

4-H WOODWORKING PROJECT

Reference Manual



Revised 2009



Agriculture and
Agri-Food Canada

Agriculture et
Agroalimentaire Canada





4-H Motto
Learn to do by doing

4-H Pledge

I pledge:

My HEAD to clearer thinking,

My HEART to greater loyalty,

My HANDS to larger service,

My HEALTH to better living,

For my club, my community and my country

4-H Grace

(Tune of Auld Lang Syne)

We thank thee Lord, for blessings great

On this, our own fair land.

Teach us to serve thee joyfully,

With head, heart, health and hands.

*Unless otherwise noted, the content of this project has been adapted from the
Alberta 4-H Woodworking Leader's Reference Manual, 2004.*

CONTENTS

1: INTRODUCTION	1
Project Overview - It's a Carpenter's World!	1
Getting Started	3
Explanation of the Reference Book	3
Teaching the Project	4
Important Steps in Teaching	4
Learning Characteristics and Styles	6
Learning Characteristics of 9 - 11 Year Olds	6
Learning Characteristics of 12 - 14 Year Olds.....	7
Learning Characteristics of 15 - 19 Year Olds.....	8
Implementing	9
Achievement Day Requirements.....	9
Quick Note About Safety.....	10
Resources.....	11
2: SAFETY.....	13
MODULE - Basic Workshop Safety Junior, Intermediate, Senior	13
MODULE - Safety Logos Junior, Intermediate, Senior	16
MODULE - Personal Protective Equipment (PPE) Junior, Intermediate, Senior....	18
MODULE - Safety and Tools Junior, Intermediate, Senior	21
MODULE - First aid Junior, Intermediate, Senior	23
3: FORESTRY AND SUSTAINABILITY.....	25
MODULE - Environmental Sustainability Intermediate, Senior	25

MODULE – Trees Please! Junior, Intermediate, Senior	27
MODULE – Canada’s Forestry Industry Senior.....	29
MODULE – Forest Management Certification Senior	31
4: WOOD	33
MODULE – Wood Basics Junior, Intermediate, Senior	33
MODULE – Knots and Warps Junior, Intermediate.....	35
MODULE - Hardwood versus Softwood Junior, Intermediate, Senior	37
MODULE – Plywood Junior, Intermediate, Senior	39
5: TOOLS OF THE TRADE: HAND & POWER TOOLS EXPLAINED	41
Hand Tool Basics Junior, Intermediate, Senior	41
MODULE – Nails Junior, Intermediate, Senior	41
MODULE – Hammer Junior, Intermediate, Senior	43
MODULE – Screws & Screwdrivers Junior, Intermediate, Senior.....	46
MODULE – Saw, Rasp and Chisel Junior, Intermediate, Senior.....	48
SAWS.....	48
RASPS	50
MODULE: Hand Drills Junior, Intermediate, Senior.....	51
Hand Drill.....	51
MODULE –Additional Hand Tools Junior, Intermediate, Senior	54
Planes	54
Block Planes.....	54
Smooth Plane.....	55
Jack Plane.....	55
Fore Plane and Jointer Plane	55
MODULE – Sharpening Senior	57

MODULE – Taking Care of Your Tools	Junior, Intermediate, Senior	59
MODULE – General Tips	Junior, Intermediate, Senior	61
MODULE: Power Tools	Intermediate, Senior	63
MODULE: Power Drills	Intermediate, Senior	65
MODULE: Jigsaws	Intermediate, Senior	67
MODULE: Band Saw	Intermediate, Senior	71
MODULE: Drill Press	Intermediate, Senior	73
MODULE: Radial Arm Saw	Intermediate, Senior	75
MODULE: Table Saw	Senior	76
MODULE: Scroll Saw	Intermediate, Senior	78
MODULE: Lathes	Senior	83
6: MEASUREMENT		85
MODULE – Measuring Up	Junior, Intermediate, Senior	85
MODULE – Intro to Measurement Tools	Junior, Intermediate, Senior	87
MODULE – Advanced Measuring Tools	Intermediate, Senior	89
7: PATTERNS AND DRAWING		92
MODULE – Patterns	Junior	92
MODULE – Pattern Drawing and Transferring	Junior	94
MODULE – Isometric and Orthographic Drawings	Senior	95
8: FASTENING, SANDING AND FINISHING		97
MODULE – Glue	Junior, Intermediate	97
MODULE - Epoxy glue	Senior	99
MODULE – Clamping	Junior, Intermediate	101
MODULE – DOWELS	Intermediate, Senior	104
MODULE – JOINERY	Intermediate, Senior	106

MODULE – Sanding Grits and Grades Junior, Intermediate, Senior.....	109
MODULE - Power Sanders Intermediate, Senior	111
MODULE - Stationary Belt Sander Intermediate, Senior.....	114
MODULE – Dust Management & Protection Junior, Intermediate, Senior.....	115
MODULE – Finish Application and Safety Junior, Intermediate, Senior	117
MODULE – Clean Up Junior, Intermediate, Advanced	122
9: GLOSSARY	124
10: APPENDIX.....	133
Approximate Conversions from Standard / US Units to Metric (SI) Units	133
Approximate Conversions from Metric (SI) Units to Standard / US Units	134
References	135

INTRODUCTION

Project Overview - It's a Carpenter's World!

Woodworking has become an important trade, with the building that both urban and rural areas have experienced over the past few years, not to mention the trend towards buying locally, and supporting one's neighbours.

The 4-H Woodworking project encourages members in developing a sense of accomplishment, pride and confidence, and also gives them a solid foundation in the basics of woodworking, which could complement a future career.

This Reference Book has been divided by themes—Safety; Forestry and Sustainability; Wood; Tools; Measurement; Patterns & Drawing; Fastening, and Sanding & Finishing—with each theme serving as an umbrella for several learning modules. Information on judging and entrepreneurship is included in the Activity Guide.

While the learning modules do all fall under a specific theme, each is designed to stand alone, and can therefore be taught at any point throughout the club year. While teaching the modules in succession may help to enhance the members' learning, it is by no means necessary. Feel free to pick and choose!

An appendix, with a glossary and a metric conversion chart can also be found in the Reference Book.

Format

Each module has the following information:

Objective

States the desired outcome of each activity.

Processing Prompts

Two or to three questions will be provided as a means of helping to encourage group discussion. Leaders are welcome to present members with their own questions, as well as encourage members to form their own.

Applicability

No one likes to think that they're being made to learn something "just because". This section illustrates the importance of the concept.

Background Information

Background information will be provided for some learning modules.

Key Messages

Key Messages are the core ideas that you want members to take away from that particular activity. Ideally, these would become “popcorn statements” for members. When they are asked about a certain concept, activity or skill, it will be these simple, short Key Messages that will “pop” into their heads. The Key Messages will correlate to the “Processing Prompt” questions that are posed at the start of the module.

Activities

This section provides suggestions for the hands-on complementary projects that will see members directly applying the tools, knowledge and skills that have been presented in the particular module. By linking a hands-on activity to learning, members are more likely to remember the concept as they have had mental and physical prompts to help them in their understanding of the topic.

NOTE: For this section, some tasks will need to be done beforehand. For the most part these tasks will be gathering materials, pre-cutting wood, mixing appropriate paints, providing wood-appropriate finishes or sandpaper coarseness.

References/Resources

This section will list the original source from where the activity or concept came from so that members can find more information.

Getting Started

Congratulations on your decision to be a 4-H project leader! Know that as a 4-H leader, you are helping to build tomorrow's leaders, by instilling confidence in today's *youth and advocating for members' continued personal growth and skill* development. Wow! And you thought that you were just teaching someone how to use a lathe! The following points and suggestions just are a few things to know as a leader to make sure that this year is as successful as possible.

Explanation of the Reference Book

Experiential Learning

Experiential learning is a model that consists of action and reflection. Research shows that learning is often best achieved when it is fun, active, interesting and easy to understand. Participating in fun activities creates a sense of togetherness within a group and help members relate to one another, as well as allowing the group to relax, to feel safe and at ease. Through guided reflection and discussion, activities with meaning often help individuals understand concepts and skills more than if the same meaning was presented in a lecture format.

A leader can help 4-H members and groups learn, by leading activities with meaning. These activities can then be processed to help the group find the meaning. These lessons can then be applied to other area of the members' lives – helping them to transfer the meaning from the activity to the real world and everyday life.

Participating in fun activities creates a sense of togetherness within a group and help members relate to one another, as well as allowing the group to relax, to feel safe and at ease.

The following 4-H Woodworking Reference Book includes learning objectives at the beginning of each module. Members will discuss and explore the meaning behind the activities and transfer these insights, through the help of the 4-H leader, into their everyday lives, whether it be in sports teams, school groups, community groups or at home with family. The 4-H leader can facilitate this by using the processing prompts listed at the end of each activity.

What is Processing?

Processing is when individuals reflect, describe, analyze and communicate what they have or will be experiencing in an activity.

Each module has processing prompts. There will be a list of questions to ask regarding concepts to focus a group discussion. Some or all of the questions can be used to process the activity. Feel free to add your own processing prompts if you feel there is a specific topic that you would like to discuss.

When questions are designed properly and used thoughtfully, discussion questions can be an effective learning tool that promotes creativity, as well as generates meaningful interaction and understanding for the member. Processing can be fast or slow depending on the group and the activity.

Source: 4-H Foods Project, Activity Guide.

Teaching the Project

A 4-H project is meant to impart to members the following:

- A feeling of accomplishment in a job well done
- A feeling of empowerment as a result of challenging his or her abilities
- Pride of ownership
- Sense of responsibility

The job of a project leader is important. Effective project leadership begins with the wise selection of projects. As a Woodworking Project leader, help your members choose plans to suit their interests and abilities. Help members to set attainable personal development goals at the outset of the club year. Devise a feasible plan to help members realize their goals. As their leader, actively commit to helping each member meet their personal development goals for the year.

Important Steps in Teaching

Draw up a plan for the year – planning should be done near the beginning of the club year. Decide how many meetings your project group will hold and what topics are to be studied. In planning, decide what will be taught, how and by whom at each meeting. You may want your members, particularly older members, to help. Each member in your project group should have a copy of the plan.

Consider your members – before starting to teach, it is wise to look at the number of members, their ages and their experience. Try to keep the size of your project group to no more than eight. This will depend on your members' interest in the project. If you have more than this number, divide the group based on their age and/or experience level or find more project leaders or assistants. You could draw on the experience of the oldest members to help with the younger members.

Start where the members are – At the start of the year find out what it is about the project that interests them, how much they already know and if they have any questions. This will help you know where to start teaching and the interest of your members. As you teach, make sure the topic being discussed, the words, charts and other teaching tools being used can be understood by all members.

1 Section 1 - Introduction

Have every member active – Involve as many members as possible through planning, arrangements for the meetings and the meeting itself. Wherever possible, a practice session should follow project instruction, giving every member a chance to become involved.

Experience is the best teacher - Members retain more information if they learn through practical experience.

Make the teaching practical – Wherever possible, use real items in a demonstration rather than pictures. For example, in teaching how to sand, use a real piece of wood and sandpaper rather than just talking or only using posters.

It has been shown that we remember:

- 30% of what we hear
- 80% of what we see and hear
- 90% of what we do

Use a variety of teaching methods – When doing your planning for the year, consider different ways of presenting the material and choose the method that will be the most suitable. Each method will have advantages in particular situations and a change in teaching methods helps to maintain interest. Remember younger members need more frequent changes and more activity to deepen their interest, so plan activities no more than 20 minutes. 4-H members enjoy tours, guest speakers, demonstrations, quizzes and hands-on activities. For specific project ideas please refer to the Possible Activities in each section. Following is a list of the learning styles of youth.

Source: *“Teaching Your Project”*: New Brunswick 4-H Council Ltd.

Learning Characteristics and Styles

If one recognizes that each member is a unique individual, learning styles then become important to keep a member motivated, interested and involved in all aspects of 4-H.

Designing a project's Activity Guide and Reference Book to be all encompassing and to present members and leaders all available subject matter, rather than dividing the learning into age-appropriate levels, creates the opportunity for members, regardless of age, to learn at their own rate.

However, with this style of learning, it is very important for leaders to be aware of the different ways that members learn, so as to be able to provide each member with the best 4-H experience possible.

The following charts, provided by the New Brunswick 4-H Council Ltd., outline general characteristics of junior, intermediate and senior-aged members.

Learning Characteristics of 9 - 11 Year Olds

Characteristics	Implications for 4-H Learning Experiences
Are quite active with boundless energy	Put emphasis on "hands-on" learn-by-doing activities. Keep members busy with individual or group projects. Group free time is encouraged.
Like group activity	Emphasize group-learning experiences.
Like to be with members of own sex.	Encourage learning experiences to be done with participants of the same sex.
Have interests that often change rapidly, jumping from one thing to another.	Encourage many brief learning experiences.
Usually work best when the work is laid out in small pieces.	Use detailed outlines of sequential learning experiences.
Guidance from parents and adults is important if members are to attend to a task and achieve their best performance.	Provide opportunities for parent involvement. Outline "things to do" and make assignments. Participants will probably need individual and group guidance. Suggest how parents and other volunteers can help.
Admire and imitate older boys and girls.	Encourage apprenticing with teen volunteers.

1 Section 1 - Introduction

Are easily motivated, eager to try something new.	Provide a wide variety of learning experiences.
Do not like to keep records and do not see the value in them; need assistance and close supervision.	Keep written work simple. Review the project or activity forms with the group step by step. Give clear instructions and solicit the help of parents to assist their children with written work.
Like symbols and regalia.	Make recognition available to those who earn it.
Need recognition and praise for doing good work.	Present recognition in front of peers and parents. Let members know that they will receive rewards for completing activities.
9 - 11 year olds are extremely curious and constantly ask "why".	Do not answer all of their questions. They will learn by finding some answers on their own. Encourage a few members to find answers and report back to the group.

Learning Characteristics of 12 - 14 Year Olds

Characteristics	Implications for 4-H Learning Experiences
Are concerned about physical development and being liked by friends.	Encourage learning experiences related to understanding yourself and getting along with others.
Desire a sense of independence, yet want and need their parents help.	Encourage working with adults and older teens to complete learning experiences and apprenticing.
Are self-conscious with many needing help to get over inferiority complexes.	Concentrate on developing individual skills.
Like fan clubs, with many having adult idols.	Need to have the opportunity to practice leadership roles with coaching. Encourage working with or apprenticing older teens and adults. Teen and adult leaders must be well liked to be effective, and teen leaders should be three to four years older than participants and considerably more mature (must not reject those who they are leading).
Want to explore outside of their community.	Provide learning experiences outside of the community.

Are getting over the age of fantasy and beginning to think of what they will do when they grow up, but are often unclear of needs and values.	Relate what they are doing to career choices.
Are interested in activities involving boys and girls.	Provide learning experiences involving boys and girls.
Are interested in sports and active games.	Encourage active and fun learning experiences.
Are ready for in-depth, longer learning experiences.	Tasks may be more difficult and of longer duration. Encourage deeper exploration of leadership roles; encourage more detailed record keeping of leadership experiences. Activities provide hands-on and skill-centered experiences in specific subject matter.

Learning Characteristics of 15 - 19 Year Olds

Characteristics	Implications for 4-H Learning Experiences
Have social needs and desires that are high.	Emphasize leadership life skills that also relate to social development. Provide opportunities for self-expression.
Want and need a strong voice in planning their own program.	Encourage youth to plan programs with guidance and support of adult helpers.
Want adult leadership roles.	Encourage working with adult role models. Emphasize guidance and counsel from adults rather than directions.
Are quite interested in coeducational activities.	Encourage co-educational learning experiences.
Have areas of interest that have become more consistent than earlier, than patterns of interest becoming more definite.	Encourage greater in-depth of study of leadership roles and life skills.
Often need guidance in selecting careers.	Apply leadership life skills to career exploration roles and life skills.
Are developing community	Encourage learning activities involving the

1 Section 1 - Introduction

consciousness.	community.
Are beginning to think about leaving home for college, employment and/or marriage.	Emphasize application of leadership life skills to being on your own.
Many will leave the community for employment, and many who go to college will not return to their present community after graduation.	Need experiences that expose and involve members with the larger society.

Source of "Learning Styles" chart: New Brunswick 4-H Council Ltd.

