can find. In 150 words explain what you like about the cabinet and something you would like to incorporate from the design into one of your future projects.

Chapter 21

Moldings and Trim

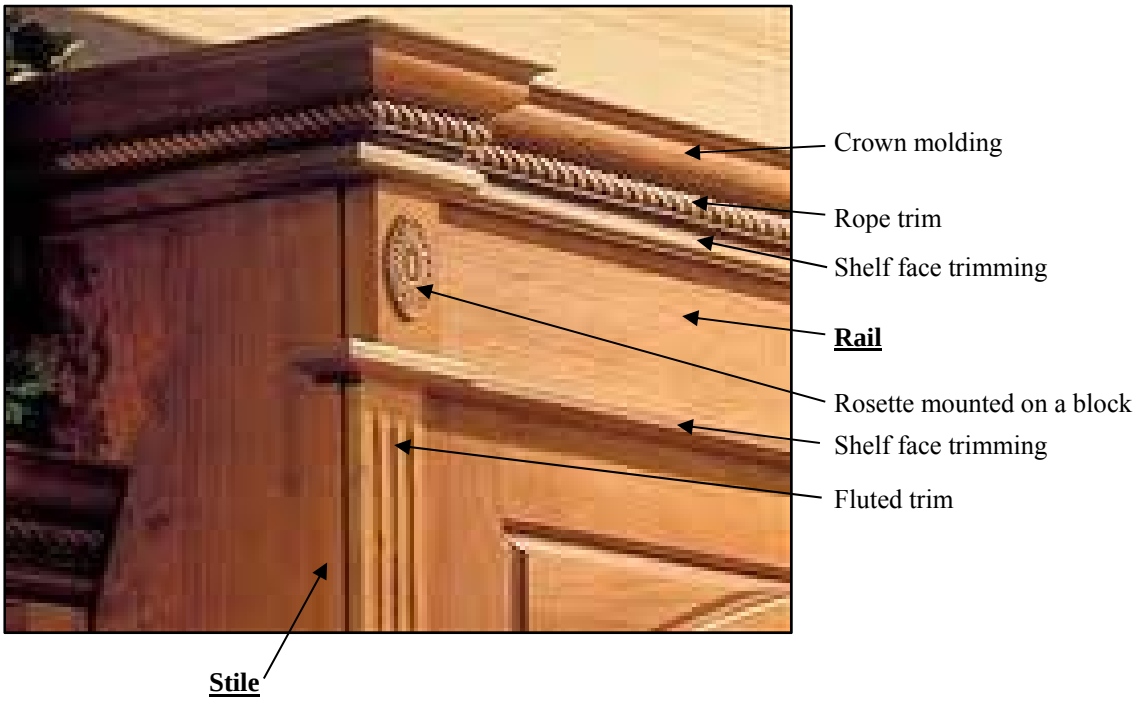
Introduction

The difference between a good woodworker and a great one is craftsmanship. The craftsman is not only skilled but creative. He/she knows how to make something beautiful out of the ordinary, and in cabinetry that is no exception.

As we have seen, a cabinet is nothing more than a box. It's what you do to that box that defines it. Adding shaped wood, known as molding and trim, to stiles and rails is one such practice of beautifying a project.

Moldings and trim

Below is a picture of a cabinet loaded with molding and trim. Before you say, "I could never do anything that beautiful," don't forget that a cabinet is nothing more than a box. Once the box is built, you can create beautiful masterpieces simply by adding, or layering, molding and trim. Can you identify in the cabinet below where the carcass ends and the beautifying begins?



As you can see, the stile and the rail are both behind the molding and trim. Remember, the face frame (made up of the stiles and rails) is a part of the box, or carcass. Everything you see above was attached to a simple box, a box any novice cabinetmaker can build. Just look at how the added molding enhances the beauty of the cabinet. And guess what? It's not that difficult. It just takes a little skill and a great imagination. So, if you want to do something amazing with your next box and case project, take the time to add molding and trim and you will be pleased with the results.

Oh, and before you say, "I can never make trim like that." Think again. Such trim and molding are prefabricated and can be purchased at most hardware stores.

Chapter 22

Drawer Construction

Introduction

To increase the efficiency of a cabinet, drawers may be placed in the body to provide a devoted space for storage. Like the face-frame, drawer fronts have the potential to add tremendous beauty to your project. Beside door fronts, drawers are the most visible part of the cabinet. So, it stands to reason, the more aesthetically pleasing the drawer fronts, the more aesthetically pleasing the entire cabinet.

Types of drawers:

When constructing a cabinet with drawers, you must first decide what type of drawer face you want. The drawer face is the front of the drawer. It is what you will pull on to open the drawer. It is also what people will see. There are three different types of faces to choose from.

The Flush Drawer: The flush mount drawer front is recessed into the cabinet. When fully closed the face/front is even with the face-frame.

The Lipped Drawer: Lipped drawer fronts overlap the opening but do not completely conceal the face-frame. They may be constructed by either cutting a rabbet joint on the back of the drawer face or by attaching the drawer face to a separate piece of wood used to form the front of the drawer box.

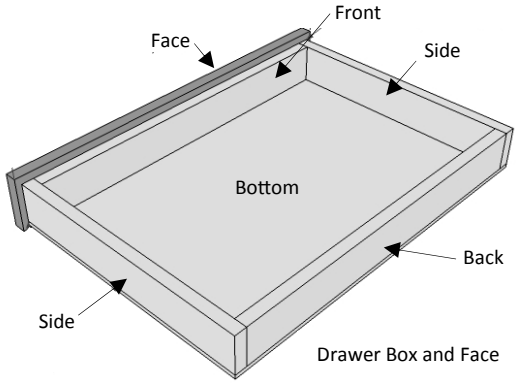
The Overlay Drawer: Overlay drawer fronts, like the lipped drawer, overlap the opening. However, this style completely covers the face frame.

Drawer Guides:

The second decision you must make when constructing a drawer is the type of drawer guides you will use. Do not wait to make this decision until after you begin building. In fact, purchase the guides before you even begin construction. The dimensions of the guides will determine the size of your drawers. There is nothing worse than constructing a drawer and having to tear it apart because the sliding hardware didn't fit.

Drawer Construction:

Though joinery may vary from one drawer style to the next, the basics to drawer box and face construction are the same. A drawer has five parts: The face, the front, the sides, the bottom, and the back. You will build the box first. That is to say you will attach the front, sides, bottom, and back together. Once the drawer box is built, you will add the decorative drawer face. To better understand the process, it will help to become familiar with each part of the drawer.



Drawer Box and Face

The drawer box: The drawer box is the actual drawer body, much like a shoe box without the lid. To save money, the box is often constructed of a different type of wood than the front of the cabinet, such as pine or douglas fir. High quality furniture and cabinets will use more expensive hardwoods. Cabinets drawers manufactured in mass production are often made of particle board, which breaks easily. The drawer box is made up a front, two sides, a bottom, and a back.

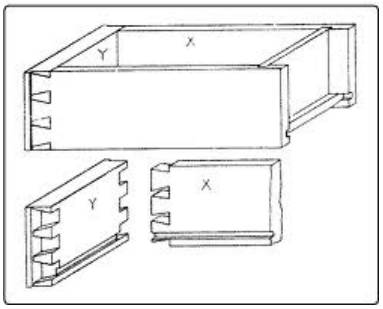
To determine the size of your drawer box, measure the face-frame opening. The box should not be any taller than 2/3 the height of the opening. In other words, if your drawer opening is 6", the drawer box will be no taller than 4". This will prevent the drawer from binding as well as provide room for the drawer slide hardware to work effectively.

The face: The face of the drawer is the visible front, the decorative part. It is attached to the drawer box front after the box has been constructed. Some use the drawer face as the front of the box and attach it directly to the sides. I do not recommend doing so unless special joinery is employed. With the amount of use the drawer gets it is best to attach the face to the drawer box front and provide yourself with a little extra strength. The drawer face will either be a flush, lipped, or overlaid. Decide before you begin. Measure the opening of the face-frame. If you are using a lipped or overlay drawer front, decide how much your drawer face will overlap the face frame. Typically, lipped drawers will overhang between 3/8" to 1/2" on the sides and top, and just enough to cover the hardware on the bottom.

The front: The front of the box is the leading member of the drawer. It is what the drawer face is attached to. Notice in the above picture how the sides of the box run the full length of the box depth and the front and back members go between the sides, much like the stiles and rails of a face-frame. This is done to provide strength for the pulling action on the drawer.

The sides and back: Because the sides are seen when the drawer is opened, they should run the full length of the drawer. The back, as well as the front of the drawer box (not the face), will be attached between the drawer sides.

The most common method used today for constructing the drawer box is nailing. For more decorative drawers, the dovetail joint is used (right).



The bottom: The bottom of the drawer is best attached to the drawer box by cutting a ¼" dado from the bottom of the sides, front, and back wide enough for the bottom to slide into (right). Some simply attach the bottom to the bottom edge of the box. The drawer guides hide the unsightly exposed edge. If you do so, remember to factor the thickness of the material used for the bottom into the overall height of the drawer box.

Chapter 23

Cabinet Doors and Hinges

Introduction

Cabinet doors often define the beauty of a cabinet. In fact, it is popular today to give old cabinets a new look simply by replacing the doors.

Types of doors:

Cabinet doors types fall into the same three categories as drawers: Flush mount, lipped, and overlay (shown below). Each requires specific types of hinges, so make certain you purchase the hardware before you begin construction.

Flush mount: The entire cabinet face-frame is seen

Lipped: Part of the cabinet face-frame is seen

Overlay: None of the cabinet face-frame is seen

Door Construction:

When constructing a cabinet door, you must first decide which method you will use. Two options are available: formed or frame and panel construction.

Formed doors

Formed doors require one solid piece of material, typically MDF or glued wood stock. After cutting the door to fit the opening according to the desired door type (flush, lipped, or overlay), the door face is then beautified by applying decorative trims and moldings, or by shaping the edges or interior of the face with a router bit.

Applied trim and molding to door face

Routered face

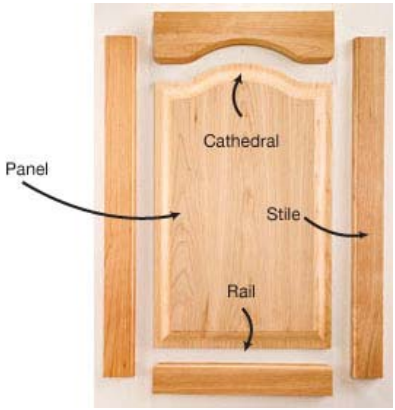
Frame and panel doors

Frame and panel construction requires the use of stiles, rails, and a panel (raised or flat). On face-frame paneled cabinet doors, the stiles run the full height of the door so that the unsightly ends of the rails may not be seen. On miter joinery construction, a 45° miter cut is made at each corner.

Face-frame panel door

Miter frame panel door

An example as to how face-frame panel doors are constructed using router face-framing bits is shown below. These manufactured cutters shape the stile and cut the groove for the panel at the same time. Then, a second bit is used to cut the end of the rails which fits perfectly into the shaped stile. Once finished shaping the face-frame, the panel is set into the grove and the frame is glued together.



Some, to save time, construct the face frame of the cabinet using pocket screws and then attach a flat panel to the back of the face-frame.

Chapter 24

Cabinet Feet and Bases

Introduction

To accentuate the beauty of a cabinet, do not underestimate the value of the base support. Sure, a cabinet can simply sit on the ground, but why? Feet, legs, and decorative toe kicks are three valid options to consider.

Feet:

Feet come in as many shapes and styles as there are craftsmen. Some, called bun feet, are added to the bottom of the cabinet as shown on the right (square bun feet, ball and claw bun, weaved bun, detailed bun, etc.)

Maple chest atop 724B Bolton Square Bun Feet in maple.

Legs :

Another option is to build legs into the face-frame, as shown below. A leg is different than a foot in that the leg is a continuation of the stile while a foot is attached to the bottom of the cabinet.

Decorative toe kicks:

Finally, another option to consider is that of accentuating the toe-kick (the front of the cabinet base where your toes go under). Below are some samples. Often, this design is incorporated into the face-frame as the bottom rail.

More pictures:

Chapter 25

Furniture Building

Introduction

Cabinetry craftsmanship does not end with building cabinets. Other forms of wood furniture are highly valued and great fun to build as well. Keep in mind that a cabinet is a piece of furniture, it just happens to be box-shaped. Building other types of furniture is very similar to building a simple cabinet. Many of the elements and techniques are the same. So, for your next project, why not make a piece of furniture? The possibilities are endless.

Keep in mind that woodworking is an art, a craft that must be perfected. Whether you build a cabinet or an elegant piece of furniture, you will need patience and determination. Fine woodworking cannot be rushed, and the craftsman must be willing to strive for excellence in all he or she does. If you have these two characteristics, you are ready to move on.

Standards:

It is important that you remain faithful to furniture standards. A *standard* is the normal size of something, or the average space it requires. Different types of furniture have a standard size. Wherever you go in the western civilization, furniture will be the same height, depth, and length. These standards are well tested, and have as much to do with what the human eye finds pleasing as it does with practicality. Ratios have been considered for ascetic beauty, strength, and balance. You will do well to follow them.

The chart on the right shows the standard size of many pieces of furniture. Be sure to incorporate these into your design.

Joinery:

Of course, joinery plays an important role in designing furniture as well. The type of joints you employ will determine the quality. Do not underestimate this important step by convincing yourself that you can decide the joinery further down the road in the building process. Joinery should be determined before you begin, and artistic value should be a part of the equation. Don't simply screw or nail things together. Take the extra time to pursue excellence by adding stylish joinery.

Wood specialties:

Another aspect of fine furniture design is the use of carving, inlaying, scroll work, pyrography, and bending. These will be covered in detail in the next unit, but for now it is worth noting. Consider incorporating these into you next design. On the following page you will find samples of ways specialized craftsmanship is incorporated into a piece of furniture.

Standard Dimensions of Furniture

	width/length	depth
Sofa (3-seater)	78-90"	34-38"
Love seat (2-seater)	56-68"	34-38"
Chair-and-a-half	54-60"	36-40"
Chaise longue	72-90"	30-36"
Club chair	30-36"	30-36"
Slipper chair	22-28"	22-28"
Dining chair (with arms)	22-24"	16-24"
Dining chair (armless)	18-22"	16-24"
Coffee table/ottoman (square)	24-48"	24-48"
Coffee table/ottoman (rectangle)	24-48"	16-28"
Coffee table/ottoman (round)	18-32" in diameter	
End table	14-24"	14-24"
Dining table (square)	36-48"	36-48"
Dining table (rectangle)	60-84"	34-42"
Dining table (round)	36-60" in diameter	
Drop leaf table	36-72"	21-63" (with leaves)
Console/sofa table	48-72"	15-20"
Card table	30-36"	30-36"
Desk	28-48"	24-30"
Low cabinet/buffet	48-72"	16-26"
Armoire	36-60"	20-30"
Chest of drawers	30-74"	20-24"
Nightstand	14-24"	14-24"
Bed (twin)	80"	40"
Bed (double/full)	80"	55"
Bed (queen)	85"	61"
Bed (king)	85"	79"

Inlay

Inlay

Scroll work

Carving

Wood bending

Pyrography

Dare to dream:
You are only limited by your ability to dream, your desire to put forth effort, and your willingness to keep fear from controlling your life. The people who don't accomplish anything, are those who don't try anything. The people who make mistakes, are those who are willing to make something. You don't fail when you make a mistake. You fail when you don't try. Just look at the possibilities…

Build your own bedroom set

Build your own furniture

Build an entertainment center

Put window casings around a window

Attach a chair rail or wainscot

Build a dining set

Put on baseboard

And so much more…

Shudders and blinds

Stairs and balusters

Game boards and tables

Pool tables

Doors

Mantles

Entire rooms

Unit 6

Wood Specialties

Wood Carving

Inlay and Marquetry

Intarsia and Parquetry

Wood Bending

Pyrography

Advanced Woodworking

Prompts

Answers to prompts must include one reference from the class text and one reference from an internet article (dictionary and encyclopedia resources will not be accepted). Be sure to put quotation marks around your citations, number them, and place footnotes at the bottom of your paper to reference where your material came from.

Prompt 26: In 150 words, explain five different methods of carving: relief carving, figure carving, chip carving, treen carving, and whittling. Provide photograph examples of each. List the type of tools required for each method. Also, include a list of the best types of wood to use for carving.