Implementing

With this in mind, the following Achievement Day requirements, while separated by Junior, Intermediate and Senior, is referring to skill level rather than age, as is typically when these categories are used. If a 16-year old (senior in regards to 4-H's age divisions) was a member of the Woodworking project for the first time this year, he or she may very well be at a junior skill level and therefore, adhere to the junior level Achievement Day requirements.

Achievement Day Requirements

Achievement Day gives members a venue at which to display to the public the projects they have worked on all year, and have these projects evaluated competitively. Project completion at Achievement Day requires a satisfactory completion of a number of requirements.

The following is a list of member's Achievement Day requirements:

Junior (those new to the woodworking project)

- A completed Record Book
- Make and display a cutting guide and a sanding block
- Display 2 projects made over the year

Intermediate (those who are at a medium skill level)

- Completed Record Book
- At least 2 completed projects that demonstrate the use of different finishing techniques and require the use of power tools
- For one of the completed projects, the plans and a cardboard model of the project

- An example that shows the use of filler and wooden plugs (if the proper use of filler and wooden plugs have already been demonstrated in the member's completed projects, then additional projects are not necessary)
- Example of a mitred corner, either in a project or as a model (if a properly executed mitred corner has already been demonstrated in the member's completed projects, then additional projects are not necessary)

Senior (those who possess an advanced level of skill)

- Completed Record: At least 2 completed projects that demonstrate the different types of joints and that require the use of power tools discussed
- Plans drawn by a member for a personal project; cardboard model of intended project
- Item made by member that required the use of a router
- Display of tool sharpened by a member (chisel, plane blades, etc.)

Quick Note About Safety

As project leader, members will be looking to you for an example of how to conduct oneself around power tools. Therefore, leaders **MUST** be mindful at all times how their actions may be perceived by members. Doing otherwise may set members up for serious injury.

Resources

People

- Hardware store employees
- High school shop teachers
- Local woodworkers and carpenters
- Family members
- Other 4-H clubs, members and leaders

Places

- Local hardware stores
- Lumber yards (what a great place for a pre-booked tour!)
- Home décor shows
- Shop facilities at a high school
- Exhibitions and fairs that have woodworking demonstrations and displays
- Museums occasionally have displays of woodworking projects that show the progression of woodworking
- Libraries
- Colleges that offer Carpentry and Woodworking as curriculum or non-credit courses

Magazines

- Woodworker's Journal
- Canadian Home Workshop
- Wood Magazine
- American Woodworker
- Workbench Magazine

Books

Bridgewater, Alan and Gill. Encyclopedia of Woodworking. 2007.

Hamilton, Katie and Gene. Build it Together: 30 Easy Woodworking Projects for Kids and Parents. Stackpole Books, 1994.

Leavitt, Jerome E. Easy Carpentry Projects for Children. Sterling Publishing Co., 1959.

McGuire, Kevin. Woodworking for Kids. New York, New York: Sterling Publishing Co., 1993.

Robertson, Craig and Barbara. The Kids' Building Workshop: 15 Woodworking Projects for Kids and Parents to Build Together.

Starr, Richard. Woodworking with Your Kids. Newton, Connecticut: The Taunton Press, 1990.

Thiel, David. I Can Do That! Woodworking Projects. Popular Woodworking Books, 2009.

Websites:

www.rickswoodworking.ca

www.woodzone.com

www.woodzone.com/websites.htm (a page on the web site listed above that serves as a database to various woodworking magazines, patterns, woodworking shows, etc.)

www.woodworking.com

www.carpentrycorner.com

www.woodmagazine.com/wood/file.jsp?item=video/player&temp=yes

www.popularwoodworking.com

www.canadianhomeworkshop.com/woodworking-projects

SAFETY

MODULE – Basic Workshop Safety

Junior, Intermediate, Senior

Objectives:

- To learn about safety in the workshop.

Processing Prompts:

- Why is workshop safety so important?
- What are some safety hazards? What would be a way to avoid each hazard?
- What are some fears that members, if any, have regarding safety in the workshop? What could be changed to reduce that fear?

Applicability:

Workshop safety is very important. It's the difference between stitches or no stitches, blood or no blood, scars or no scars, etc. It pays to be smart in the workshop, because there's a lot to lose if you're not being mindful.

Background:

There are many things to consider regarding workshop safety including sharp edges, moving blades, and leaning boards. An accident may happen once we begin to get comfortable with our craft. This is when we can start to get a bit lazy with our workshop management and may start to develop habits that may not always be conducive to safety.

Did you know that we all are born equipped with the best defense against workshop accidents?

It's called common sense. Taking a few extra seconds to think an action through can save time, money, and prevent injuries.

Here are a few tips on how easy it is to incorporate common sense into your safety plan.

Protect Yourself – Wearing the proper shop protection is an important part of safe tool operation. Goggles, ear protection, and lung protection should be used when operating tools. Use push sticks when working close to the blade and make sure the tool's safety features are in place.

Think Before You Cut – The most powerful tool in your shop is your brain. Use it. Thinking about your cuts and movements before acting can help save both fingers and wood.

Keep a Clean Shop – A cluttered shop is an accident waiting to happen. Keeping your shop clean will help protect you and your tools.

Avoid Distractions – Pay attention to your actions. Looking up to watch the shop TV or a visitor can result in trouble. Always wait until you have completed your cut before you take your eyes off the blade.

Don't Rush – Take a break when you feel rushed or frustrated with a project. Mistakes happen when we rush to complete a job.

Don't Force It – If your saw is resisting the cut, stop and see what's wrong. A misaligned rip fence or improperly seated throat plate can sometimes cause a board to get stuck in mid-cut. Forcing the board in these situations may cause kickback or contact with the blade. Take a moment to evaluate the situation and determine the problem.

Let the Tool Stop – Not giving the power tool time to wind down after a cut is an often-overlooked safety mistake. Even without power, the spinning blade can still do a lot of damage.

Fumes and Dust – Solvent fumes and airborne dust can present health and explosion hazards. Care should be taken to ensure a supply of fresh air and use only explosion-proof vent fans.

Wear Appropriate Clothing – Loose clothing or hair can get caught in power tools and cause severe injury.

Source: The Wood Zone On-Line Store, http://www.wood-worker.com/articles/shop_safety.htm, accessed July 19, 2009

Key Messages:

Safety in the workshop is very important. The consequences of not being mindful could affect you for the rest of your life.

2 Section 2 –Safety

Many accidents that occur in the workshop can be avoided by using one simple tool: common sense.

Activities:

- Hazard Hunt
- Our Club's Safety Rules
- Safety Video Challenge

MODULE - Safety Logos

Objective:

Junior, Intermediate, Senior

- To increase member's awareness of what safety logos mean.

Processing Prompts:







- What are safety logos?
- What are the most common safety logos? Where do members see the most of them?
- What are the different levels of danger associated with safety logos?

Applicability:

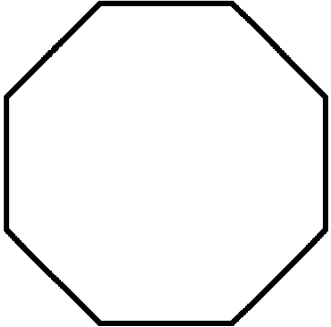


Whether it be in the workshop, in the kitchen or walking down the street, knowing the meaning of safety logos is very important. Can you imagine picking up an item with safety logos, but you have no idea what you're being warned against? You may buy something that has the potential to be very dangerous. Knowledge is always the best defense against accidents and injuries.

Background:

Safety Logos

Flammable 	Poison 
Explosive 	Ventilation Required 
Crushing Hazard 	Electrical Hazard 

There are also three levels of danger that correlate to the safety logos:

<p>Danger This indicates the most hazardous type of material. The octagon indicates this level of danger.</p>	
<p>Warning This indicates a threat that is less hazardous than something marked “Danger”, but still poses a significant safety threat. The diamond sign represents this level of hazard.</p>	
<p>Caution The least hazardous of the three safety ratings but a material that is labeled with “Caution” can still cause harm if the item is not used properly or if the instructions are not followed closely. The sign for this level of hazard is a triangle.</p>	

Key Messages:

Safety logos are symbols used to warn people of the dangers associated with using that particular product.

Common logos mark items that are flammable, poisonous, explosive, require ventilation, or pose an electrical threat.

There are three levels associated with safety logos: danger, warning and caution.

Activities:

- Loony Logos

References & Resources:

Work Safe BC, “What is this Thing Called WHMIS” pdf:
<http://www2.worksafefbc.com/Safety/Home.asp>

MODULE - Personal Protective Equipment (PPE) Junior, Intermediate, Senior Objective:

- To have members become familiar with personal protective equipment (PPE)

Processing Prompts:

- Despite all of the personal protective equipment that is on the market, there are still a number of workshop-related incidents every year. Discuss why members think these accidents occur.
- What are some articles of safety gear, and what do these articles protect against?

Applicability:

Taking responsibility for your own well-being and safety is an important part of life and is as simple as putting on a pair of safety goggles, or buckling your seatbelt and making sure that all passengers in your car have done the same.

Background:

With almost any sport where there's a chance of injury. Hockey players carry around entire bags of equipment. Volleyball players wear kneepads, basketball players have mouth guards, and snowboarders wear helmets.

The same is true for any trade or profession where jobsite injury is a possibility. While it may not seem as obvious as a hockey player needing to wear shin pads, woodworkers need to wear protective gear. As you advance in your woodworking knowledge and expertise, your repertoire of tools that you will use also advances.

Safety Glasses

Your eyesight is too important to take a chance on. Put safety glasses on as soon as you enter the shop (assuming that you're working with tools that day) and don't take them off until you leave.



They may cause two little red dimples to form on either side of your nose. However, those dimples will go away 10 minutes after taking the glasses off. Having a wood chip make contact with your eye would be something that bears a lifetime of consequences.

Hearing Protection

When working with loud power tools and machinery such as routers, surface planers and joiners, it is wise to wear hearing protection. Being mindful of wearing hearing protection will help to reduce the possibility of long term hearing loss.



Respirators or Face Masks

Sanders, routers and other power tools can generate a lot of dust. When using tools it is a good idea to wear a dust mask or respirator as it offers a secure fit around your mouth and face. This is done to keep these fine particles from entering your lungs. When spraying varnish or paint, a respirator is a better choice, to protect you from any harmful effects of using these chemicals.

Face Shields

When using a lathe, you'll likely generate a lot of flying chips. In addition to using your safety glasses, a clear full-face shield is a good idea. The shield is comfortable, can be flipped up when not needed, and will keep most of the flying chips away from your face.



Proper Clothing

A shop apron is also advisable at times, particularly when using a lathe.

You should avoid wearing loose fitting clothing as loose pieces of material can easily become entangled in a power tool, which can be very dangerous. Comfortable, long-sleeved shirts and long pants will do the trick.

Key Messages:

While there is no specific reason for why accidents in the workshop continue to happen, they often occur when people are not diligent about wearing the proper personal protective equipment. It only takes a minute to put safety equipment on, and that minute could save a life.

Safety goggles, hearing protection, a face shield and a respirator are all important pieces of PPE for a woodworker. Wearing properly fitting clothing is also a key component to safe workshop practices.

Activities:

- Safety Gear Runway

MODULE - Safety and Tools

Junior, Intermediate, Senior

Objective:

- To encourage members to be mindful of safe practices when working with hand and power tools.

Processing Prompts:

- Name a specific hand or power tool, and a specific danger that tool might pose.
- What are some basic safety rules associated with using hand and power tools?

Applicability:

If you're planning to spend time in a workshop, regardless of it just being for the purpose of this project or if it is something that you're thinking will be a lifelong hobby, it's never too early to start thinking about power and hand tool safety. Prevention is always preferable to reaction.

Background:

Tools are such a common part of our lives that it is difficult to remember that they may be dangerous. Tragically, a serious incident can occur before steps are taken to identify and avoid tool-related hazards.

Members should be trained in the proper use of all tools. They should be able to recognize the hazards associated with the different types of tools and the safety precautions necessary.

Five basic safety rules can help prevent hazards associated with the use of hand and power tools:

- *Keep all tools in good condition with regular maintenance.*
- *Use the right tool for the job.*
- *Examine each tool for damage before use and do not use damaged tools.*
- *Operate tools according to the manufacturers' instructions.*
- *Provide and use properly the right personal protective equipment.*

These safety tips are mainly geared toward the workshop environment. When tools are involved, common sense, and an adequate amount of skill and know-how are all very important.

Key Messages:

As a woodworker, hand and power tools become a regular part of life. While becoming comfortable with using them and knowledgeable about proper operating techniques, it is important to remember that they are still potentially dangerous.

Keeping tools in good working condition, using the correct tool for the job, checking tools for damage prior to use, using proper technique and being sure to wear the appropriate protective gear all important rules to follow when woodworking.

Activities:

- Safety “Faux Pas”

References & Resources:

Hand Tool and Power Safety. <http://www.authorstream.com/Presentation/Valentina-44654-handsafety-Hand-Power-Tool-Safety-Regulations-Covering-Tools-Say-General-Precautions-Misuse-as-Education-ppt-powerpoint/>, accessed July 19, 2009

Murphy Constructors, Engineers, Mechanical, Industrial. “Safety Manual”. <http://www.docstoc.com/docs/3932191/SAFETY-MANUAL-TABLE-OF-CONTENTS-Safety-and-Health-Policy-Statement>, accessed July 19, 2009.

MODULE – First aid**Junior, Intermediate, Senior**

This module must be instructed by a certified First aid instructor. Contact your nearest certified first aid organization (links included in the background section below) for the names of certified instructors in your area, as well as for brochures and supplementary information about first aid.

Objective:

- To learn the basics of first aid.

Processing Prompts:

- Why is First aid training valuable?
- What are some necessary items to have in a first aid kit?
- What are some examples of times when knowing first aid would be useful?

Applicability:

Having up-to-date first aid training is important. In any situation, if there are people present, there is the potential for something to happen.

If you could help to save someone’s life, wouldn’t you want to?

Background:

While first aid training can vary from session to session, depending on the environment, area of focus (sports, workplace, farm, standard, advanced, youth, senior, etc.) and so on, here is a list of basic, generic topics that would likely be covered in a standard first aid training session:

- Terms of administering standard first aid and CPR, the first aid attendant's role, obligations and liabilities
- Emergency Scene Management and Medical Emergencies
- Artificial Respiration, Choking, Adult CPR
- Wounds, Bleeding, Shock and Fainting
- Fractures, Head and Spinal Injuries
- Eye Injuries, Burns, Medical Conditions
- Poison, Bites, Stings, Environmental Injuries
- Heart Attack, Stroke
- Healthy Heart Living, Diet and Exercise

Source: Statistics Canada: <http://www.statcan.gc.ca/training-formation/generic-generique/0602-eng.htm>

Here is a list of resources to help you find a certified first aid trainer:

Red Cross: <http://www.redcross.ca>

Canada's Safety Council: <http://www.safety-council.org/info/OSH/firstaid.html>

St. John's Ambulance: <http://www.sja.ca>

Key Messages:

First aid training is valuable because no one ever knows when an accident is going to happen. By having first aid training, you will have piece of mind knowing that you're equipped to deal with one, should it happen.

Rubber gloves, scissors, bandages, gauze, rubbing alcohol, tweezers, cotton swabs, antibacterial hand wash are some examples of items to have in a first aid kit.

Activities:

- Safety First! Homemade First Aid Kits

FORESTRY AND SUSTAINABILITY

MODULE - Environmental Sustainability Intermediate, Senior
Objective:

- To make members aware of environmental sustainability.

Processing Prompt:

- What is environmental sustainability?
- What can be done to contribute to the environment's sustainability?

Applicability:

Being aware of what can be done to enhance sustainability is now more important than ever before. If people are aware of their actions we can work towards a sustainable future.

Background Information:

Sustainability is the concept of making sure that the rate at which something is being depleted is in balance with the rate in which it can be regenerated. The idea of sustainability can be applied to many areas of day-to-day life (a person needs to deposit as much money as they withdraw to maintain a balanced bank account). In terms of environmental sustainability, this means that for every tree that is cut down and turned into lumber, another one is planted to grow in its place.

The temperature of the Earth's atmosphere has risen 0.75 degrees Celsius in the last hundred years and is continuing to rise. The Intergovernmental Panel on Climate Change (IPCC) predicts that by 2100, the temperature of the Earth's atmosphere has the potential to rise 6.4 degrees Celsius. This severe of an increase will have a large impact on ocean water levels, weather patterns, disease control and rainfall.

Trees play an important part in helping to regulate temperature, and so it is important to be mindful of what forestry industries are doing to allow for the trees that get cut down for lumber, lumber byproducts and consumer products.