Prompt 27: In 150 words, explain marquetry and methods used for inlaying wood. Provide photographs of five different examples of marquetry or wood inlay. List the type of tools required for each method.

Prompt 28: In 150 words, explain intarsia and parquetry. Provide photographs of five different examples of each. List the type of tools required for each method.

Prompt 29: In 150 words, explain two different processes for bending wood and the equipment needed for each.

Prompt 30: In 150 words, explain pyrography and the tools it requires. Provide five samples of different types of pyrography.

Chapter 26

Wood Carving

Introduction to Wood Specialties

Woodworking is a craft that can incorporate many different disciplines. Applying these disciplines to a woodworking project not only raises the value, but the enjoyment and pride of producing a signature piece as well. Try incorporating one of these wood specialty fields into your next project: wood carving, marquetry, intarsia, parquetry, wood bending, and pyrography.

Carving

Marquetry/Inlay

Intarsia

Parquetry

Wood Bending

Pyrography

Carving:

Carving wood is the art of shaping a piece of wood into a design by using a variety of cutting tools. Much of what makes the different styles of carving unique are the tools used. Below is a list of the commonly used tools:

Carving gouges: Carving gouges have a handle and a blade. The blades vary in size and shape, and may be driven by a carver's mallet or by hand. Do not use a hammer to drive gouges or chisels. They damage the handle by fraying or splitting it.

Carving knives: Carving knives are uniquely shaped to perform a variety of tasks. The handle on the craving knife is designed to give the woodworker maximum control and power.

Rough cutting tools: When carving, it is important to remove as much wood as possible before using gauges or knives. The band saw, coping saw, chainsaw, and grinder are all used for this purpose. Simply begin by drawing the design on the wood and begin removing material with one of these tools.


Band saw

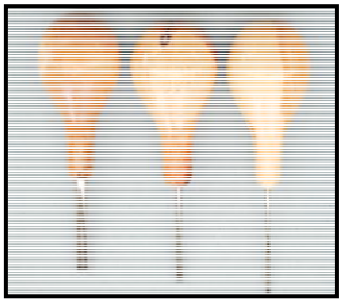

Coping Saw


Chainsaw


Grinder

Dremel: The Dremel tool is a small grinder. It is useful for fine detail cutting and grinding.

Wood Carving Chisels: Chisels work much like a gouge. They may be driven by hand or by mallet. Unlike gouges, however, chisels have flat cutting edges and are beveled on three sides. They are used for removing large amounts of stock. Fine detail carving and shaping are not done with chisels because their flat edges tend to split or lift the wood along the grain.



V-tool/parting tool: V-tools get there name because the blade is shaped in a V. They are designed to fit in the palm of your hand. Because they are v-shaped, the blades do not split or lift the wood like a chisel does. Fine detail carving is done with a v-tool.

Relief carving

This form of art is accomplished by carving images into a flat piece of wood, usually depicting scenes of people and/or nature. In relief carving, foreground images project from the carved background, and are classified into two groups: High Projections and Medium Projections. Each refers to the degree the image protrudes from the background. On high degree projections, the relief stands out almost like a figure carving. The cuts here are deep. The images on medium degree projects, however, are closer to the background. The sample of the right shows a high degree projection in the foreground and a medium degree projection in the background.

The most commonly used tools in relief carving are the gouge, the v-tool, and the Dremel.

Figure Carving
Figure carving is precisely that, the carving of figures. Unlike relief carving, however, these figures, or wooden statues, stand alone. They may be small or big, and carved from raw material, like a tree, or from milled lumber.

Chip Carving
Chip carving using knives and chisels to remove small pieces of wood from a piece of stock to form a design.

Treen Carving:
Treen is another name for a small useful household item, such as a jewelry box, bowl, plate, shoe horn, and more. If it is made of wood, carved, and useful for every day functions, it is a treen.

Whittling
Whittling wood is done with a knife, usually a pocket knife. Images are simply carved from a raw piece of material such as a stick or branch. It is a great hobby used by many to leisurely pass the time.

Steps to carving:

The steps to take for carving wood vary according to the type of carving you will be doing. Here are some things to consider:

1. Draw your pattern first. You can do this by free handing your drawing or copying a pattern.
2. Imprint your drawing. Imprinting is the process of setting your drawing in the wood. For figure carving, you will first cut out the image as detailed as possible using a band saw, coping saw, grinder, or any such device. For relief and chip carving, first use a razor knife and cut the pattern into the wood, about 1/8” to 3/16” will do.
3. Once you have imprinted your image, carve it out of the wood. Use gauges for figure carving to rough out the image. Use flat chisels for relief and chip carving to remove the wood around the image. For final details, use a V-tool.

Chapter 27

Inlay and Marquetry

Introduction

Wood inlaying, or marquetry, is the art of inserting thin sheets of different colored woods, called veneers, into a base material to form images and patterns. Veneers may be purchased or made from excess stock in a variety of colors and grain patterns.

The design formed into the base material does not fill the entire work area (i.e. the cabinet top, door, jewelry box lid, etc.). Wood inlays are often the subtle decorative addition or the border art of a project. It does not define the object. It decorates it. Below are some samples.

Tools and steps for inlaying:

Depending on the design you choose, the process of inlaying can be quite simple or very complex. Regardless, as with any woodworking craft, it does require patience. Below are the tools needed and the steps necessary for creating an inlay.

1. Carbon paper: Once you have drawn the image you wish to insert into the workpiece, you will need to transfer it onto the wood. This is easily accomplished by using carbon paper. Carbon paper has a thin layer of dry ink coated on one side of a piece of paper, which when placed under your drawing and traced the image transfers what has been etched onto the wood.

2. Utility knife: Utility knives hold specially made razor blades. Press the blade along the lines of your image transferred onto the wood as deep as the thickness of the veneer.

3. Router: Using an undersized dado bit, router out the image the same depth of the veneer. The edges of the image cut into the wood from the utility knife help make for a clean cut.

4. Scroll saw, utility knife, coping saw: Cut the veneer into pieces for your design. The tool used for cutting will depend on the thickness of the veneer. It is important that the pieces fit together with precision. This can best be accomplished by shaping one piece, then tracing that piece onto the veneer that will be adjacent to it. Then, cut that piece out.
5. Wood files and disc sander: Shape the pieces of veneer to fit together exactly and fit them into the recessed area. Once you are satisfied with the way the pieces fit, glue the pieces in place.
6. Scraper: A wood scraper is simply a flat piece of sharpened metal. Use the scraper to remove any uneven edges.

Palm sander: Using fine grit sandpaper to sand the workpiece smooth.

Chapter 28

Fretwork

Introduction

Fretwork is the art of cutting designs or patterns into wood either as a shallow relief or a cutout. These ornamental designs are sometimes called "scrollwork." Incorporating fretwork into a piece of furniture is a popular means of adding character, beauty, and even elegance to an otherwise simple piece. From the side rails of a table to the top of entertainment centers, from the foot of the bed to the top of the headboard, the uniqueness of fretwork elevates both the worth of a project and the pride of a job well done. Just look at the difference between the two entry tables and the two quilt hangers below.

Without Fretwork

With Fretwork

Without Fretwork

With Fretwork

Tools and steps for fretwork:

Fretwork is more an act of patience than of skill. Sure, craftsmanship is necessary, but even beginners can accomplish great scroll work if they are willing to take the time necessary, work slow, and be meticulous. The process is relatively simple, even the person lacking in great artistic abilities can produce something marvelous. Here is what you will need…besides the patience.

1. A design: You may choose to draw your own design, but many choose to use premade patterns, which can be found just about anywhere, magazines, internet, and books. Simply make a copy of a design you like and attach it to your workpiece.

2. Spray adhesive: Once you have drawn your design on a piece of paper or made a copy of a pattern attach it to the workpiece with a spray adhesive. With this attached pattern, simply cut your image by following the lines.

3. Carbon paper: Some choose to use carbon paper to trace their image onto the workpiece. This is a valid option, and it does not require sanding off any paper.

4. Scroll saw, fretsaw, or coping saw: Narrow cuts are necessary for fretwork, so be sure to choose the appropriate blade. For interior cuts, you will need to drill holes first. Then, insert your blade, attach to the armature, and begin cutting.