Key Messages:

Sustainability is the concept of making sure that the rate at which something is being depleted is in balance with the rate in which it can be regenerated.

Simple things like recycling aluminum cans, shutting the fridge door, turning off lights in rooms where no one is sitting or not running the water while you brush your teeth will have long-term positive effects on the health of the environment.

Activities:

- Simply Sustainable

References & Resources:

Canada Global Warming: <http://www.canadaglobalwarming.com/>

Environment Canada: <http://www.ec.gc.ca>

The Sustainability Report: <http://www.sustreport.org/>

United States Environmental Protection Agency:
<http://epa.gov/climatechange/kids/greenhouse.html>

Environment Canada's Youth page:

<http://www.on.ec.gc.ca/community/youth/ec-educators-e.html>

MODULE – Trees Please!

Junior, Intermediate, Senior

Objective:

- To help members make the connection between trees and how they affect the environment and woodworking.

Processing Prompts:

What are the environment-enhancing qualities of trees?

How many products can you name that use trees as one of their “ingredients”?

Applicability:

Trees do a lot more than line the streets, provide shade on hot afternoons and grow various fruits and flowers in the summer. They are also used to make tennis rackets, toilet seats, hand sanitizers, food, tea bags and blackboards. It is important to be mindful of the various products that trees produce.

Background:

Trees affect the composition of the air we breathe and the weather that we experience. They emit oxygen into the atmosphere while taking in carbon dioxide. They block wind and snow, as well as provide shelter from precipitation and UV rays.

Trees also provide habitats for many animals, conserve water and provide the raw materials for an endless number of products.

One tonne of wood can produce:

- 7,500,000 toothpicks
- 942 (1lb – 450 gram) books
- 4,384,000 postage stamps
- 12 dining room tables
- 2,700 copies of the daily newspaper

One tonne of dry wood pulp can produce:

- 0.9 ton of bathroom tissue
- 1.05 ton of paperboard which can produce 1,400 lbs (636 kg) of magazine paper
- 1 ton of newsprint

Examples of More Wood and Wood Pulp Products

- Wood By-products: asphalt, chewing gum, turpentine, paint, detergents
- Cellulose: to make toilet seats, melamine, helmets, toothbrushes, cellophane, rocket fuel, rayon fabric.
- Wood Pulp By-products: cleaning compounds, deodorants, hair spray, artificial vanilla flavoring, medicines, cosmetics, torula yeast, baby foods, cereals, imitation bacon, pet foods and baked goods.

For more examples of wood and wood products, go to http://www.idahoforests.org/wood_you.htm.

Wood is an organic material and can decompose easily. It is also possible to use it as an alternative energy source that can reduce demand for non-renewable fossil fuels like oil, natural gas and coal.

Source: Alberta Forest Products. http://albertaforestproducts.ca/industry/facts_figures.aspx.

Key Messages:

Trees enhance air quality, moderate the climate, house wildlife, conserve water and are required for the building of more than 500 different products.

Activities:

- Trees Are Everywhere!

References & Resources:

Bowyer, Jim et al. Forest Products and Wood Science: An Introduction. Oxford: Blackwell Publishing, 2007.

Idaho Forest Product Commission's website at: http://www.idahoforests.org/wood_you.htm , accessed July 19, 2009

Idaho Forest Product Commission, "Forests Are for Kids" page: <http://www.idahoforests.org/kids1.htm>, accessed July 19, 2009

St. Louis County, Minnesota's website: http://www.co.st-louis.mn.us/slcportal/Portals/0/Departments/Land/People%20and%20forests/lisfr_omtrees.pdf, accessed July 19, 2009

Trees Are Good. http://www.treesaregood.com/treecare/tree_benefits.aspx, accessed July 19, 2009

MODULE – Canada’s Forestry Industry

Senior

Objective:

- To increase member’s awareness of Canada’s forest products industry.

Processing Prompts:

- How large of an industry is forestry in Canada?
- What are the two components make up Canada’s forestry industry?
- How many people does the forestry industry directly affect in Canada?

Applicability:

Canada is the largest exporter of forestry-related products. The forestry industry is a major source of income and employment for Canadians.

Background:

Forestry is one of Canada’s leading industries. Canada is the largest exporter of forestry-related products in the world - it makes up almost 16% of the world’s trade!

In Canada, the forestry industry is made up of two integrated components: 1) the wood products industry and 2) the paper and the allied products industry. The wood products industry includes items such as lumber and panels, as well as value-added products such as windows, doors, kitchen cabinets, manufactured housing and flooring. The paper and allied products industry is comprised of products such as pulp, newsprint, printing and packaging papers, as well as paperboard. It also includes consumer items like paper towels and napkins.

Some quick facts regarding Canada’s forestry industry:

- In 2006, the forestry industry made up 2.7% of Canada’s total Gross Domestic Product (GDP);
- In more than 300 rural communities in Canada, forestry contributes makes up over 50 percent of the residents’ income;
- In 2007, Canada’s forestry industry was worth \$78.3 billion;
- In 2008, there were 822,400 people employed by the forest industry. This makes up 1.7% of Canada’s entire employment;
- Of the 822,400 forest industry employees in Canada, the largest number are found in British Columbia (84,300 employees), followed by Quebec (83,100) and Ontario (66,800).

Source: Natural Resources Canada, “The Forest Industry in Canada”.

<http://cfs.nrcan.gc.ca/index/forestindustryincanada>, accessed July 19, 2009

It is an industry that is very much affected by national and global economic conditions.

Key Messages:

Canada is the largest exporter of forest-related products. Canada's forest-related products make up nearly 16% of the world's trade in this commodity.

More than 300 rural communities rely on the forestry industry to supply more than 50% of their residents' income.

There are more than 800,000 people involved with Canada's forestry industry, with the largest numbers of people involved in the industry in British Columbia, Quebec and Ontario.

Activities:

- Forestry in Canada

Resources and References:

Canadian Forests: <http://www.canadian-forests.com>, accessed July 19, 2009

Industry Canada, the Canadian Forest Industries: <http://www.ic.gc.ca/eic/site/ifi-if.nsf/eng/home>, accessed July 19, 2009

Canadian Forest Service, National Resources Canada: <http://cfs.nrcan.gc.ca/index/forestindustryincanada>, accessed July 19, 2009

MODULE – Forest Management Certification

Senior

Objective:

- To describe forest management certification.

Processing Prompts:

- What is Sustainable Forest Management Certification?
- What are Canada's three governing bodies that regulate Forest Management Certification?

Applicability:

It is important for members to be aware of the actions that are being taken to protect the environment. Forest Management Certification addresses sustainability and regeneration, arguments over clear cutting and even-stands and the balance involved with keeping up with the industry's constantly changing supply and demand.

Background:

Sustainable Forest Management Certification is a voluntary certification that is available to corporations who want to do their part in making sure that the forestry industry remains viable and that there is always adequate green space.

In Canada, there are three forest-specific certification bodies involved in sustainable forest management certification. All three are not-for-profit, non-governmental organizations that conduct third party independent reviews of a company's forestry management planning and practices. The three certification entities in Canada are:

- Canadian Standards Association (CSA) www.csa.ca
- Forest Stewardship Council (FSA) www.fscus.org
- Sustainable Forestry Initiative program (SFI) www.sfiprogram.org

Sustainable Forest Management certification standards go beyond basic industry requirements and look at social, economic and environmental considerations as well.

These standards are set by the Forest Stewardship Council (FSC). Universal standards have been developed for 10 aspects of responsible forest management:

1. Compliance with Laws and FSC Principles
2. Tenure and Use Rights and Responsibilities
3. Indigenous Peoples' Rights
4. Community Relations and Workers' Rights
5. Benefits from the Forest
6. Environmental Impact

7. Management Plan
8. Monitoring and Assessment
9. High Conservation Value Forests
10. Plantations

In addition, there are also regional-specific standards, which are created to reflect that specific area's needs, both ecological and social. These additional standards are set with respect to economic, environmental and social factors. In Canada, a select group who represents Canada's aboriginal population also approves these standards. For up to date detailed standards, and region-specific standards, go to: <http://www.fsccanada.org/forestmanagementstd.htm>.

To learn more about the sustainable forestry certification process, visit www.certificationcanada.org/english

Key Messages:

Sustainable Forest Management Certification is voluntary.

In Canada there are three “governing” Sustainable Forest Management Certification bodies: Canadian Standards Association (CSA), Forest Stewardship Council (FSA) and the Sustainable Forestry Initiative program (SFI).

Activities:

- Know Your Region
- Forest Leftovers
- Cross Country Sustainability
- A Future in Forest Management

Resources and References

Canadian Standards Association (CSA): www.csa.ca

Forest Stewardship Council (FSA): www.fscus.org

Sustainable Forestry Initiative program (SFI): www.sfiprogram.org

WOOD

MODULE – Wood Basics Objective:

Junior, Intermediate, Senior

- To introduce members to basic information about wood.

Processing Prompts:

- How do tree cells react to water?
- How does the counting of the rings to reveal a tree's age?
- How is a tree's grain created?

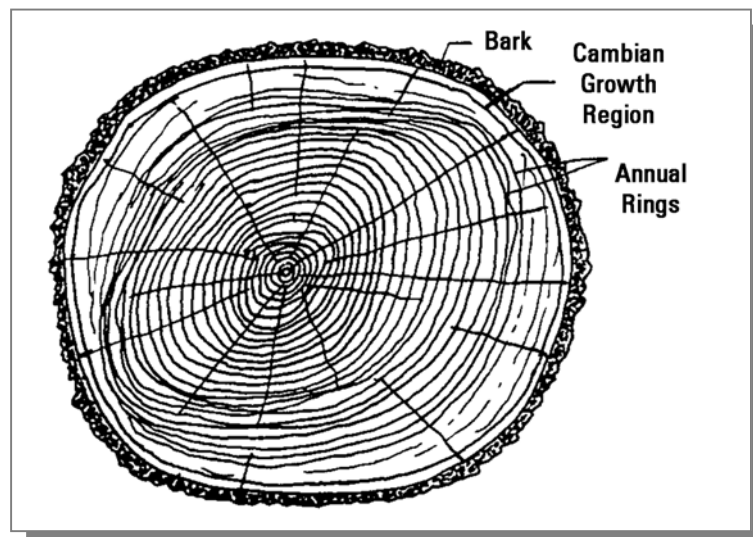
Applicability:

For members to be able to better understand why certain woods are better to use than others for projects, they should first know the basics about trees, including how trees grow, their cellular makeup and how grain is created in wood.

Background:

Wood is made of cells. These cells swell when they absorb moisture and shrink when they dry. Cells swell and shrink across their diameter much more than along their length. This is why wood expands and contracts more across the grain than it does from end to end. Wood also tends to split parallel to its fibres. When people are splitting firewood, they always split it parallel to the log's length (or else they are out there a really long time!).

Trees grow a new layer of wood under the bark each year. These layers are called “annual rings”. Counting these rings on a log or stump reveals the actual age of the tree. Foresters are able to calculate the approximate age of trees by using a tool called an increment borer.



An increment borer works by drilling into the tree and removing a cross section of the wood core, which shows the tree's annual rings without having to cut the tree down.

When a tree is cut into planks, the pattern of these annual rings produce what we call grain in the wood. Each type of wood has its own special grain. Through experience, many woodworkers can identify most woods by their grain.

Key Messages:

Wood is made of cells, which can swell when they absorb moisture and shrink when they dry. These cells tend to swell and shrink across their diameter much more than along their length (from end-to-end).

Trees grow a new layer of wood under the bark each year. These layers are called annual rings and can be counted to determine the actual age of the tree.

An increment borer is a tool used to drill into a tree and extract a section of the wood's core. This allows them to count the annual ring layers without having to cut the tree down.

Activities:

- “Wood” You Take a Look at That?

On the Road

References & Resources:

Real Trees 4 Kids: www.realtrees4kids.org/sixeight/stemsrings.htm. Accessed July 19, 2009

MODULE – Knots and Warps

Objective:

Junior, Intermediate

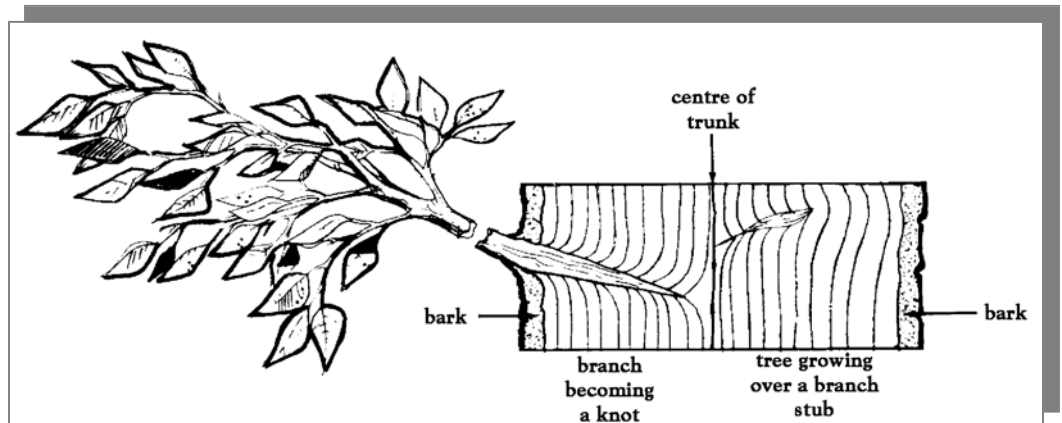
- To educate members about different types of woods and their potential defects.

Processing Prompts:

- How are wood knots formed?
- What does it mean if wood is “warped”?
- Does the type of wood used for a woodworking project have an effect on the project and the finished product?

Applicability:

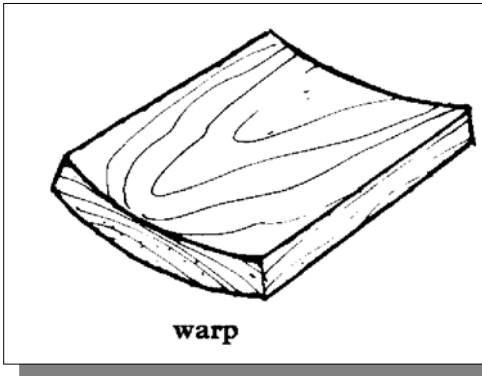
It is important for members to do their research regarding the various types of wood that exist so that they can make



informed decisions about the wood that they choose to use in their building projects. By encouraging members to look into the advantages and disadvantage of various wood choices, they will realize the benefit of doing their research before making a decision, and will be able to apply this thinking to other areas of their lives.

Background:

Wood has natural defects. The knot is the most common defect that woodworkers have to deal with. Knots form where tree branches grow. Knots can be quite hard and if a knot is hit with a nail, the nail will often bend or bounce off. Knots also absorb finishes differently than the rest of the wood. If possible, knotted wood should be avoided for project work.



Warping is the bending of wood as it gains or loses moisture. Wood can warp in many directions. When selecting wood for your project, check for warped wood and avoid it.

Different types of trees have different colours of wood. Woodworkers can enhance these natural colours by applying various finishes.

Key Messages:

Knots form where tree branches grow.

Warping is the bending of wood as it gains or loses moisture.

Knotted wood is undesirable to use in a woodworking project because of the potential for bent nails, and the variation in absorption that happens when a finish is applied. Warped wood is also not ideal to work with because of its overall appearance, which will affect the overall look of the finished product.

Activities:

- Wood Types

References & Resources

For a complete dictionary on a number of different woods and their usability, go to the Wood Zone website, <http://www.woodzone.com/properties.htm#sectH>, accessed July 19, 2009

MODULE - Hardwood versus Softwood Junior, Intermediate, Senior Objective:

- To describe the differences between hardwood and softwood.

Processing Prompts:

- What type of tree produces hardwoods and what type produces softwoods?
- What are some examples of hard and softwoods?
- What is the difference in the cellular make up of a hardwood tree versus a softwood tree?

Applicability:

Knowing the difference between a hardwood and a softwood is important for members as they are beginning to learn their craft. It will help them to decide what types of woods to use for certain projects. It will also help members to gauge their skill progression, as working with hardwoods will become less difficult as they become more experienced and confident in their abilities.

Background:

Wood comes in various grades. The higher the grade, the more expensive the wood.

Hardwoods come from deciduous trees, which are the trees with big leafy branches that occasionally bear fruit and typically go dormant for the winter. Birch, oak, hickory or cherry woods are all popular examples of hardwoods.