5. Small wood files: A good set of files, both fine and coarse tooth, is necessary. These come in a variety of shapes and sizes. You will need all of them. Small kits are available for just this purpose.

Appendix

Sample Portfolio

Oral Presentation Resource

Project Evaluation Forms

Advanced Woodworking

Include a log and company name

Logo and Company Name

Include a slogan

"Flawless Wood Tech"

Integrity Respect Initiative Balance Diligence
Clear Efficient Excellence Humility Worship

Include key words from your work ethic that describe you or your business

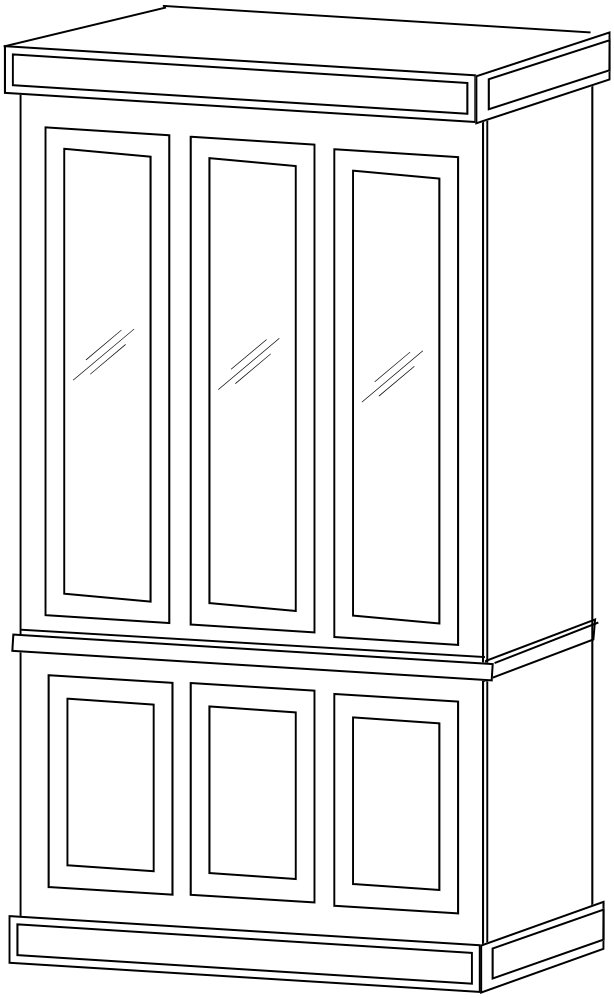
Machine Certification

Table saw
Band saw
Router
Drill Press
Scroll saw

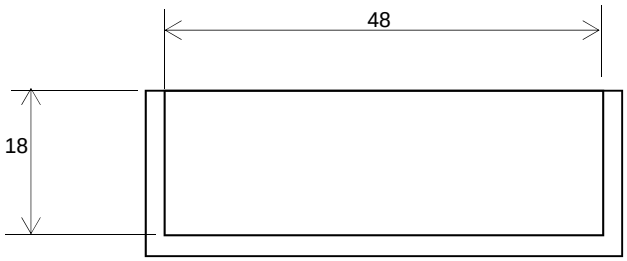
Include a list of tools in which you have been certified

Include your name and location of residence

Joe Smith ***Bakersfield, CA***

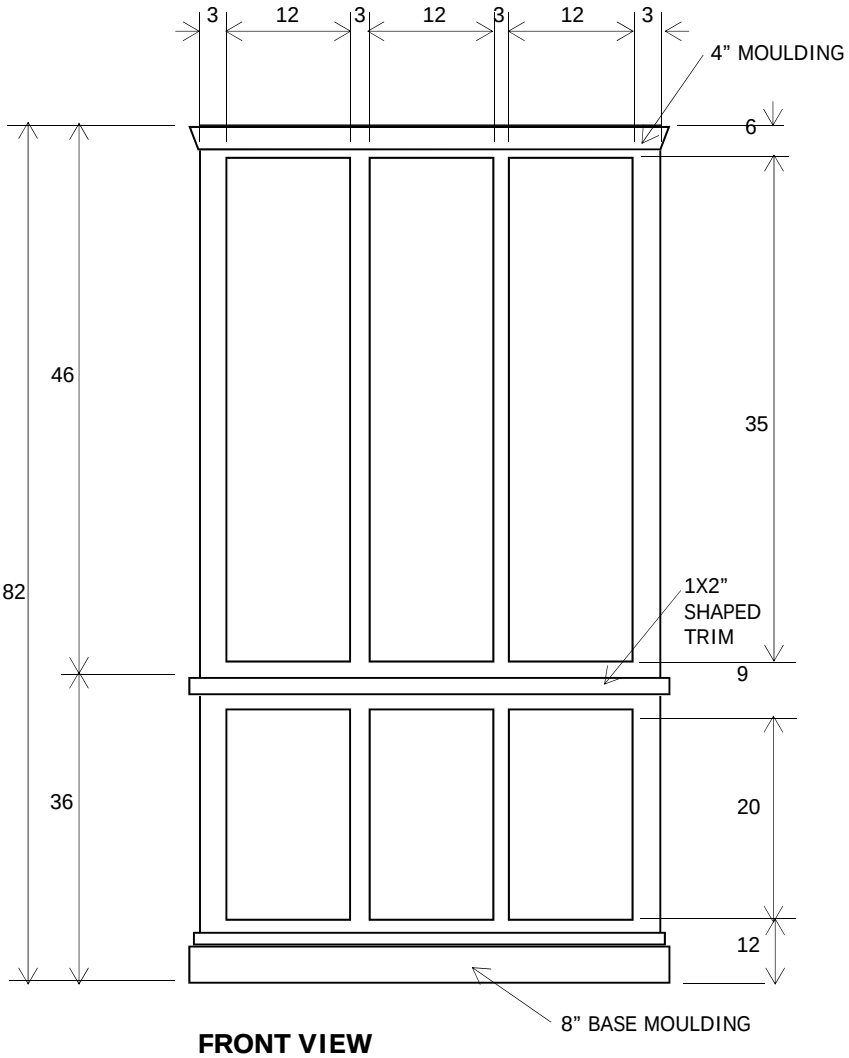


Name:	Bookshelf	T1
Class:		
Date		

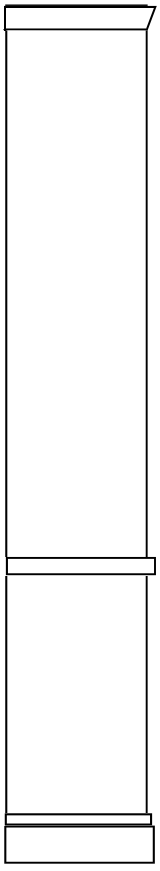


NOTES:
1) MOULDING AND CARCASS TO BE AJOINED WITH NAIL GUN
2) FACE FRAME TO BE JOINED WITH POCKET HOLE AND SCREWS
3) SUPPLY RABBET CUT ON BACK FOR BACK PANEL

TOP VIEW

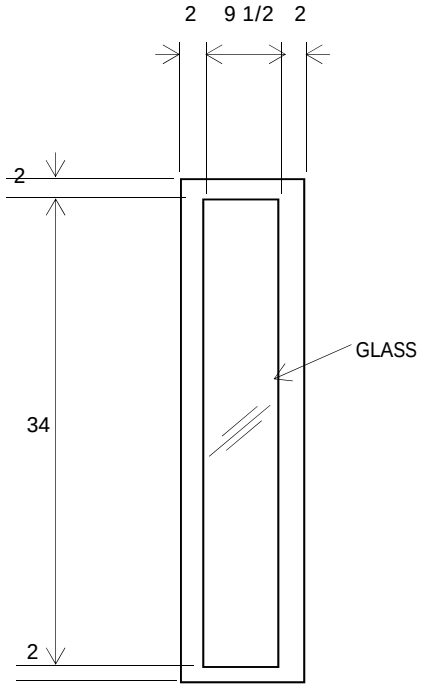


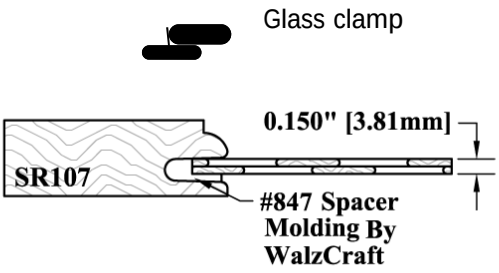
FRONT VIEW



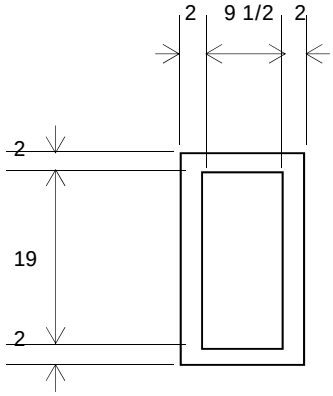
RIGHT SIDE VIEW

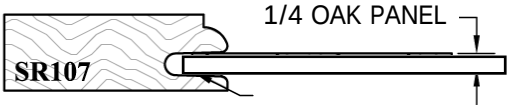
Name: Class: Date	Bookshelf Scale 1/4" = 1'-0"	D 1





GLASS DOOR





PANEL DOOR

Name:	Bookshelf Scale 1/4" = 1'-0"	D2
Class:		
Date		

List of Materials

Builder: Joe Smith

Estimated Cost: $1,258.16

Date:

Materials	Quantity	Cost per item	Total
¾x4x8 Oak plywood	2	$58.62	$117.24
1x2x8 Oak	10	$8.44	$80.44
Pocket screws	1 box	$5.89	$5.89
Stain	1 qt.	$11.14	$11.14
Poly urethane	1 qt.	$9.78	$9.78

Sub total: $224.49
Tax: $33.67

Total cost of materials: $258.16

Hourly labor rate: $20.00

Estimated hours: 50 hours

Total labor cost: $1,000.00

Total Cost to Client: $1,258.16

Name: Class: Date	Bookshelf List of Materials	F 3

Cutting Schedule

Builder: Joe Smith

Estimated Cost: $1,258.16

Date:_____

Project: Bookshelf Overall Dimension: 82" H x 48" W x 18" D

Key:	Part:	Quantity	Dimension of cut	Material
A	Sides	2	18" x 82"	3/4" Oak Ply
B	Top	1	18"x 47 1/4"	3/4" Oak Ply
C	Bottom	1	18"x 47 1/4"	3/4" Oak Ply
D	Vertical divider	1	17 3/4" x 81 3/8"	3/4" Oak Ply
E	Face frame top rail (top)	2	6" x 42"	1x Oak
F	Face frame style (sides)	6	3" x 46"	1x Oak
G	Face frame bottom rail	2	4" x 42"	1x Oak
H	Back	1	47 1/4" x 81 1/4"	1/4" Oak Ply
J	Door face frame rails	12	3" x 15"	1x Oak
K	Door face frame styles	12	3" x 21"	1x Oak
L	Door panel	3	9 1/4" x 15 1/4"	1x Oak (glued stock)
M	Shelves	5	47" x 17"	3/4" Oak Ply
N	Moulding top	1	4" x top	Crown Oak
P	Moulding bottom	1	10" x bottom	Shaped Oak
R	Ply face moulding	5	1/4" x 3/4" x 47"	Oak shelf face

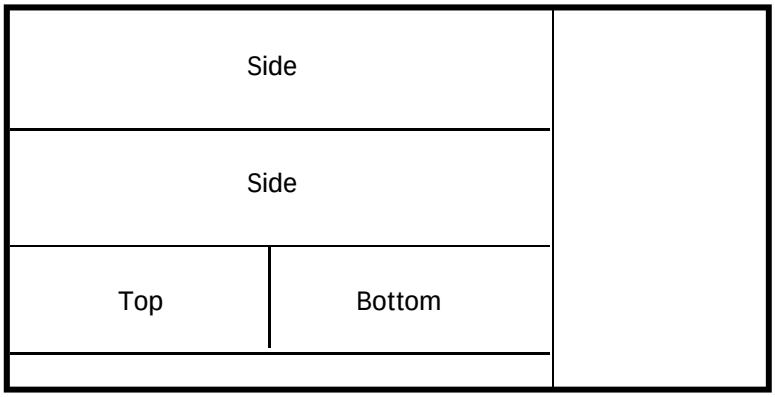
Name:

Class:

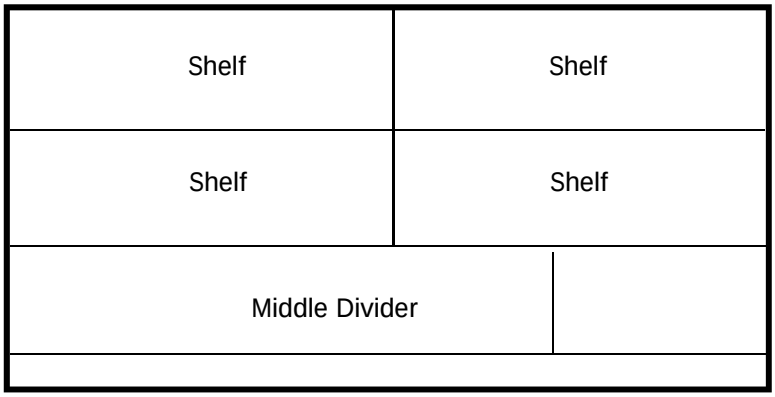
Date

Bookshelf
Cutting Schedule

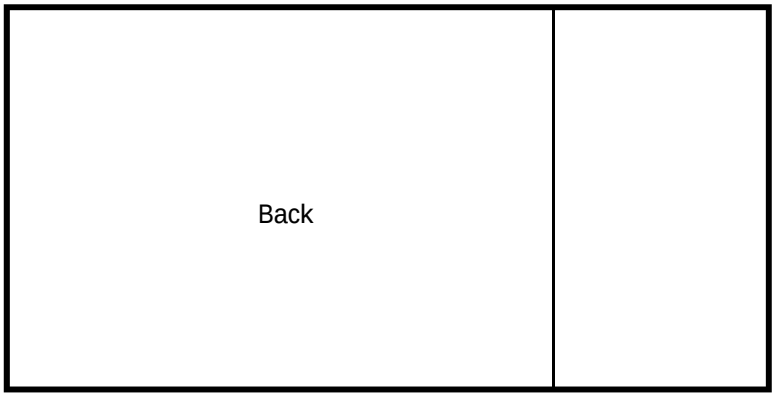
F 1



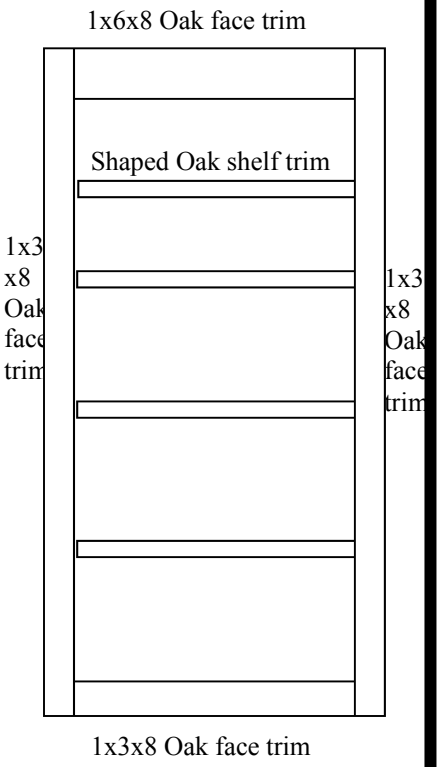
¾x4x8 Oak Plywood



¾x4x8 Oak Plywood



¼x4x8 Oak Plywood



Name: Class: Date	Bookshelf Cutting Schedule	F2

This **Work Agreement** issued on the _____*day*_____ of _____*month*_____year _____*year*_____.

Between ___*Your name here*_____.
(the Student)

And _____*Mr. Warren, Valley Oaks Charter School*_____.
(the Teacher)

WE agree together that the Work listed below shall be performed in pursuant of the goals of Valley Oaks Charter School to help the Student achieve academic excellence, effective communication skills, critical thinking skills, technological competence, cultural awareness, and initiative.