Softwoods are made from coniferous trees, which have thin leaves or needles. Cedar, fir, pine and spruce are a few examples of softwoods. Interestingly enough, despite its name, softwoods are quite hard and very durable. The Douglas fir, which is softwood, is actually harder than many hardwoods.

Softwoods are less expensive than hardwoods, and most woodworkers start by working with softwoods.

One of the main differences between hard and softwoods is their cellular makeup. Hardwoods have larger cells, some of which make up vessels that allow moisture to travel more efficiently throughout the tree. Softwoods are made up smaller cells that make up fibres. Because of this, softwoods lack the ability to transport water through the tree like hardwood trees do. Instead, softwoods have resin reserves (the syrupy sap that drips from trees in the spring time) that protect the tree against injury.

Softwoods are still the best option for those just beginning to hone their craft as a woodworker because the resin reserves makes the wood very versatile and easy-to-use. Softwoods also make up the majority of the wood that is used for larger-scale building, from structural framing materials of a house, to the doors and window frames.

Key Messages:

Hardwoods come from deciduous trees, which have leafy branches and go dormant in the winter. Coniferous trees produce softwoods.

Birch, oak, hickory and cherry wood are popular hardwoods. Common types of softwoods are cedar, fir, pine and spruce.

Hardwood trees have large cells, which act as vessels to make the distribution of water throughout the tree very easy. Softwood trees have thin, fibrous cells, which do not transport water in the same way. Reserves of resin are stored throughout softwoods trees to compensate for the tree's lack of moisture.

Activities:

- Microscopic View

Resources & References:

Peters, Rick. Woodworker's Guide to Wood. New York: Sterling Publishing Co., 2000.

Valcourt Installations, Inc.

<http://www.valcourtinstallations.com/hardwood%20page3.html>

Farm Forest Line: www.farmforestline.com/pages/2.1.2.1_wood.html

Wood Magic at Virginia Tech. <http://www.woodmagic.vt.edu/>, accessed July 19, 2009

MODULE – Plywood
Objective:

Junior, Intermediate, Senior

- To discuss plywood and how it is different from other types of wood, and the types of projects for which it is used.

Processing Prompts:

- What sorts of projects use plywood?
- What are some of the benefits of using plywood in construction? What are some of the negatives?

Applicability:

With plywood, it is useful to know how it is made and how its composition makes it different from hardwoods and softwoods. As a woodworker, these are important points to know so that in the future, when a project comes up, members will have enough information to make an informed choice about what type of wood will be the right fit for that particular job.

Background:

Plywood is a manmade material. It is a laminated product that is made up of numerous thin strips of wood laid in alternating directions and bonded with glue into strong, stable sheets. Because of this construction method, plywood is less susceptible to expansion and shrinkage. Due to plywood's construction, it is much stronger in each direction than a similarly-sized board cut from a single tree.

Plywood usually has one side that is more "presentable" than the other side. The nicer side, the front, is smoother and more likely to be blemish-free. The side that isn't as clean or smooth is called the back. Plywood with two presentable faces is available for projects where both sides of the sheet will be visible.

Plywood is most suitable for projects that have a high-stress use, because it is stronger than other types of wood and more resistant to warping, twisting and shrinking. This includes construction projects such as floors, walls, scaffolding, and other uses. Plywood is made out of both hardwoods and softwoods and can be designed to be fire retardant, pressure treated, or moisture resistant. Check the plans for your project to find out what kind of plywood you need.

When you go to a hardware store, you'll notice that plywood is graded using A, B, C or D (with "A" being the smoothest and "D" being the roughest). A two-letter system is also used, which indicates the condition of the plywood's face and back, e.g.: A-C

plywood, which means that the face is of the highest grade, whereas the back is of a much lower grade. There is also a C-D grade of plywood, which is also written as CDX. This type of plywood is great for structural uses, but likely not so good if presentation or appearance is your #1 priority as CDX is not suited to be finishing material.

Key Messages:

Plywood is a laminated, manmade material that is made by alternately layering several thin strips of wood and bonding them together with glue. Because of this construction method, plywood is less susceptible to expansion and shrinkage.

Due to plywood's construction, it is much stronger in each direction than a similarly sized board cut from a single tree.

Plywood is graded according to the appearance of its face and back on a scale that ranges from A to D, with "A" being the smoothest and "D" being the roughest. Sometimes plywood is graded using two letters, such as A-C or C-D. The C-D is also written as CDX and is primarily used for structured purposes, where nice finishing is not required.

Activities:

- Plywood – The "Other" Lumber

References & Resources:

Baylor, Chris. "Plywood" <http://woodworking.about.com/od/plywood/p/Plywood.htm>, accessed July 19, 2009

Baylor, Chris. "Plywood Grades" <http://woodworking.about.com/od/plywood/p/PlywoodGrades.htm> accessed 2008

TOOLS OF THE TRADE: HAND & POWER TOOLS EXPLAINED

Hand Tool Basics MODULE – Nails

Junior, Intermediate, Senior

Objective:

- To describe the difference between common and finishing nails.

Processing Prompts:

- How many types of nails are there? What are their uses?
- How are nails sized?
- What is a nail set?

Applicability:

Choosing the correct tool for the job is an important part of a woodworker's craft. After reading about the different kinds of nails and their uses, members will be able to identify when a project requires a common nail, and when the project calls for a finishing nail.

Background:

Nails come in different sizes and materials. Nails work by pushing wood fibres back against the nail, which keeps the fit snug. A nail driven into the edge or face of a board will hold better than a nail driven into the end of a board. The larger and rougher the surface of a nail, the better it holds the wood.

There are two types of nails that carpenters work with most often. They are:

- **Common Nails**
These have a big head and are quite thick.
- **Finishing Nails**
These have a smaller head than a common nail and are thinner. Finishing nails are usually set into the wood. The hole is then covered up with putty so that it does not show.

Sizing of Nails

The sizes of nails are referred to as penny size. The short form for penny is "d". A 1 ½ inch nail is written as a "1 ½ d" nail. Nails that are shorter than two inches in length

(5 cm) are sized in fractions of an inch as well as the wire gauge size. Wire gauge sizes include #17, 18, 19 and 20. These numbers are written on the bins or boxes that nails are sold out of at the hardware store. Most woodworking patterns tell you what size and the number of nails to use. If you get confused, explain what the project and the store employee should be able to recommend the size of nail.

Nail Set

A nail set is used to push the head of a finishing nail further into the wood so that the hole can be covered up with putty. A nail set looks like a fat spike with a flat end. Nail

sets come in different sizes, to fit the different sizes of finishing nails.



Key Messages:

Nails work by pushing wood fibres aside. The wood fibres then push back against the nail and help keep it snug.

There are two different types of nails, the common nail and the finishing nail. Nail sizes are referred to as penny size. The short form for penny is “d.” A 1.5-inch nail is recorded as being a “1 ½ d” nail. Smaller nails are sized by length and wire gauge, which include # 17, 18, 19 and 20. The bigger the number, the thinner the nail. However, the industry is moving away from the use of gauge numbers, to specifying the actual diameter to a thousandth of an inch.

A nail set is used to push the head of a finishing nail further into the wood so that it can be covered in putty and hidden.

References & Resources:

“Nails”, <http://www.sizes.com/tools/nails.htm>, accessed August 13, 2009

Activities:

- Penny for your Thoughts

MODULE – Hammer
Objective:

Junior, Intermediate, Senior

- To introduce members to proper hammering techniques.

Processing Prompts:

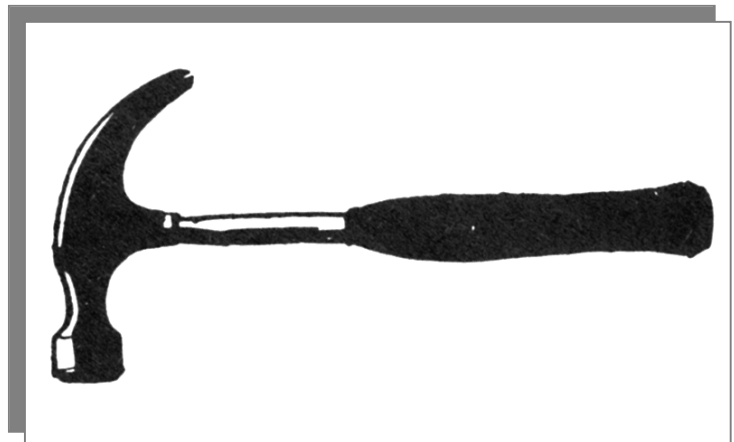
- What are some things to keep in mind when selecting the right hammer to use?
- What are a few safety tips regarding proper hammering technique?
- What should be done if a nail is bent in the hammering process?

Applicability:

During a 4-H club year, members will become very familiar with hammering. It is important to lay the initial groundwork regarding safe and proper techniques to avoid injuries or mishaps. The more confident members are in their ability to swing the hammer accurately and without incident, the faster they will advance and expand their woodworking skills.

Background:

Hammers come in a range of sizes and shapes. Choose the weight that feels right for you. Hammers come with wooden, metal or fiberglass handles. The best hammerheads are forged steel. Mark your name and phone number somewhere on

**Safety Tips for Hammering**

- Make sure the hammerhead is secure.
- Wear eye protection.
- Secure long hair so it does not get caught in the passing hammer.
- Make sure the hammerhead is clean.
- Use your woodworking hammer only for woodworking.
- Hold your hammer at the low end of the handle when using it.
- Watch out for other people when using your hammer.
- When you set your hammer down, make sure the entire hammer is out of the way so that people don't accidentally knock it off the surface.

your hammer.

Hammers come in a number of different sizes, shapes and weights. The decision on what one chooses to buy/use is based strictly on preference. Try out a number of different ones to see what weight feels the best, what handle will work best and what hammerhead is going to be most effective at driving nails.

When using a hammer, it is important to wear eye protection and to make sure that the hammerhead is securely fastened to the handle. Be sure to tie back long hair and be mindful of where other members and leaders are so that in case there's a "swing and a miss", someone isn't getting a hammer to the side of the head.

Bent Nails

Bent nails are very common. Try to straighten them to prevent waste. Hold a block of wood against the nail and then tap the nail repeatedly against the block. Don't try to straighten it all in one swing, unless it only has a very small bend. Sometimes you can straighten a short nail without the block.

Tip: *Nails go into dry wood more easily if they have been dipped in a bit of wax. You can drill a small hole in the end of your hammer and fill it with melted paraffin, so the wax is always handy for you!*

Driving Nails

Now that both the nail and the hammer have been introduced, it is time to put the two tools to work together.

How to Hammer

- Choose the right hammer for the job. Use a smaller hammer for small nails and a heavy hammer for larger nails.
- Hold the nail in the right spot with one hand.
- Swing the hammer from your wrist. Tap the nail lightly so that it will stick in the wood by itself.
- Once it sticks into the wood by itself, take that holding hand away. This is important. Use that hand to steady the board as you hammer.
- Hold your hammer at the lower end of the handle (away from the metal head). This will give you a better swing and make better use of your energy.
- Use your whole arm for the most power. This will come with experience.
- Keep the handle of the hammer at a 90-degree angle to the nail while driving. This will help the nail go into the wood in a straight line and not bend.
- Keep your eyes on the nail. Hit the nail squarely on the head. Your skill at this will increase with practice.

5 Section 5 – Tools of the Trade

- Try to avoid hitting the wood itself, so you do not dent the wood.
- If you have to pull out a long nail, put a block of wood under the hammerhead. This gives you better leverage and will also prevent breaking off the handle.



To Start a Nail

Sometimes wood is so hard, that it is difficult to start a nail into it. This can be frustrating. Here's a way around the problem:

- Clamp the two pieces of wood together securely.
- Mark the spot for the nails with a scratch awl or a pencil.
- Drill a pilot hole with a drill bit slightly smaller than the nails you are using.
- Voila! Nail away!

Using a Nail Set

- Choose a nail set that matches the size of the head of the nail you want to work on.
- Hold the nail set on the head of the nail.

Gently but firmly tap the nail until it is just under the surface of the wood. Now you will be able to fill the hole with putty, so that the nail will not show. After the putty dries completely, you will sand it smooth.

Tip: To hold a nail in a tiny spot, thread a doubled string through a drinking straw. Poke the nail through the loop and then tighten the string to hold the nail.

Key Messages:

Hammers come in a range of sizes, weights, and materials. Woodworkers should choose the hammer that best suits their needs, and should follow proper safety procedures, including wearing eye protection.

To properly hammer a nail, hold the hammer at the lower end of the handle, use your whole arm, keep the handle of the hammer at a 90-degree angle to the nail while driving, keep your eyes on the nail, and hit the nail squarely on the head.

Activities:

- Nailed It! Practice with a Hammer and Nails

MODULE – Screws & Screwdrivers

Objective:

Junior, Intermediate, Senior

- To introduce members to what a screw is, and how its purpose is different than that of a nail.

Processing Prompts:

- What are the different parts of a screw?
- What sizes do screws come in?
- What is the difference between a screw and a nail?
- What are the three most popular types of screwdrivers?

Applicability:

The screw is a useful tool when it comes to woodworking as they can be used in both the construction as well as the finishing aspects of a project. However, a screw is used differently than a nail, despite the two looking more or less the same. It is important to recognize the differences between the two items and their individual uses so that an informed decision can be made when having to choose between a screw or nail as a fastener.

Background:

Screws have three parts – the **head**, the **shank** and **spiral threads**, which end in a sharp point. The spiral threads pull the screw into the wood as you turn the screwdriver. Screws hold pieces of wood together by gripping the wood with the threads. Never hammer screws into wood.

Screws differ from nails in that they must be driven into the wood by a screwdriver or a power drill as opposed to a hammer.

Different Screw Heads

- Screws come in many shapes and sizes. The most common size of screw is the #8.
- Thickness ranges from #4 to #12, with #4 being the smallest, and #12 the largest.

Screwdrivers

- The **slot screw** features a simple groove cut across its head. Screwdrivers can easily slip from this groove and damage the wood.
- The **Phillips** or star head is used more often in cars and metal work than in woodwork.
- The **Robertson** or square socket is favoured for woodworking in Canada. The right-sized screwdriver tip fits snugly in its square head.

Key Messages:

Screws have three parts – the head, the shank and spiral threads.

It is the gripping of the spiral threads that twists the screw into the fibre of the wood for a firm hold. Nails work by pushing wood fibres aside. It is the pushing back of those fibres against the nail that keeps the fit snug.

The most common size of screw is #8, and they typically range in diameter from #4 to #12.

There are three favoured types of screwdrivers: the slot, the Robertson and the Phillips.

Activities:

- Pilots in Training
- Take Your Pick

MODULE – Saw, Rasp and Chisel

Junior, Intermediate, Senior

Keep in mind that even though these tools are not power tools, they all still have the ability to cause injury. Please handle with the utmost safety and under parental/leader supervision.

Objective:

- To begin to introduce members to the basic hand tools and techniques that will serve them for the rest of their woodworking career.

Processing Prompts:

- What are a few safety precautions that should be discussed prior to using hand tools?
- For what tasks will you use a saw? What about a rasp? A chisel?

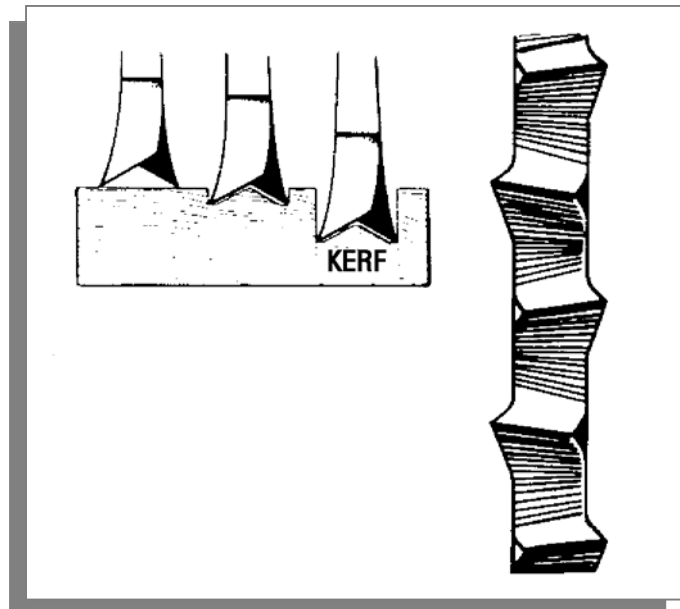
Applicability:

Knowing proper technique when it comes to using tools is important. Paying close attention to the demonstrations and taking plenty of time to become acquainted with the tools that are introduced will not only be useful in advancing your woodworking expertise and confidence in your craft, but it will also ensure safety, both for yourself and others.