Description of Work to be Done: *(Following the example below, provide an outline of the work you will accomplish)*

1. Supply complete set of working drawings, list of materials, and cutting schedule
2. Construct oak bookshelf as presented in the working drawings
3. Color of stain: Natural
4. Polyurethane 3 coats

Cost Estimate: *(Provide an estimated cost below as found on your List of Materials)*

The *estimated* Cost of Materials for the above project is: _____.

Time estimate: *(Provide the estimated time you and the teacher agree it will take you to accomplish the Work)*

The date of commencement:_____ The *estimated* date of completion:_____.

Agreement: *(The written agreement below must be included in your work agreement)*

It is agreed, subject to the clause under this agreement, that:
(A) The Student will complete the Work to be done under this Agreement in a good and workable like manner, and will comply with all safety standards of Valley Oaks Charter School as well as the standard laws and requirements of all statutory authorities.
(B) The Teacher shall provide instruction, encouragement, and guidance to help the Student accomplish the above mentioned project with excellence in accordance with the standards listed under this work agreement.
(C) The Student shall strive to live by their work ethic as written below.

***Your* Work Code of Ethics:** (*A sample of Mr. Warren's work ethic is provided below. Write your own here)*

1. **Integrity**: I will be honest in everything I do, even to my own hurt.
2. **Respect**: I will respect all people equally.
3. **Initiative**: I will be self-motivated. I will look for what needs to be done next and do it without waiting to be told.
4. **Balance**: I will keep a proper balance in my life and serve my wife and children above all others. Work will not dominate my life.
5. **Diligence**: I will work hard, stay focused, not take short cuts, and see a job through until it is completed in a safe, efficient, and timely manner.
6. **Communication**: I will communicate clearly with people.
7. **Time management**: I will manage my time wisely and not engage in activities that are not beneficial to myself or others.
8. **Excellence**: I will pursue excellence in everything I do and will always seek to *do things right.*
9. **Humility:** I will have the heart of a servant and not work for financial profit. I will work for the profit of others, be open to criticism, seek advice, and always be hungry to learn.
10. **Worship**: I will do everything as an expression of my adoration for Jesus Christ.

Student's Signature:_____ Date: _____

Parent's Signature: _____ Date: _____

Teacher's Signature: _____ Date: _____

Name: Class: Date	Work Agreement	F 4

Name:	Bookshelf Finished Project	D2
Class:		
Date		

Portfolio Checklist

Cover:

1. Is your portfolio in a binder?
2. Does your binder display your cover?
3. Do you have a professional looking logo?
4. Do you have a business name?
5. Is your name on the cover?
6. Do you have a "catch phrase"?
7. Did you list the machinery in which you have been certified?

Table of Contents:

1. Do you have a table of contents?
2. Are the pages of your portfolio in the same order as your table of contents?

Previous Work:

1. Do you have pictures of your previous projects?
2. Have you included previous drafting projects?

Title Block:

1. Do all of your pages have the same title block around them?
2. Does your title block include your name, date, class name, project name, and page number? Logo is optional.
3. Is your title block drawn with thick, bold lines?

Pictorial:

1. Did you draw a pictorial of this year's project?
2. Are the lines of your drawing parallel to one another?
3. Does your pictorial accurately express the look of your project?

Plans:

1. Do your plans have the top, front, and right side views?
2. Are views in the correct place and, if on the same page, do they line up?
3. Are your views properly labeled?
4. Does your title block include the scale of your drawing?
5. Did you include any necessary section drawings?
6. Are your dimensions "off" of your object by at least ¾" and in line with one another?
7. Did you include all necessary notations?
8. Did you neatly PRINT all of your notes in capitals?
9. Do your dimensions run in the correct direction (Horizontal or Vertical bottom to top)?
10. Is your line quality correct (dark object lines, light dimension lines)?
11. Is your line quality clean, straight, and smooth (not freehand)?

Contract:

1. Does your contract have the same title block as all other pages?
2. Does your contract include the work code of ethics you will strive to live by?
3. Does your contract include an estimate of time it will take you to complete?
4. Did you estimate the total cost of your project?
5. Did you, your parent(s)/guardian, and your instructor sign and date the contract?

Material List:

1. Does your Material List have the same title block as all other pages?
2. Did you include the name of the materials, the quantity, the cost per item, and the total cost of each item?
3. Did you total the cost?
4. Did you assign yourself a fictitious hourly rate IF you were to be paid?
5. Did you include any hardware (hinges, slides, handles, etc) needed for your project and the cost of each?
6. Did you include cost of finishing materials (stain, poly, wax, oil, sand paper, etc.)?

Cutting List and Schedule:

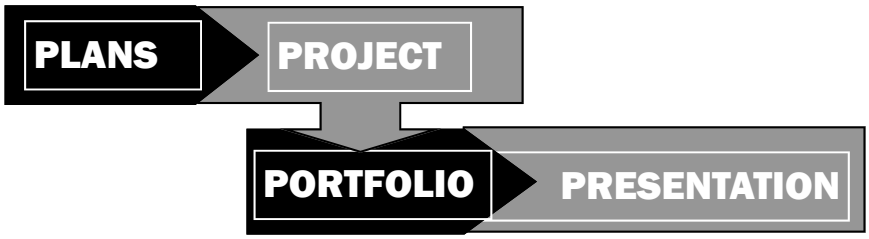
1. Does your Cutting List and Cutting Schedule have the same title block as all other pages?
2. Does your Cutting List include all the pieces of your project and the final cut-size of each?
3. Does your Cutting Schedule show a picture of how plywood will be cut (if any)?

Photograph:

1. Did you include a photograph of your completed project?
2. Does your photograph page have the same title block as all other pages?

Oral Presentation:

1. Have you done everything with the highest degree of excellence you are capable of mastering?
2. Are you proud of your work?
3. Have you prepared your oral presentation by outlining what you will say?
4. Can you make your oral presentation without looking at your notes?
5. Have you looked over the Presentation Evaluation form and the Presentation Help Guide?
6. It is recommended that all pages of your portfolio be in clear protective sleeve covers.



1. Introduction:
    a. Portfolio presentation (introduce yourself, your business name, your catchphrase/motto, and your past work) – see Portfolio Sample in the appendix of your text.
    b. Show plans of project (walk us through the plans)
    c. Show off completed project (inside and out)
        - Tell why you chose to make this project, who you made it for, and how it will be used.

2. Explanation of Work
    a. What type of wood did you use and why?
    b. What tools did you use to make it?
    c. What new methods did you employ to make it (explain methods)?

3. Impressions
    a. What were the best and worst moments of this entire process?
    b. What would you do differently next time you construct a project?
    c. What did you find most difficult about constructing your project?
    d. If you could change one thing about the finished project what would it be?
    e. What about your experience will you take into building your next project?
    f. What part of your work ethic changed as a result of this project?
    g. What aspect of your finished project do you like the most?

4. Conclusion
    a. What one piece of "Work Ethic" advice would you give to others?
    b. What was most rewarding about making your project?
    c. What are you looking forward to making next? Why?

5. Further help
    a. Look over the following "Presentation Evaluation Form" and make sure you address everything listed. You will be graded on each topic.

Presentation Evaluation Form

Portfolio

Content	4	3	2	1
Professionalism of Cover Page				
Effectiveness of Isometric				
Competency of Drafting				
Quality of required Forms (Material list, cutting schedule, work agreement)				

Showcase	4	3	2	1
Evidence of creative individual thought				
Organization of materials				
Pride of ownership: neatness, details, photos				
Transition from portfolio to project unveiling				

Project Presentation:

Explanation of Work	4	3	2	1
Explanation of project description and purpose				
Description of tools used				
Explanation of construction methods used				

Impression of Work	4	3	2	1
Student's overall impression of the project				
Evaluation of construction techniques used				
Self-evaluation: abilities, work ethic, techniques				
Project evaluation: appearance, use, function				
Demonstrated ability to improve upon work				
Pride of ownership				

Conclusions	4	3	2	1
Presentation of work ethic challenge				
Evidence of rewarding experience/growth curve				
Evidence of future plans				
Competency in answering questions				

Speech Components	4	3	2	1
Delivery component: Demeanor, eye contact, volume, rate, enthusiasm, posture, transitions				
Organization component: progression, flow, clarity				
Interaction component: valued audience, respectful, engaging, listening skills				
Competency component: Fluid answers, insightful responses, expansion of information				

Score:

Individual Descriptors

4 = Sophisticated
Individual was powerful, eloquent, informative, precise, insightful, and/or effective.