Background:**SAWS**

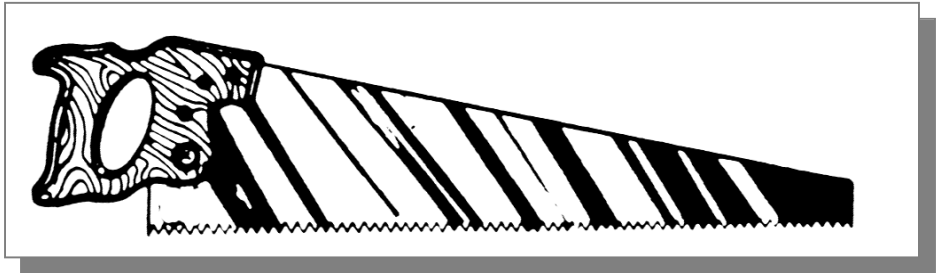
Saws are one of the first tools that people associate with woodworking, but who knew that there were so many kinds, each with a specific purpose!

- **Hand Saw**
Hand saws have a metal blade with teeth and a handle made of wood or plastic. The teeth cut a path (kerf) through the wood. Saws have set teeth. This means that the teeth are bent alternately from side to side, so that the kerf is wider than the actual saw. This helps prevent the saw getting stuck when cutting wood.



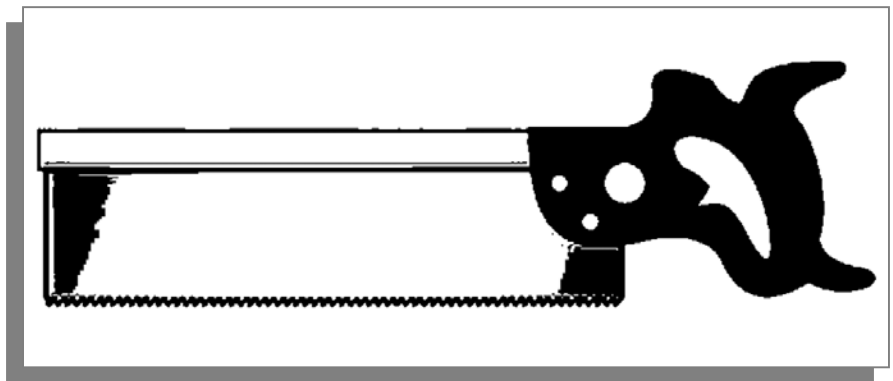
5 Section 5 – Tools of the Trade

- **Common Saw**
The common saw has about eight teeth per inch (2.54 cm.). Use this saw to cut across the grain of a board.

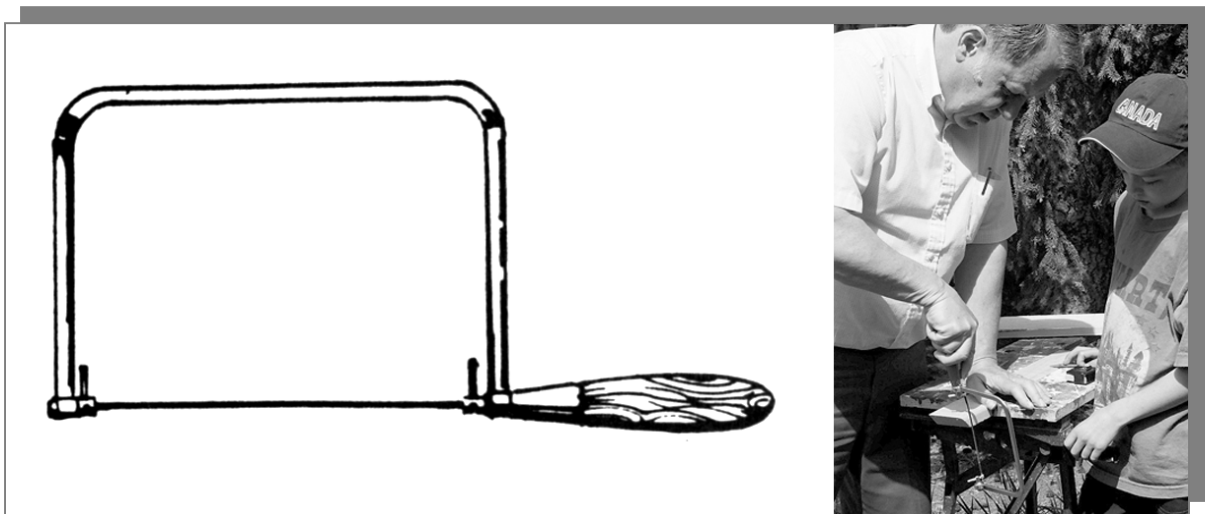


- **Rip Saw**
The rip saw has half as many teeth than the common saw. Use the rip saw to cut along the length of a board.

- **Backsaw (Mitre Saw)**
The backsaw has a rectangular blade with a stiffening metal strip on the top edge. It is used with a mitre box to cut exact angle cuts.



- **Frame Saw**
The frame saw is used for making curved cuts. A frame holds the fine blade firmly. The coping saw is the most common type of frame saw.



There are, of course, more than just saws that fall under the category of hand tools:

RASPS

Woodworkers use rasps to shape wood and smooth rough surfaces. Rasps look like a coarse file with a handle on one end. Rasps quickly remove excess wood with their coarse teeth. A rasp only removes wood as it moves forward. Pick it up and lift it back to the start, to take another stroke. Rasping is done before sanding.



CHISELS

WARNING: Supervision necessary. Use extreme caution when handling.

Chisels are sharp wood knives that are used to remove unwanted strips of wood. The end of the blade is the sharp part that cuts with a pushing action. The tip of the blade is slanted or beveled. Most chisel work is done with the bevel side down against the wood. Whenever possible, use your chisel with the grain of the wood.

Key Messages:

There are several different saws that have been introduced in this module: the hand saw, common saw, rip saw, and frame saw. Each one has been designed with a specific purpose in mind. Take advantage of the activity time in order to learn more about each one and to become more comfortable using them.

There are three favoured types of screwdrivers: the slot, the Robertson and the Phillips.

The chisel is an extremely sharp tool that should be used by members only when supervised, and only when they are at an intermediate-to-advanced stage of expertise.

Activities:

- Hand Tool Extravaganza
- Tool Jeopardy
- Field Trip

MODULE: Hand Drills

Objective:

Junior, Intermediate, Senior

- To challenge members with slightly more experience to learn how to work a hand drill and a brace and bit tool.

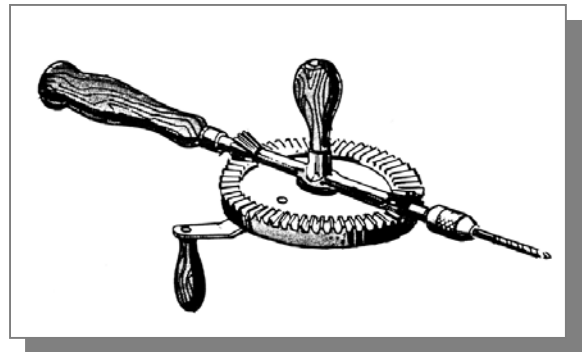
Processing Prompts:

- What is it about these two tools that would require some experience to be able to use properly?
- From their names alone, can you guess what these two tools might be used for?
- Why would proper technique and set up be particularly important with these two?

Background:

Hand Drill

This is a great tool that looks like an eggbeater! It has a clamp at one end called a chuck that will hold different sizes of smaller drill bits. It is powered by turning the crank.



To Chuck (install) a Drill Bit

Hold the drill in one hand. Twist the chuck until it opens up. If the chuck seems to be stuck, hold the chuck while you turn the crank a bit. Slide the flat end of the bit all the way up into the chuck, and then tighten the chuck against the bit.

To Drill a Hole

Dimple the spot where you want to drill a hole by tapping a nail there with a hammer. This makes a small hole so your drill will not move. Set the bit in the dimple.

Hold the drill handle with one hand, pressing down on it as you turn the crank. Hold the hand drill straight up and down so the hole will be straight.

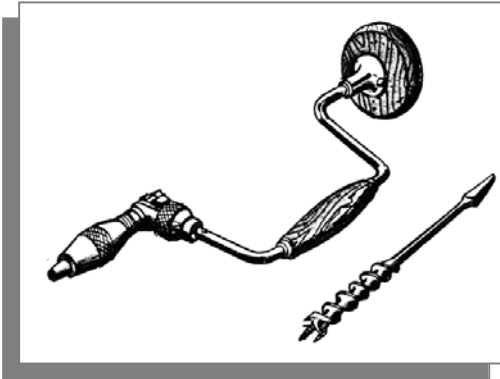
To remove the drill from the hole, turn the crank the opposite direction.

To Drill a Hole a Certain Depth

Measure the depth on the bit, and then stick some duct tape at that spot. Stop drilling when you reach that piece of tape.

Drilling Pilot Holes for Screws

Screws go into wood much more easily if you drill a pilot hole. Choose a bit that will remove most of the wood, while leaving enough for the screw to grip on.



Brace and Bit

We use this tool to drill larger holes. It looks like something from a dental nightmare! The brace and bit is a very old design that has stood the test of time. It was used to make the ships that brought many of our ancestors to Canada and many of the historic buildings in our country. Watch for used ones at auctions. They are valuable additions to your toolbox.

The brace is the curved metal that has a small knob handle at the end and another longer handle on the bumped out middle section. At the working end there is a chuck, which holds the bits.

The bits have three parts - a square or rounded end that fits into the chuck; a spiral shaft, and a screw-tipped end. Bits come in many sizes.

Tip: Some braces have a switch or collar that you have to adjust to tighten the chuck, for removing the bit from the hole.

Using a Brace and Bit

Because of its spiral design, the bit actually pulls itself into the wood as you crank the brace! The sharp tip on the bit does its own dimpling of the wood.

Hold your brace and bit straight up and down when drilling so the hole will be straight.

Put a piece of scrap wood under your project so you do not make a series of holes in the workbench. To remove the bit when the hole is complete, pull it up and out.

Sometimes it helps to put your project down on the floor and kneel on it while you are using the brace and bit. It is quite a big tool and it helps to be above it when using it.

Key Messages:

The hand drill resembles an eggbeater and allows for precise drilling to be done by hand.

5 Section 5 – Tools of the Trade

The brace and bit is a tool that was used by our ancestors and is something to keep your eyes open for at an auction, as it is a useful addition to any toolbox.

There are three parts to a brace and bit: a square or rounded end that fits into the chuck, a spiral shaft and a screw-tipped end. Because the brace and bit is quite a large tool, it is sometimes useful to kneel on the floor when using it, simply because being above the tool gives you more leverage.

Activities:

- Drill Practice
- Hand Tool Discussion

MODULE –Additional Hand Tools

Objective:

Junior, Intermediate, Senior

- To introduce members to the block plane and the jack plane, and explain all related aspects regarding care and maintenance of the planes, blade adjustment and blade setting.

Processing Prompts:

- What is a plane used for? Is it a necessary piece of equipment?
- What are some important points regarding safety to keep in mind before, during, and after operating a plane?

Applicability:

Using a plane is another way that a woodworker expands knowledge of their craft. Using a plane takes awareness, conscientiousness and due care, as sharp and properly aligned blades are two necessary components of an effective plane. When a member graduates to using a plane, it is indicative of his or her knowledge of their craft, and their confidence in their abilities. Congratulations!

Planes

As the club's leader, be sure to do a thorough job of showing members how to inspect and store the plane and its blade(s), the importance of checking the plane's blade for sharpness and assessing the blade's alignment to the rest of the plane. Have members' practice, while under supervision, the setting of the blade into the plane until you both are comfortable with their ability to do so safely.

Woodworkers use planes to smooth wood surfaces to reduce or eliminate the need for sanding. Sounds good, right?

Some tips to keep in mind when operating a plane:

- *Plane with the grain, not against it or you will raise splinters.*
- *Always set a plane down on its side. This protects the blade.*
- *Make or buy a fabric sock for storing your plane.*

There are many kinds of planes available. Here are the most commonly used ones.

Block Planes

The smallest and most practical plane for young woodworkers, the block plane is about 12 cm long. It is small enough to be carried in a toolbox. It works well to finish work. It has a low blade angle and is often used for fine work or cutting across end grain.

It is important that planes are in proper adjustment, or they do not do a proper job.

Turn the plane over and check along the bottom. The blade should appear through the gap evenly, about the thickness of a sheet of paper.

To push out the plane's iron (to get more blade exposed) turn the adjusting knob clockwise. To pull the iron in, turn the knob to the left until the blade is in the correct position. Then turn it clockwise until it starts to push the plane out. The plane iron will stay in the right place when the plane is used.

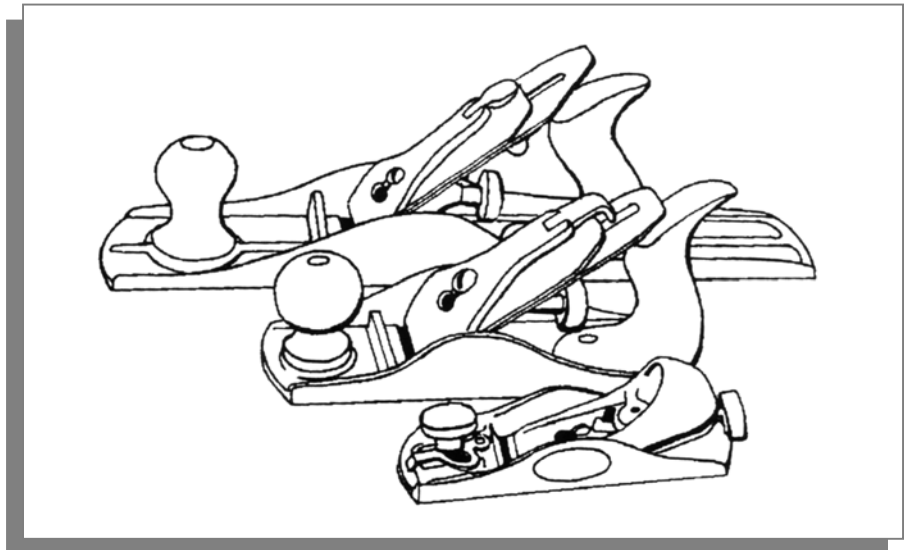
To adjust for an even blade, loosen the lever cap screw. Turn the plane over and look at it. Press the plane iron to the right or left until it is even. Then tighten the lever cap screw.

Test the plane on a piece of scrap wood, not your project.

Smooth Plane

This is also a short plane, in sizes from 12 to 25 cm long. It cuts extremely smooth surfaces and stays adjusted.

The smooth plane can also be used for smoothing rough surfaces, for sanding out end grain, chamfers and edge shaping.



Jack Plane

This is a medium-sized plane, ranging from 30 to 75cm long and can be used for just about any job! Because it has a longer bottom, it does less riding up and down on uneven surfaces and quickly cuts off the high spots.

Fore Plane and Jointer Plane

These planes do a good job on cutting an edge or surface perfectly straight. Fore planes are usually 45 cm long and jointer planes are usually 45 cm to 60cm long. Their long lengths allow them to ride over bumps and produce a smoothly cut surface.

Key Messages:

There are a number of plane varieties. However, the ones covered in this module were: the block plane, smooth plane, jack plane, fore and jointer plane. These planes vary in sizes and uses.

A plane works to smooth out rough wood surfaces, and therefore reduces or eliminates the need to sand a project down as well, which is a bonus that many woodworkers are excited to cash in on!

Because a plane that is equipped with a sharp blade and a properly spaced blade works the best, care and attention is required when maintaining, using and storing a plane.

Activities:

- Smooth Rider

MODULE – Sharpening

Senior

*Note: Sharpening must be done under adult supervision***Objective:**

- To teach members how to properly and safely sharpen the blades of their planes and tools.

Processing Prompts:

- How often do you think that a blade needs to be sharpened?
- Is there such a thing as “over sharpening”?
- What will happen to your tools if you’re not diligent about maintaining them and keep all parts of them in their best working condition?

Applicability:

Learning how to sharpen one’s blades is important because it shows skill advancement, and it shows that members are mindful of keeping their tools in proper working order.

Background:

You’ve now been taught how to do the various blade assessments on chisels and planes, but what do you do when you discover one to be dull? Do you have to buy a new one each time?

That would get WAY too expensive. Rather, discuss with the members how to go about sharpening (or whetting) their blades.

Whetting

Whet your chisels and plane irons on an oilstone to keep a very sharp cutting edge.

Apply oil to the stone surface to keep it moist. The oil prevents particles of steel from clogging the pores of the stone. Wipe the stone before putting it away.

Hold the chisel or plane iron on the fine grit oilstone with the bevel flat on the surface. Raise the handle slightly (5 degrees or less) so you whet only the forward part of the bevel.

Move the chisel or plane in a circular pattern back and forth lengthwise on the stone several times. Working in this way wears the stone evenly so it will last you all your life.

After you have sharpened the bevel edge, turn the blade over to remove the little bits that have appeared on the other side. Lay the blade flat on the stone. Move it back and forth a few times to remove those little bits.

Inspect the blade edge. Is it completely and evenly sharpened? Are there still some nicks or unsharpened spots? It may be necessary to repeat the whetting process until you have done a complete job.

Test your blade on a piece of wood (not your project!).

Plane marks show less if the corners of the plane iron are slightly rounded.

Round off the corners by slight honing on the whetstone.

When is it time to grind?

When you notice the cutting edge is nicked or it is getting harder and harder to use the tool, it is time to grind. Use a grindstone or an emery stone for this job.

Demonstrate this to your members.

Wear eye protection! Dip the blade in water frequently so it does not overheat. You may want to hold the blade in a clamp to hold it steady while grinding.

The plane iron or chisel should be ground to a 25 or 30-degree angle. This provides the right combination of sharpness and strength.

After grinding, finish by whetting on the oilstone for a very sharp cutting edge.

Key Messages:

Whetting, or sharpening your tools is an important part of being a woodworker because it shows that you are diligent in checking the condition of your tools, which will elongate your tool's life. This ultimately means more money in your pocket.

MODULE – Taking Care of Your Tools Junior, Intermediate, Senior
Objective:

- To instill in members the importance of proper tool maintenance.

Processing Prompts:

Why is proper tool care important?

What might be a consequence of not properly caring for, labeling or storing one's tools?

How can this component of woodworking be added into your club's workshop safety plan?

Applicability:

Emphasize to members that taking proper care of their tools is important, not only to ensure the tool's longevity but also to guarantee a safe work environment. Imagine what a hazard the workshop would become if it were left scattered with saws, hammers and nails. Someone would likely end up injuring themselves or a fellow member, not to mention having to spend more on tool replacement because of bends or dents.

Background:**Care of Tools**

- Store tools where they will not be dropped or bumped by other tools or materials.
- Use tools only for what they were designed.
- Use the correct size of tool for the job.
- Never force a tool.
- Secure tools so they will not drop off work surfaces or hangers.
- Keep them as clean as you can.
- Some people make or buy fabric socks for some of their more delicate tools, such as planes. This protects them from damage and dirt.
- It also keeps them out of sight from potential thieves. Tools are also prime targets for thieves.
- For pointed tools, protect the point (and your fingers) by storing the point in an old tennis ball or wrap in a piece of dry canvas or leather.
- Label tools with your name and phone number, if possible. This will prevent mix-ups at meetings.

Key Messages:

- Be mindful of messes and the possible harm and damage that could be caused as a result of not taking the time to properly clean-up the workshop area.
- Be sure to have adequate storage space, proper cleaning techniques and appropriate protection for your tools.

Activities:

- Tool Labelling
- Tool Maintenance

References & Resources:

“Storage Ideas in the Workshop”. The Builder’s Archive.
www.buildersarchive.com/storage-ideas-in-the-workshop, accessed August 13, 2009

“Power Tool and Workshop Safety”, E-Zine Articles. <http://ezinearticles.com/?Power-Tool-and-Workshop-Safety&id=1737383>, accessed August 13, 2009

“Storing Blades and Bits”, DIY Network.
www.diynetwork.com/diy/wk_storage_organization/article/0,2037,DIY_14428_2275275,00.html, accessed August 13, 2009

MODULE – General Tips

Junior, Intermediate, Senior

Objective:

- To impart to members one last set of tips and hints to help them in their woodworking project (future career or lifelong hobby).

Processing Prompts:

- Name one woodworking tip that you have learned so far.
- Name a good way of remembering general woodworking tips.

Background:

- If you store your tools on a pegboard, paint the shape of the tool on the board, to help tools make their way back to the right spot!
- Magnetic strips on the workbench or on the wall nearby hold small metal tools in sight.
- Fight scratches and rust on hand tools. Store the tools in a drawer that is lined with a piece of carpet. Lightly spray the carpet with a coating of machine oil.
- Help your tape measure slide smoothly! Rub it with a bit of paste wax.
- When buying a tool with a wooden handle, examine the direction of the grain of the wood. Wood with grain that runs parallel to the tool head is the strongest.
- A bit of beeswax or paraffin on the tip of a nail will aid in driving a nail into hardwood.
- Don't want to hit your thumb when starting a nail? Hold the nail with a pair of pliers, or else push it through a piece of cardboard or stiff paper!
- Protect the teeth on your handsaw. Slide your blade into a slit piece of old garden hose or a piece of styrofoam. Store and transport your wood chisels with their points in an old tennis ball.
- Does your saw blade get stuck in the kerf when sawing long pieces of wood? Prevent this by sticking a small wooden shim into the kerf after you have started the cut.
- Only use one measuring tape for a project. Sometimes the end hooks vary as much as 1/16 of an inch. If you must use more than one measuring tape, check them to ensure they give the same measurement.
- For precise measurements with a measuring tape, start measuring at the 1 cm or 1-inch mark on the tape (the "start" of a measuring tape can differ, depending on the end hook. By starting with a uniform distance such as 1 cm or 1 inch, your measurements will be more precise.)
- To check for square in a project, measure the diagonals of the piece. They should measure exactly the same.

- Making many pieces of the same item? Use only one piece as the pattern.
- You can copy a pattern using a photocopy and an iron! Copy the picture you want. Turn the page, print down, onto the wood. Tape it so it will not shift. Heat it with an iron. Check occasionally to make sure the pattern is clear in all areas. If the pattern has words on it, first print it onto tissue paper, then turn that copy over and copy it. You will produce a copy that has the words backwards on it.
- Use old inner tubes as clamps. They will apply gentle but firm pressure onto odd shaped projects.
- Are your c-clamps leaving marks on projects? Pad the clamping surfaces with felt, chair leg protectors, the caps from film canisters or small pieces of wood.
- Store glue bottles upside down, with the caps on securely! Store in a can or else make a simple holder similar to a toothbrush holder.
- Save those old toothbrushes! They work well to clean out dust or to apply stain in small areas.
- A little too heavy with the hammer? Made a few too many dents? Lift the dent by ironing a moist cloth over the dent. (Wood cells swell with the addition of water.)
- Hands all splattered with oil-based paint or stain? Soften the paint with salad oil! Then, wash with warm soap and water.
- To prevent dents from those last hammer taps, put an old tennis ball over the head of the hammer.
- Use clothespins as mini clamps for tiny pieces of wood.
- If you lose the lid from your glue bottle, or the original one does not work well, try a mariette (the electrical wire nuts you use to twist two or more electrical wires together). The thread should hold on snugly.
- **Never** saw freehand. Take the time to draw a straight line!
- Put a piece of scrap wood under your project when you are drilling holes in it. This will prevent you drilling holes into the work surface.
- Always saw on the waste side of the marking line.
- Clean as you go.

MODULE: Power Tools

Intermediate, Senior

NOTE: *It is at the discretion of the leader when members begin to work with tools. It can be done after each new tool is discussed, or it can be done all at the end during Power Tool Olympics. Ensure for all activities that all members have appropriate personal protection equipment.*

Before any power tool is introduced, review some basic woodworking safety points.

Safety Notes:

- Never use an electrical tool or appliance in damp conditions
- Ensure the cord is in good condition
- Ensure the key is removed from the chuck before using the drill
- Have a firm grip on the drill when using
- Keep the bit away from skin
- Secure the object being drilled so it will not spin
- Ensure that the drill bit has quit spinning before setting it down
- Keep long hair and loose clothing away from the drill
- Remember that drill bits get hot from friction and can burn
- Ensure the drill bit is securely inserted before starting the drill

Objective:

To further expand intermediate-to-advanced woodworking member's repertoire of tools by introducing them to power tools. This includes the capacity to:

- identify tools accurately
- explain purpose of each tool discussed in this unit
- explain and demonstrate the use of each tool
- explain safety precautions for each tool
- compare various models
- demonstrate safe use of tools
- ask for help if unsure
- ask another member to stop if they see unsafe practices or hazards.

Processing Prompts:

- Why is it important to be of a certain skill level before learning how to use power tools?
- What are some important safety features to keep in mind when using power tools?
- What does being introduced to power tools tell you about your current state of woodworking expertise?

Applicability:

Learning how to use power tools is a big step for woodworkers. It means that the basic skills and tools have been mastered, that due diligence has been paid to learning about the proper technique, appropriate uses and safe storage for basic tools, and that members are ready to take their craft to the next level. This is an important progression to keep in mind in all aspects of learning. The basics must be taught and learned before the advanced can be understood. You would never be taught the Pythagorean theory before learning how to multiply, just like you would never be introduced to a router before learning how to use a rasp.

Background:

For specific objectives, processing prompts, background and activities for individual power tools, see the following sections.

Activities:

- Posters
- Olympics

References & Resources:

Sam Allen's Woodworking Dictionary of Woodworking Terms.

<http://www.samallen.com/dictionary.html>, accessed July 27, 2009

Lowe's Woodworking Glossary.

<http://www.lowes.com/lowes/lkn?action=howTo&p=Build/WoodworkGlossary.html>, accessed July 27, 2009

Baylor, Chris. Woodworking Tools: Power Tools, Hand Tools and Woodworking Machinery.

<http://woodworking.about.com/od/toolsequipment/u/WoodworkingTools.htm>, accessed July 27, 2009

MODULE: Power Drills

Intermediate, Senior

Objective:

- To teach members the proper care and use of power tools.

Processing Prompts:

- What is the main use of a power drill? Why would you use a drill rather than a screwdriver?

Background:**Power Drills**

Power drills speed up the job of drilling holes. They can also speed up errors or injuries, so need to be handled carefully. Most drills will also work in reverse, which is very helpful if you have to remove screws with a special bit.

When you use any drill, make sure you drill straight, without putting bending pressure on the bit. Otherwise, you could spoil the bit and probably the hole you are drilling. Ask someone to watch you as you practice.

Power drills come in two formats – plug-in or rechargeable. A plug-in drill is stronger and works as long as there is power (makes sense!). Rechargeable drills are convenient where power is not available or for working in very tight or awkward situations.

Rechargeable drills are much heavier and larger because they include a battery. They are not as powerful as plug-in drills but are capable of doing the work for most 4-H projects.

When the battery runs out, replace it with a recharged battery. Follow the recharging instructions that came with the drill.

Care and Storage of Power Drills

- Gather the cord up and snug it up with the drill
- Take the bit out and put it in its case or protect the bit with a chunk of Styrofoam
- Protect from moisture or excess dust

Key Messages:

Power drills are useful for increasing the speed at which you drill holes. However, this also increases the speed at which you can cause injury so be very careful when using one and always be sure that you, as leader, are on hand before you turn one on.

There are two types of power drills: plug-in or rechargeable. Plug-in drills are more powerful and more lightweight; though, they do require a power source, which is not always available. Rechargeable power drills, because they come equipped with a battery, are heavier and do not have as much power as a plug-in drill. However, they are useful to have in smaller spaces, or where there may not be a power source.

Activities:

- Drill Practice
- Make a Featherboard
- Power Drill Roundtable

Resources & References:

Suggested Resources for Enforcing the Importance of power drill safety:

Power Saw Informational Video: on the riving knife features of eight different power saws, courtesy of Roland Johnson's entry on taunton.com's *Fine Woodworking* web site:

<http://www.taunton.com/finewoodworking/ToolGuide/ToolGuideArticle.aspx?id=31896>

Read an interesting posting regarding featherboards from woodworking.com:

<http://www.rockler.com/blog/index.cfm?commentID=324>

MODULE: Jigsaws

Intermediate, Senior

Objective:

- To teach members the proper jigsaw safety and operating procedures; to teach members the purpose of a jigsaw.

Processing Prompts:

- Why would you use a jigsaw instead of a table saw?

Applicability:

Members may need to cut curved lines in their woodworking projects. A jigsaw is ideal for this kind of activity.

Background:

The jigsaw is an electrical tool with a small blade that moves up and down. It is ideal for cutting curved lines, which makes it useful for more artistic work. It can cut straight lines as well, but with more difficulty.

Using a jigsaw is similar to holding an iron. The teeth point upwards so the blade cuts on the upward stroke. Most jigsaws have more than one speed. The saw does its best work when set at full speed.

Safety

- Wear goggles to prevent injury from flying chips.
- Hold the jigsaw until the blade has completely stopped. Otherwise it will move about, injuring someone or causing other damage.
- Make sure whatever you are cutting with a jigsaw is secure.

Tips for Using a Jigsaw

- Sometimes you have to make separate cuts to complete cutting into a tight spot.
- Do not force the blade to turn too quickly or you will bend or break the blade.
- Start the blade going before it touches the wood.

Key Messages:

The jigsaw is an electrical tool with a small blade that moves up and down. It is used to cut both straight and curved lines.

It works best a full speed, which makes the wearing of safety goggles a necessity, as flying wood chips are a reality.

For most effective use of the jigsaw, start the blade running before it touches the wood.

Activities:

- Jigsaw Discussion
- Jigsaw

MODULE: Router**Senior****Objective:**

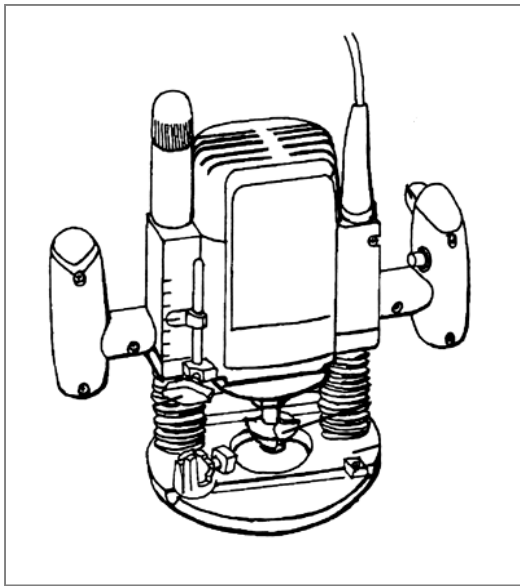
- To teach members the proper care and use of a router.

Processing Prompts:

- Think about wood items you have at home – can you name any that might have been created with a router?

Background:

This is a great tool that can accomplish all kinds of decorative and functional work. It is designed to cut across and along wood edges. Examples of router work include table edges, signs, grooves and clean-cut holes.



Routers spin at speeds up to 24,000 revolutions per minute (RPM). Compare that to a drill's speed of up to 3,000 RPM! It is very important to secure the bit before starting up the router.

As with any tool, do not force a router. Forcing a router can ruin the bit and damage the motor. Especially when working with hard wood, it is often necessary to take more than one pass to remove the amount of wood you want.

Routers use interchangeable bits so that you can make a variety of patterns in the wood. These bits are very hard, very precise and usually very expensive! Cheap bits are just that - cheap. So - buyer beware.

When choosing bits, think about all the uses you will have for that design. Most woodworkers start out with the edge round and a straight bit.

Practice using a router with the bits available to you. What patterns do you like? What patterns would work for your project?

Key Messages:

A router is an excellent tool for creating distinctive designs and unique touches. It is designed to cut across and along wood edges. Examples of router work include table edges, signs, grooves and clean-cut holes.

Routers can spin at speeds up to 24,000 revolutions per minute (RPM), so exercise extreme caution when using one, and make sure that your bit is securely in place before turning it on or touching wood to it.

Router bits are very hard, very precise and usually very expensive. However they are a smart investment as cheap bits typically prove to be just that. You will end up spending more in the long run because you will constantly have to purchase new ones.

Activities:

- Practice Using a Router – Name Plate

MODULE: Band Saw

Intermediate, Senior

Objective:

- To teach members the proper care and use of a band saw.