3 = Capable
Individual was consistent, thoughtful, prepared, conscientious, organized, and/or clear.

2 = Emerging
Individual was inconsistent, scattered, disorganized, unclear, ineffective, and/or unrehearsed

1 = Undeveloped
Individual was not deliberate, unpracticed, uninformed, superficial, distracting, and/or not serious

Appendix: Project Check 1

Name:_____ Date:_____

Project:_____Current Grade:_____

Grading Scale: 1= Poor 2= Needs work 3= Good 4= Well done 5= Excellent

Grading Notes: Plus sign (+) = progressing satisfactory, work complete, demonstrates competence.
Zero (0) = no progress evident, needs improvement, demonstrates lack of understanding.
Minus sign (-) = continued failure to show progress, does not follow instruction, incompetence.

Project Planning

A. **Portfolio Preparation** (week 1)..... Preparation ☐

1. Work agreement: _____
   (Typed work agreement with personal work ethic code and commitment signed by parent and student, Valley Oaks expectations, teacher signature, current date, target date of completion)
2. Company name: _____
3. Logo: _____

B. **Idea samplers** (week 2)..... Sample Ideas ☐

1. Ideas: _____
   (Magazine clippings, photographs, computer images, catalog advertisements of desired project)

C. **Standard title block** (week 3)..... Title Block ☐

1. Margin framing: _____
   (Thick, black lines, ½" from edge of paper, uniform lines)
2. Information block: _____
   (To be used on every page of portfolio: Logo and/or company name, name, class name, date, project title, scale, page number)

D. **Pictorial Sketch** (week 4)..... Pictorial Sketch ☐

1. Rough sketch: _____
   (Isometric or pictorial sketch of project)

E. **Drafting sketches** (week 5)..... Drafting Sketch ☐

1. Three Views: _____
2. Overall Dimensions: _____
3. Important Notes: _____
   (Labeling, joinery notes, hardware notes, wood type notes)

F. **Overall work ethic**..... Work Ethic ☐
   (Daily work ethic evaluation: Cooperation, diligence, and behavior)

Progress Check Total: ☐ /30

Grade Report:

- ☐ Missing Prompts
- ☐ Low Test Scores
- ☐ Undeveloped Project Preparation
- ☐ Project Plans do not meet drafting standards
- ☐ Project construction lacks progress
- ☐ Overall Work Ethic needs improvement

Name:_____ Date:_____

Project:_____Current Grade:_____

Grading Scale: 1= Poor 2= Needs work 3= Good 4= Well done 5= Excellent

Grading Notes: Plus sign (+) = progressing satisfactory, work complete, demonstrates competence.
Zero (0) = no progress evident, needs improvement, demonstrates lack of understanding.
Minus sign (-) = continued failure to show progress, does not follow instruction, incompetence.

Project Preparation

G. **Pictorial Drawing** (week 6)..... Pictorial ☐

4. Pictorial: _____

H. **Drafting Plans** (week 7)..... Drafting ☐

2. Views: _____
   (Completed top, front, and right-side views, sections)
3. Drawing Quality: _____
   (Penmanship, neatness, line type, line quality, orderliness, layout)
4. Scale: _____
   (Drawn to scale, dimensions, notations)
5. Title Block: _____
   (logo/company name, student name, class, date, project title, scale, drawing number)

I. **Purchasing** (week 8)..... Purchasing ☐

3. Material List: _____
   (Shopping list complete, lumber purchase size, hardware needed, finish materials)
4. Cutting Schedule: _____
   (Item letter, name, finish cut size, wood type, plywood cut layout)

J. **Project Construction** (week 9)..... Construction ☐

2. Project knowledge: _____
   (Understands overall cut layout, desired joinery methods, assembly process)

K. **Tool Usage** (week 10)..... Tool Usage ☐

4. Cutting has begun: _____
5. Tool Usage: _____
   (Skillful, efficient, safe, and thoughtful use of tools)

L. **Overall work ethic**..... Work Ethic ☐

1. Progress: _____
   (Corrections/updates made to portfolio. Progress Check 1 corrections made. Showing sufficient progress on work. On task to meet deadlines)
2. Work Ethic: _____
   (Daily work ethic evaluation: Cooperation, diligence, and behavior)

Progress Check Total: ☐ /30

Grade Report:

- ☐ Missing Prompts
- ☐ Low Test Scores
- ☐ Undeveloped Project Preparation
- ☐ Project Plans do not meet drafting standards
- ☐ Project construction lacks progress
- ☐ Overall Work Ethic needs improvement

Name:_____ Date:_____

Project:_____Current Grade:_____

Grading Scale: 1= Poor 2= Needs work 3= Good 4= Well done 5= Excellent

Grading Notes: Plus sign (+) = progressing satisfactory, work complete, demonstrates competence.
Zero (0) = no progress evident, needs improvement, demonstrates lack of understanding.
Minus sign (-) = continued failure to show progress, does not follow instruction, incompetence.

Project Construction (weeks 11-15)

Difficulty

M. **Project Difficulty**.....

1. Difficulty of project:_____
   (1=basic woodworking skills required. 2=few advanced skills required. 3=moderate advanced skills required. 4=advanced skills required. 5=skilled craftsmanship required)

Safety

N. **Safety Awareness**.....

6. Safety guidelines: _____
   (Follows the rules of the shop, uses tools safely, is proactive and consciences)
7. Attention to safety: _____
   (Remains focused on work, is not a distraction to others, is aware of safety methods)

Preparation

O. **Project Preparation**.....

1. Drafting plans: _____
   (Plan modifications updated, quality improvements made, work is complete)
2. Portfolio: _____
   (Complete: cover with logo, work agreement with work ethic, plans, lists, and schedule)

Construction

P. **Project Construction** .....

1. Lumber cut quality: _____
   (Dimensions of cut stock match plans, mill marks, burns, pencil marks)
2. Progress of work: _____
   (Construction is progressing at an acceptable rate)
3. Effective joinery: _____
   (Joints are strong, clean, and smooth. Proper growth ring usage)
4. Surface preparation:_____
   (Careful attention to surface preparation. No dents, scratches, mill marks, burns, etc.)
5. Project knowledge: _____
   (Understands overall cut layout, desired joinery methods, assembly process)

Tool Usage

Q. **Tool Usage** .....

6. Tool usage: _____
   (Skillful, efficient, safe, and thoughtful use of tools, growth in applying new tool applications and methods)

Work Ethic

R. **Overall work ethic**.....

1. Progress: _____
   (Corrections/updates made to portfolio. Progress Check 1 and 2 corrections made. Showing sufficient progress on work. On task to meet deadlines)
2. Work Ethic: _____
   (Daily work ethic evaluation: Cooperation, diligence, and behavior)

Progress Check Total: ____/30

Grade Report:

- ☐ Missing Prompts
- ☐ Low Test Scores
- ☐ Undeveloped Project Preparation
- ☐ Project Plans do not meet drafting standards
- ☐ Project construction lacks progress
- ☐ Overall work ethic needs improvement

Name:_____ Date:_____

Project:_____Current Grade:_____

Grading Scale: 1= Poor 2= Needs work 3= Good 4= Well done 5= Excellent

Grading Notes: Plus sign (+) = progressing satisfactory, work complete, demonstrates competence.
Zero (0) = no progress evident, needs improvement, demonstrates lack of understanding.
Minus sign (-) = continued failure to show progress, does not follow instruction, incompetence.