Processing Prompts:

- How can you tell if you are stressing the blade of a band saw?
- Name a job for which you would use a band saw.

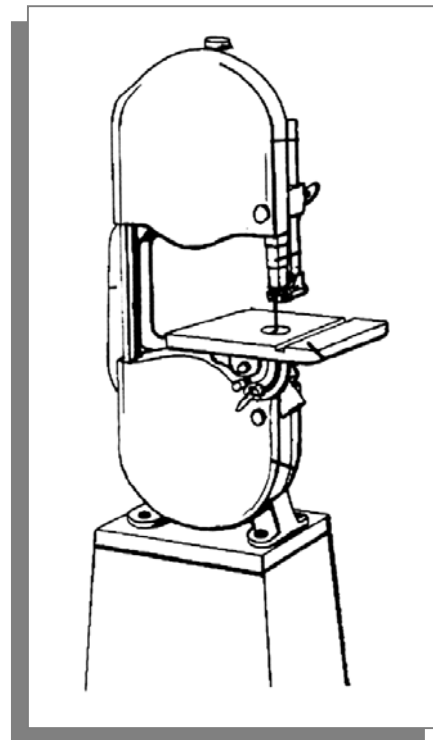
Background:

The band saw is an impressive stationary power tool. Its blade is a loop of steel with teeth on one edge. The blade is driven and held in place by two large wheels. Metal shields cover the wheels and most of the blade. The blade runs through guides to keep it straight.

A band saw is something like a granddaddy jigsaw – it cuts straight or curved lines at a tremendous speed.

The blade cuts in a continuous downward stroke at a high speed. It does not discern between fingers and wood, so watch your work (and your hands)!

To use the band saw, you push the wood slowly into the blade. Cut corners and tight turns slowly and carefully. If you put too much stress on the blade, it can break. One way to tell you are stressing the blade is that it starts to make a different sound. You can also smell the wood getting hot.

**Key Messages:**

The band saw's blade is a loop of steel with teeth on one edge. The blade is driven and held in place by two large wheels, which are covered by metal shields.

A band saw cuts straight or curved lines by cutting (at VERY HIGH SPEEDS) in a continuous downward stroke. Use extreme caution when operating a band saw.

Do not put too much stress on the blade, as this can result in the blade breaking. The band saw will tell you if you are applying too much pressure as it will begin to make a different sound, and you will be able to smell the wood getting hot.

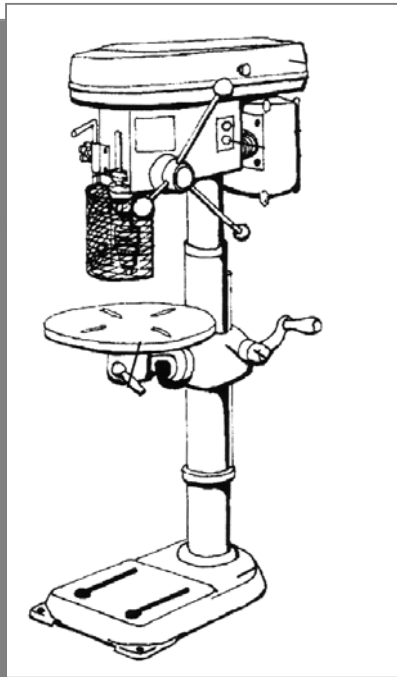
MODULE: Drill Press
Objective:

Intermediate, Senior

- To teach members the proper care and use of a drill press.

Processing Prompts:

- How would you make sure the drill bit goes through the wood completely?
- What is the function of the drill bit key?



Background:

A drill press is a large stationary tool that operates at high speed. You bring the drill bit down to the wood with a downward pull of a lever. A drill press uses a variety of sizes of bits that need to be secured before use. Ensure that the key is removed before turning on the drill.

To ensure that the drill bit goes completely through the wood, raise or lower the drill table accordingly, and place a block of scrap wood under your project.

Always place a piece of scrap wood under your project. This protects the drill bit from hitting the table. It also prevents splintering on the back of the wood you are drilling.

Safety Notes

There is a safety overview contained in the first general power tool section. If each tool is being tried out as it is discussed, please heed these safety notes regarding the operation of the drill press.

1. Secure long hair. Do not wear loose clothes.
2. Before using the drill, always check to see that the last user removed the tightening key!
3. Hold the piece of wood you are working on securely. Otherwise, it might whirl around and whack you, and no one wants a broken nose their first day at the drill press.

Key Messages:

A drill press uses a variety of sizes of bits that need to be secured before use. Ensure that the key is removed before turning on the drill.

Always place a piece of scrap wood under your project. This protects the drill bit from hitting the table. It also prevents splintering on the back of the wood you are drilling.

Take note of the special safety precautions listed as the bit of the drill operates at high speed.

MODULE: Radial Arm Saw

Intermediate, Senior

Objective:

- To teach members the proper care and use of a radial arm saw.

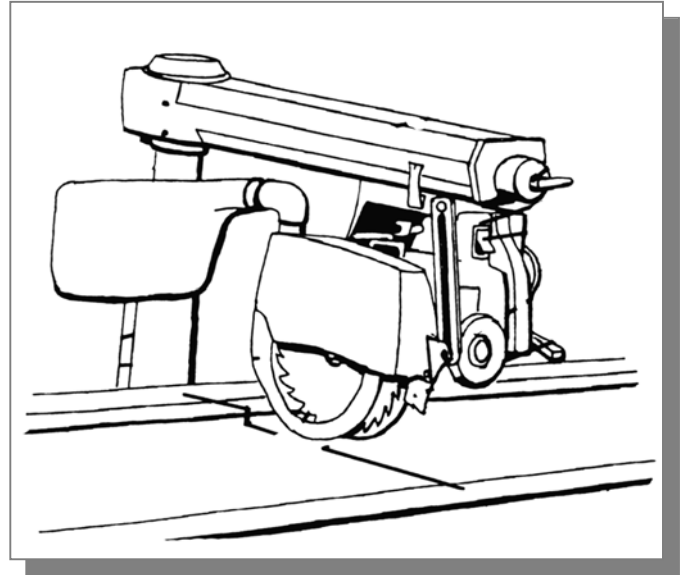
Processing Prompts:

- Where would you be likely to see a radial arm saw?
- What makes a radial arm saw a popular saw?

Background:

You will often see a radial arm saw on construction sites. It is used most often as a cut off saw (to cut wood to certain lengths). Radial arm saws can make exact duplicates of a cut, which makes it a very popular saw.

The wood is held against the backstop with the left hand while the operator pulls the saw with the right hand.

**To Use the Radial Arm Saw**

1. Wear safety goggles or a safety face shield. Earmuffs are also a good idea.
2. Keep appendages (body parts) away from the blade. Use a push stick to push wood past the blade.
3. Put your wood against the backstop so that the cut line lines up roughly with the blade. Do not turn the saw on yet. Bring the saw blade down to touch the wood. Line the wood up so that the blade will cut on the waste side of the cut line. This is usually to the right of the line.
4. Slide the blade back. Hold the wood firmly. Turn the saw on. Draw the saw slowly and firmly towards yourself.
5. Turn off the saw. Admire the clean cut you have made with a radial arm saw.

Key Messages:

Radial arm saws are used to cut wood to certain lengths. As it can make exact duplicates of a cut, the radial arm saw is a very popular tool.

Do not turn on the saw until the blade has been brought down to touch the wood. Line the wood up so that the blade will cut on the waste side of the cut line. This is usually to the right of the line. Slide the blade back and hold the wood firmly. Then it is safe to turn the saw on.

MODULE: Table Saw

Senior

Objective:

- To teach members the proper care and use of a table saw.

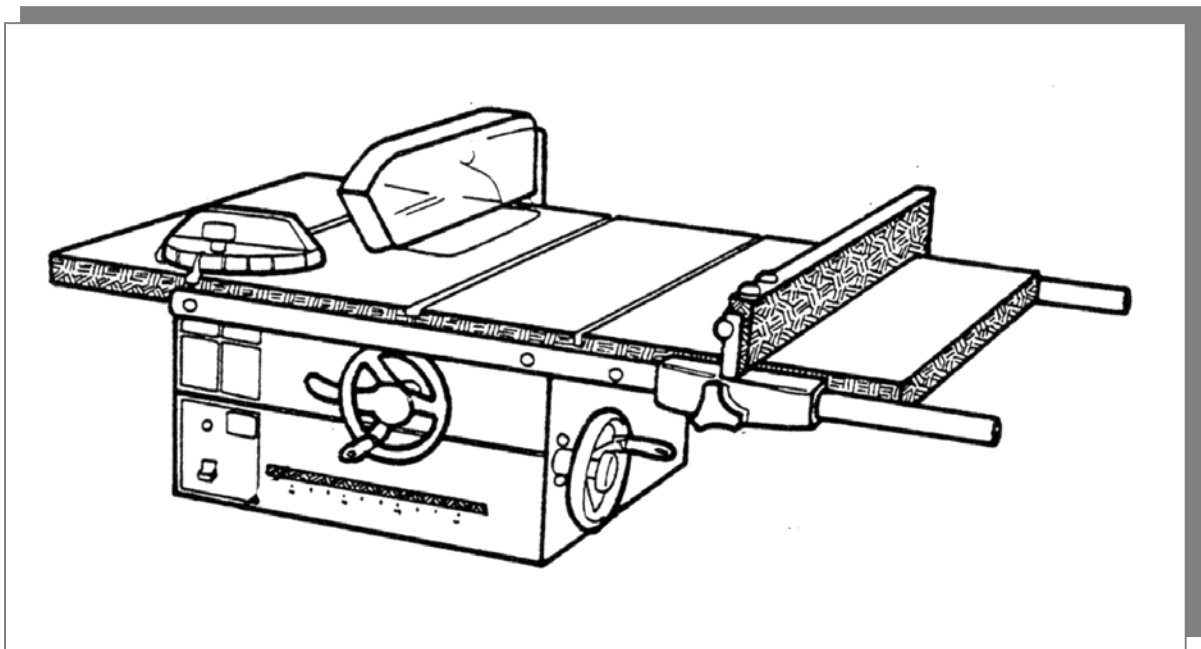
Processing Prompts:

- What is the purpose of a mitre gauge?

Background:

This is a machine for the serious woodworker. It features a smooth steel surface and a blade that can be raised or lowered and tilted. On one side you will notice a rip fence that you use to cut boards to an exact width. The blade has a protective guard.

The push-through device is also a mitre gauge that you can use to move wood into the blade at a specific angle. The angle can be set anywhere between 45 and 90 degrees.



The on/off switch should be in an easily accessible spot. The Off button is usually red. Always take note of the position of the “Off” or “Kill” button or switch button before you use a machine.

Using a Table Saw

1. Always wear goggles or a safety face shield. Use of a table saw in 4-H assumes adult supervision. Make sure sleeves are snug and not flapping.
2. If the table saw has a blade guard, use it.
3. Set the blade to a depth approximately 5 mm higher than the wood to be cut. Move the fence out of the way.

5 Section 5 – Tools of the Trade

4. Set the mitre gauge to the cutting angle you want on the wood. Draw the gauge back so that the wood can be set against it without the wood hitting the blade.
5. Switch on the saw.
6. Hold the wood firmly against the mitre gauge with both hands. Slowly and steadily push the wood through the blade.
7. When the wood you are holding has passed the blade, slide it away from the blade and take it off the table.
8. Turn off the saw. Wait for the blade to stop before reaching for the cut part. It could touch the blade and get fired back at you.

Key Messages:

This saw is for serious woodworker. It features a smooth steel surface and a blade that can be raised or lowered and tilted.

The table saw also has a push-through device, which is also a mitre gauge so you can move wood into the blade at a specific angle, anywhere between 45 and 90-degrees.

The on/off switch should be in an easily accessible spot. The Off button is usually red. Always take note of the position of the “Off” or “Kill” button or switch button before you use a machine and always use the blade guard if your table saw is equipped with one.

MODULE: Scroll Saw**Intermediate, Senior****Objective:**

- To teach members the proper care and use of a scroll saw.

Processing Prompts:

- Why would you use a scroll saw?
- What is the most important safety tip to remember when using a scroll saw?
- Why do some people remove the hold down clamp? Why should you not do this?

Background:

The scroll saw is designed for jobs such as sawing intricate, tight curves, and delicate internal cuts. It can be used to cut very thin materials to 2-inch thick lumber. It performs delicate work better than the jig saw because of the way it cuts. The jigsaw thrusts the blade down through the cut, and a spring thrusts it back up. The scroll saw's blade is suspended between two arms, which move up and down with the blade, ensuring constant tension and a smoother cut.

Safety

- Read the operating manual for your particular scroll saw before operating
- Wear safety goggles or glasses, a dust mask, and ear protection
- Do not remove the hold down clamp or lower blade guard
- Secure all loose clothing, jewelry, and tie back long hair before operating
- When using the saw, hold the stock on either side of the cutting path, never hold the material in the line of the cutting path
- Unplug the scroll saw whenever changing blades or adjusting the work table
- Never reach beneath the table when the saw is running
- Do not use worn or damaged blades
- When removing the blade, release the blade tension before loosening the chuck locking pins
- Never attempt to cut a radius that's too tight for the blade
- Never turn on the scroll saw with stock pressed against the blade
- Never cut extremely small stock. Cut small components from larger stock
- Adjust and lock the hold-down, check blade tension and adjust the blade backup as required for each operation
- Install the blade with the teeth pointing toward the table
- Before you turn on the machine, turn the drive shaft by hand to be sure the blade moves freely
- Do not force stock against the blade or try to cut too quickly
- Keep the table tilt locked

Types of Scroll Saws

Scroll saws come in three main forms: the parallel arm saw, the C-arm saw, and the parallel link arm saw.

The parallel arm saw has a top, and a bottom arm, that are connected at the rear of the machine. Parallel arm saws are slightly easier to use, more precise, and will cut thicker materials.

The C-arm saw pivots from the rear of the arm in a slightly rocking motion. Some woodworkers complain that this causes a slight undercut.

In the **parallel link arm saw**, the blade moves from the front to the rear in a constant parallel stroke.

The scroll saw is ideal for projects involving:

- Fretwork
- Intarsia
- Segmentation
- Lathe art
- Jewelry making
- Compound cutting
- Inlay
- Marquetry
- Paper cutting
- Gingerbread patterns

Scroll saws are graded by size, based on the distance between the frame and the blade – the larger the number, the larger the project the scroll saw can handle. In addition to the scroll saw, you will also need an appropriate worktable, large enough to support the material you are cutting in front and behind the blade.

Blades

Scroll saw blades come in a range of types and sizes. Check the pattern to determine which one to use. Blades are typically 5 inches (12.7 cm) long. Blades include:

- Skip tooth blades: have a tooth, a gap then another tooth;
- Double skip tooth blades: have two teeth, a gap then two teeth
- Crown / reverse tooth blades: have teeth facing up and down so the blade cuts on the down-stroke and on the up-stroke, and reduce splintering on the bottom side when cutting thick stock;
- Spiral blades: twisted so there are teeth sticking out on all sides. These will cut in any direction without turning the material
- Metal cutting blades;
- Diamond blades (a wire coated with diamond bits) for cutting glass.

What Blade Size?

Blade Size (Teeth per Inch)	Use to Cut	Stock Thickness
9	Hard and Soft Wood, Plywood, Plastic	1/4"-2"
9 1/2	Hard and Soft Wood, Plywood, Plastic, Paper, Felt, Bone	1/8"-1-1/4"
11 1/2		1/16"-1"
12 1/2	Hard and Soft Wood, Plywood, Plastic, Bone, Horn, Paper	1/32"-3/4"
20	Hard and Soft Wood, Veneer, Bone, Fibre, Ivory, Plastic, Mother-of-Pearl	1/64"-1/4"
57	Hard and Soft Wood, Veneer, Bone, Fibre, Ivory, Plastic, Mother- of-Pearl, Non-Ferrous Metal	.020"-1/8"
65		.015"-1/8"
80		.010"-1/8"

Adapted from <http://www.shopsmith.com/academy/scrollsaw/021003.pdf>, p.2, accessed September 7, 2009

Generally, as the thickness of your stock increases, use a blade that has fewer teeth per inch.

Cutting with a Scroll Saw

When beginning to use a scroll saw, start out by experimenting with a light or inexpensive wood (such as pine or balsam). Prior to using a formal pattern, draw some curves and patterns on a scrap piece of wood, and try cutting out your pattern. Cut at higher speeds for thicker materials, such as wood. Slow the cutting speed for more delicate materials.