Project Construction (weeks 16-20)

Difficulty

S. **Project Difficulty**.....

2. Difficulty of project:_____
(1=basic woodworking skills required. 2=few advanced skills required. 3=moderate advanced skills required. 4=advanced skills required. 5=skilled craftsmanship required)

Safety

T. **Safety Awareness**.....

8. Safety guidelines: _____
(Follows the rules of the shop, uses tools safely, is proactive and consciences)

9. Attention to safety: _____
(Remains focused on work, is not a distraction to others, is aware of safety methods)

Preparation

U. **Project Preparation**.....

2. Drafting plans: _____
(Plan modifications updated, quality improvements made, work is complete)

2. Portfolio: _____
(Complete: cover with logo, work agreement with work ethic, plans, lists, and schedule)

Construction

V. **Project Construction** .....

1. Lumber cut quality: _____
(Dimensions of cut stock match plans, mill marks, burns, pencil marks)

2. Progress of work: _____
(Construction is progressing at an acceptable rate)

3. Effective joinery: _____
(Joints are strong, clean, and smooth. Proper growth ring usage)

4. Surface preparation:_____
(Careful attention to surface preparation. No dents, scratches, mill marks, burns, etc.)

5. Project knowledge: _____
(Understands overall cut layout, desired joinery methods, assembly process)

Tool Usage

W. **Tool Usage** .....

7. Tool usage: _____
(Skillful, efficient, safe, and thoughtful use of tools, growth in applying new tool applications and methods)

Work Ethic

X. **Overall work ethic**.....

3. Progress: _____
(Corrections/updates made to portfolio. Progress Check 1-3 corrections made. Showing sufficient progress on work. On task to meet deadlines)

4. Work Ethic: _____
(Daily work ethic evaluation: Cooperation, diligence, and behavior)

Progress Check Total: ____/30

Grade Report:

- ☐ Missing Prompts
- ☐ Low Test Scores
- ☐ Undeveloped Project Preparation
- ☐ Project Plans do not meet drafting standards
- ☐ Project construction lacks progress
- ☐ Overall work ethic needs improvement

Name:_____ Date:_____

Project:_____Current Grade:_____

Grading Scale: 1= Poor 2= Needs work 3= Good 4= Well done 5= Excellent

Grading Notes: Plus sign (+) = progressing satisfactory, work complete, demonstrates competence.
Zero (0) = no progress evident, needs improvement, demonstrates lack of understanding.
Minus sign (-) = continued failure to show progress, does not follow instruction, incompetence.

Project Construction (weeks 11-15)

Y. **Project Difficulty**..... Difficulty

3. Difficulty of project:_____
(1=basic woodworking skills required. 2=few advanced skills required. 3=moderate advanced skills required. 4=advanced skills required. 5=skilled craftsmanship required)

Z. **Safety Awareness**..... Safety

10. Safety guidelines: _____
(Follows the rules of the shop, uses tools safely, is proactive and consciences)

11. Attention to safety: _____
(Remains focused on work, is not a distraction to others, is aware of safety methods)

AA. **Project Preparation**..... Preparation

3. Drafting plans: _____
(Plan modifications updated, quality improvements made, work is complete)

2. Portfolio: _____
(Complete: cover with logo, work agreement with work ethic, plans, lists, and schedule)

BB. **Project Construction** ..... Construction

1. Lumber cut quality: _____
(Dimensions of cut stock match plans, mill marks, burns, pencil marks)

2. Progress of work: _____
(Construction is progressing at an acceptable rate)

3. Effective joinery: _____
(Joints are strong, clean, and smooth. Proper growth ring usage)

4. Surface preparation:_____
(Careful attention to surface preparation. No dents, scratches, mill marks, burns, etc.)

5. Project knowledge: _____
(Understands overall cut layout, desired joinery methods, assembly process)

CC. **Tool Usage** ..... Tool Usage

8. Tool usage: _____
(Skillful, efficient, safe, and thoughtful use of tools, growth in applying new tool applications and methods)

DD. **Overall work ethic**..... Work Ethic

5. Progress: _____
(Corrections/updates made to portfolio. Progress Check 1-4 corrections made. Progress of work. On task to meet deadlines)

6. Work Ethic: _____
(Daily work ethic evaluation: Cooperation, diligence, and behavior)

Progress Check Total: /30

Grade Report:

- ☐ Missing Prompts
- ☐ Low Test Scores
- ☐ Undeveloped Project Preparation
- ☐ Project Plans do not meet drafting standards
- ☐ Project construction lacks progress
- ☐ Overall work ethic needs improvement

Name:_____ Date:_____

Project:_____Current Grade:_____

Grading Scale: 1= Poor 2= Needs work 3= Good 4= Well done 5= Excellent

Grading Notes: Plus sign (+) = progressing satisfactory, work complete, demonstrates competence.
Zero (0) = no progress evident, needs improvement, demonstrates lack of understanding.
Minus sign (-) = continued failure to show progress, does not follow instruction, incompetence.

Project Construction (weeks 11-15)

Difficulty

EE. **Project Difficulty**.....

4. Difficulty of project:_____
(1=basic woodworking skills required. 2=few advanced skills required. 3=moderate advanced skills required. 4=advanced skills required. 5=skilled craftsmanship required)

Safety

FF. **Safety Awareness**.....

12. Safety guidelines: _____
(Follows the rules of the shop, uses tools safely, is proactive and consciences)

13. Attention to safety: _____
(Remains focused on work, is not a distraction to others, is aware of safety methods)

Preparation

GG. **Project Preparation**.....

4. Drafting plans: _____
(Plan modifications updated, quality improvements made, work is complete)

2. Portfolio: _____
(Complete: cover with logo, work agreement with work ethic, plans, lists, and schedule)

Construction

HH. **Project Construction** .....

1. Lumber cut quality: _____
(Dimensions of cut stock match plans, mill marks, burns, pencil marks)

2. Progress of work: _____
(Construction is progressing at an acceptable rate)

3. Effective joinery: _____
(Joints are strong, clean, and smooth. Proper growth ring usage)

4. Surface preparation:_____
(Careful attention to surface preparation. No dents, scratches, mill marks, burns, etc.)

5. Project knowledge: _____
(Understands overall cut layout, desired joinery methods, assembly process)

Tool Usage

II. **Tool Usage** .....

9. Tool usage: _____
(Skillful, efficient, safe, and thoughtful use of tools, growth in applying new tool applications and methods)

Work Ethic

JJ. **Overall work ethic**.....

7. Progress: _____
(Corrections/updates made to portfolio. Progress Check 1-5 corrections made. Showing sufficient progress on work. On task to meet deadlines)

8. Work Ethic: _____
(Daily work ethic evaluation: Cooperation, diligence, and behavior)

Progress Check Total: /30

Grade Report:

- ☐ Missing Prompts
- ☐ Low Test Scores
- ☐ Undeveloped Project Preparation
- ☐ Project Plans do not meet drafting standards
- ☐ Project construction lacks progress
- ☐ Overall work ethic needs improvement

Name:_____ Date:_____

Project:_____

Grading Scale: 1= Poor 2= Needs work 3= Good 4= Well done 5= Excellent

Planning and preparation (100 points possible) Points Notes

A. Portfolio presentation
1. Pictorial Sketch _____
2. Formatting (title block, work agreement, ethical code) _____

B. Drafting plans
1. Views (front, top, left side, section) _____x2
2. Line quality, penmanship, neatness, and orderliness _____x2
3. Scaling, dimensions, and notations _____x2

C. Planning
1. Materials list _____
2. Cutting list and cutting schedule _____

Score: _____x2_____

Construction (100 points possible)

A. Project Building Comprehension Points Notes
1. Skillful and safe use of required tools _____
2. Understands woodworking techniques and plan reading _____

B. Assembly
1. Dimensions and image match plans _____x2
2. Construction is square, symmetrical, round, etc. _____x2
3. Joinery is strong, clean, and smooth. Proper growth ring usage. _____x2
4. Functionality: Project performance and operation, usability _____
5. Millwork and Hardware (panels, drawers, molding, accessories, etc.) _____

Score: _____x2_____

Finish (100 possible points)

A. Surface preparation Points Notes
1. Dents, scratches, unsightly cracks, pencil marks _____x2
2. Sanding (smooth, edges softened, etc.) _____x2
3. Mill marks, burns _____
4. Wood filler, plugs, caps, glue marks, joint gaps _____x2

B. Finishing
1. Stain: No color variance _____
2. Finish coat: Smooth, no runs, drips, bumps, or swags _____x2

Score: _____x2_____

Overall Work Ethic (100 possible points) Points Notes

A. Cooperation (does share of cleaning, picks up after self, helpful) _____x2
B. Diligence (hard working, industrious, self-motivated, initiative) _____x2
C. Behavior (fulfills personal work ethic code, punctual, not distracting) _____x2
D. Difficulty of project (see below) _____x4
1=basic woodworking skills required. 2=some advanced skills required. 3=moderate advanced skills required. 4=advanced skills required. 5=skilled craftsmanship required

Score: _____x2_____