Before cutting, select and install your blade, adjust your speed and the blade tension, and adjust the work hold-down so that it presses lightly on the material being cut. For thick stock, make sure the table is square to the blade.

Start cutting at an outside corner, if possible.

Do not force the material into the blade. Let the saw do the work by pressing the stock lightly against the table and feeding it smoothly into the blade. When properly adjusted, the hold-down will minimize vibration by lightly securing the stock, and yet be loose enough to allow the stock to move freely.

The scroll saw blade may follow the grain when cutting parallel to the grain. To prevent this, slow down the rate at which the stock is fed into the blade.

The scroll saw can make tight turns in the stock, but cannot make sharp angles. Sharp angles must be cut by either cutting across the stock and back out, then turning the stock to cut in the new direction, or, by looping around in a scrap area of the pattern.

Key Messages:

Wear appropriate personal protective equipment when operating a scroll saw, and do not remove any of the built in safety features that are built in to the scroll saw.

Scroll saws are ideal for cutting curved lines and internal cuts.

Choose the right blade, speed and tension for the type of material being cut, and smooth the material smoothly into the blade. Never force the material into the blade.

References & Resources:

Popular Mechanics: Scroll Saw Comparison.

http://www.popularmechanics.com/home_journal/workshop/1274521.html

Accessed September 7, 2009.

Rick Hutcheson's Scrollsaw Information. <http://www.scrollsaws.com/>. Accessed September 7, 2009. Includes free scroll saw tip videos, and patterns available for purchase.

Scroll Saw Goodies. <http://www.scrollsawgoodies.com/> Accessed September 7, 2009. Includes a range of online tutorials.

Pro Woodworking Tips: Scroll Saws.

http://www.prowoodworkingtips.com/Scroll_Saws.html. Accessed September 7, 2009

Wikipedia: Scroll Saws. http://en.wikipedia.org/wiki/Scroll_saw. Accessed September 7, 2009

Shopsmith Inc. Woodworking Tools and Accessories.

<http://www.shopsmith.com/academy/scrollsaw/021003.pdf>. Accessed September 7, 2009

Hermosa Beach City School District – Scroll Saw Safety.

<http://hbcasd.org/safety/scrollsaw.pdf>. Accessed September 8, 2009

Sawdustmaking 101 – Scroll Saws.

http://sawdustmaking.com/USING%20SCROLL%20SAWS/scroll_saw.htm. Accessed September 8, 2009

MODULE: Lathes

Senior

Objective:

- To teach members the proper care and use of a lathe.

Processing Prompts:

Name a woodworking project for which you can use a lathe.

Background:

While not all shops will be equipped with one of these, a lathe is a power tool that spins a block of material, such as wood into rounded products (bowls, clock faces) with smooth, even finishes. Lathes are also used in making pottery, in metalworking and metal spinning.

The lathe works by spinning the block of wood or other material, while metal shaping tools are held (usually by hand) against the block, assisted by an adjustable metal rod, called a tool rest. For bowl or plate turning, this metal rod is not present.

As with many woodworking projects, it is important to make sure you follow proper safety and operating instructions when using a lathe. Make sure you consult the operating manual for the particular lathe you intend to use before starting your project. Ensure your shaping tools are kept sharp, and that you are not wearing any loose clothing that might get caught in the machine.

Key Messages:

In woodworking, lathes are used for shaping wooden objects, and for turning objects such as bowls and plates.

Proper safety procedures should always be followed when using a lathe – consult the operator’s manual before starting a project, and keep shaping tools sharp to avoid mistakes and injury. Eye protection should be worn.

Activities:

- Turn a Tealight

References & Resources:

For more information and for project ideas, visit the following link: Around the Woods. “Wood turning lathe tips, techniques and projects to add to your joy in turning”. <http://www.aroundthewoods.com/>. Accessed July 27, 2009

Lathes and Turning Techniques. Connecticut: Taunton Books & Videos, 1991.

Saskatchewan 4-H Woodworking Manual.

MEASUREMENT

MODULE - Measuring Up

Junior, Intermediate, Senior

Objective:

- To inform members of the two different measurement systems – imperial and metric – and to stress the importance of taking precise measurements, regardless of what system is being used.

Processing Prompts:

- What makes the metric system a user-friendly way to measure length?
- Why is measuring with precision so important in woodworking?
- What are some important parts to remember when dealing with two different systems of measurement?



Applicability:

As woodworkers, it is important to know both the metric system, which is the system of measurement that is used in Canada, and the imperial system, which is the American measuring system, and what most lumber yards use to measure their lumber.

Background:

Canada uses the metric system – millimetres, centimetres, kilometers – for measuring length. It is a simple system to use as all units are in multiples of 10.

Prior to the metric system, every country that was part of the British Commonwealth used the imperial system, which measures length in inches, feet and yards. In the 1970s, many of these countries, with the exception of the United States, switched from the imperial to the metric system.

The lumber industry still measures using the imperial system because changing everything over to the metric system would have been very expensive and awkward for lumber yards.

It is very important to stress to members that when they are measuring out materials that they need to choose one measurement system and stick with it throughout the project.

Measurement is one of the most important tasks done in woodworking. In rough carpentry, tolerances of 1/8 inch would be allowed. In cabinetwork, the minimum tolerance should not be more than 1/16 inch.

Key Messages:

The metric system is user-friendly as the units used are multiples of ten.

Measuring with precision is paramount when it comes to woodworking, not only because it saves on money and time, but it also cuts down on waste.

It is important to pick one system of measurement—metric or imperial—and stick with it throughout that particular project.

Activities:

- Prove It
- Variations on a Variation

References & Resources:

Lento, Robert. Practical Woodworking Techniques. Sterling Publishing Co. Inc. 1999.

France Property and Information: www.france-property-and-information.com/metric-system-and-history.htm, accessed July 22, 2009.

“SI Units”, Wikipedia. http://en.wikipedia.org/wiki/SI_units, accessed July 22, 2009

Module - Intro to Measurement Tools Junior, Intermediate, Senior
Objective:

- To introduce members to the measurement tools that they will need for their woodworking project.

Processing Prompts:

What is an important rule to follow when measuring a project?

What is the difference between a measuring tape, a try square and a combination square?

Applicability:

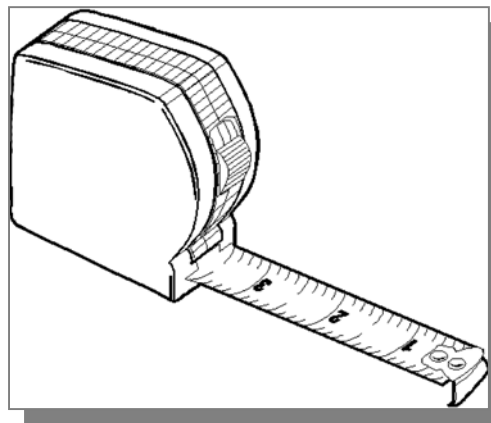
While taking precise measurements is an important part of woodworking, knowing how to properly measure something is a lifelong skill. With everything from distance to clothing sizes, knowing how to work a measuring tape will always come in handy!

Background:

Measuring Tape

These come in various sizes, colours and lengths. They are very handy and can even measure a curved surface. The tip of the measuring tape must be securely fastened, or it will give an inaccurate measurement.

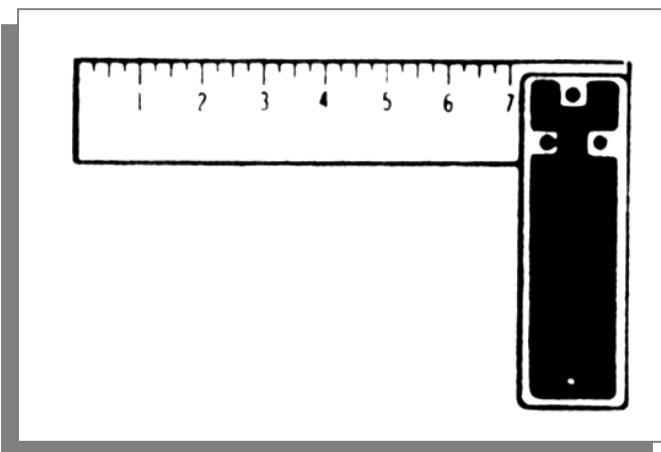
For woodworking purposes, use a measuring tape with both metric and imperial measurements, as there will be occasion for members to encounter both measurement systems when they are embarking on their various projects.



Try Square

This tool looks like a ruler with a handle attached at a right angle (90 degrees).

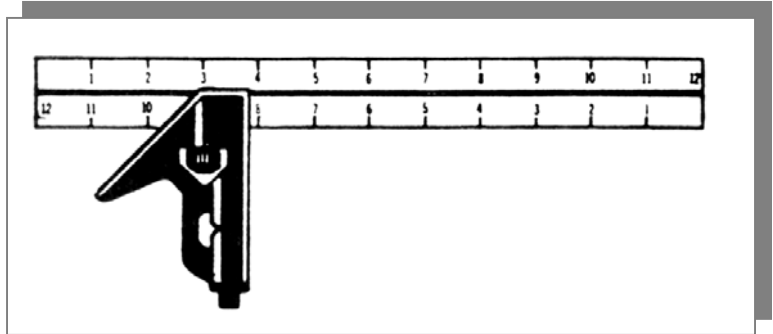
It is used to test if two surfaces are at 90 degrees. This is important because most woodworking projects assume that parts are square (positioned at a right angle) to each other. A try square is used to see if the end of a board is square (cut at right angles to the boards edge) and to mark a



new end of a board if it is not square. It is also used to mark a square line for a project piece.

Combination Square

This has several uses: to check if a board is flat, to check if a piece of wood is level, to check angles, to measure depth, to lay out a line parallel to the edge of a board.



Tips for Measuring

- Never measure when you are tired, angry or really hungry. Those are times when people make lots of mistakes. Take a break, and then come back to it.
- Make a cardboard model of your project first.
- Use a long tape or ruler when measuring, rather than adding up several measurements from a small tape or ruler.
- Mark the waste side of a cut with an X.
- Cut on the waste side of a cutting line. The saw cut (kerf) uses up part of the wood and could make your good piece of wood too small for the project.
- Do not mark all your measurements on a board at once. Each cut will take off the width of the saw cut (kerf) and it is too tricky to try to figure that in, when measuring ahead of time.
- Double-check your measurement before cutting.

Key Messages:

A good rule to follow when measuring out projects is to “measure twice, cut once.”

A measuring tape is needed for taking the initial measurements of wood lengths. A try square is needed to test right angles. A combination square has a number of purposes, such as checking to see if a piece of wood is level, determining what the depth of a piece of wood and to check angles.

Activities:

- Measuring the Distance
- Try Practice
- Take Home Practice

MODULE – Advanced Measuring Tools

Intermediate, Senior

Objective:

- To identify and demonstrate the use of a marking gauge, T bevel, steel utility or framing square, steel/combination square, pencil compass and scratch awl.

Processing Prompts:

- Why are there different tools for measuring?
- Does the need for measurement tools lessen once a person becomes an experienced woodworker?
- What is an important safety note to keep in mind when using a scratch awl?

Applicability:

Woodworking is a craft that relies on accuracy and so one must take their measuring duties seriously. An experienced woodworker takes pride in his or her work. Becoming familiar with the various tools that will aid in precise measurements will serve to enhance one’s craft in the future.

Background:

Marking Gauge

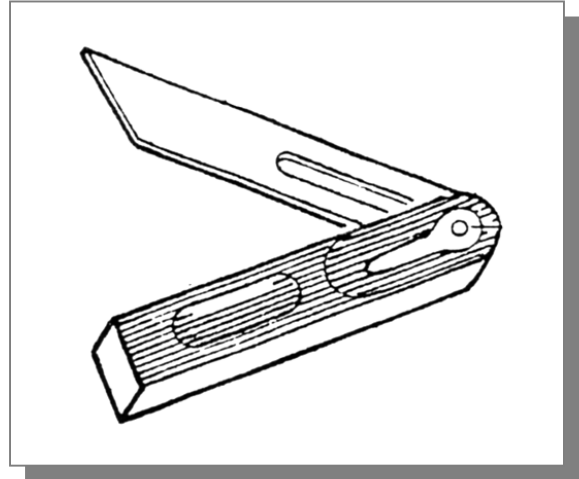
A marking gauge is used to mark a uniform width on a board, as well as for cutting and for marking where to drive screws.



T bevel

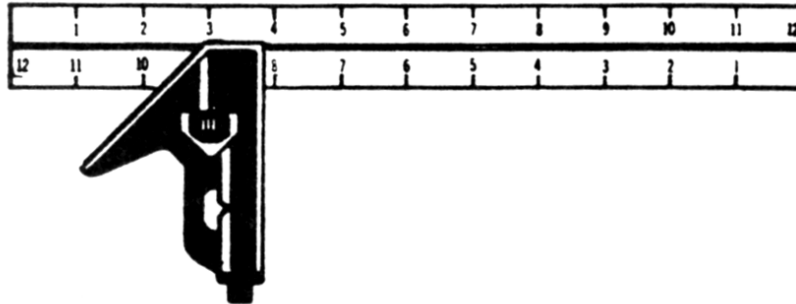
The T bevel is a very useful tool and also a very old design. Use a T bevel to test mitred corners, beveled or chamfered edges. Duplicating an existing angle is another valuable way to use a T bevel.

For definitions of a mitred corner, beveled or chamfered edges, please refer to the Glossary section of this Reference Book.



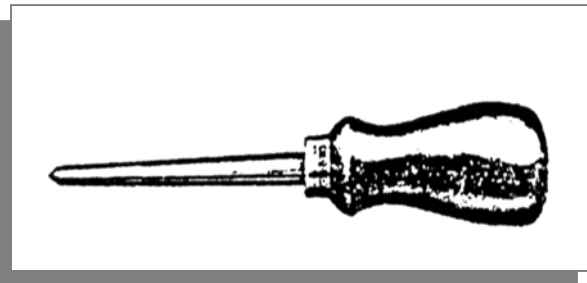
Steel Combination Square

A combination square can measure for both 45 and 90-degree angles. It can also be used to gauge whether a corner is a perfect mitre joint (meets at 90-degrees). This tool is also adjustable. A combination square can be used to mark a line that is a uniform distance from the edge of a board.



Pencil Compass

A pencil compass is used when drawing circles for projects. Always have a piece of cardboard or scrap wood under the compass point so that the surface below is not scratched.



Scratch Awl

A scratch awl is used to mark wood precisely for cutting. An awl is extremely sharp and strong. Handle with extreme caution and store carefully.

Key Messages:

Having a variety of measuring tools is necessary as there are numerous, and occasionally tricky, measurements that are required to create the perfect joint, corner or angle.

The more experienced one becomes in their woodworking craft, the need for measurement tools increases as projects become more complex. This requires increased precision to ensure the accuracy of cuts and angles.

Use extreme caution when handling the scratch awl. Despite it being a very useful tool, it is very sharp and strong. Members should always be supervised by a leader when using a scratch awl.

Activities:

- Tool Buffet
- Time for Action

PATTERNS AND DRAWING

MODULE - Patterns

Junior

In preparation for this module, you will want to explain the benefit of using a pattern to members, as well as tips on how to choose a pattern that is appropriate to their skill level, resources and interest.

Objective:

- To show members how to read and choose appropriate patterns, as well as how to redraw and transfer patterns.

Processing Prompts:

- Why is it important to be able to read a pattern?
- What does copyright mean and what does it have to do with patterns?
- What are some signs to look for in a pattern to be able to identify the level of skill required to complete the project?

Applicability:

It is important for members to learn how to read and choose patterns that are appropriate to their skill level. This improves their woodworking skills, and reduces the risk of members becoming frustrated by pursuing projects too far above their skill level.

Background:

Patterns can be found in woodworking books, magazines or web sites. Members need to be sure that they are taking patterns from websites that offer patterns in the public domain, and that if they are working off of a photocopied pattern from a woodworking book, that it is not infringing on any copyright laws.

If something is copyrighted, it means that the creator of that particular work or idea has legal ownership of it, which means that it cannot be pre-produced or copied unless the creator grants permission.

Key Messages:

Being able to read a pattern is important in order to identify the level of skill involved, the amount of resources (time and money) and your level of interest in the finished product.

Sources such as books, websites and magazines that offer patterns for woodworking projects are great, just be sure to check out whether or not they are free, or if you have to pay for them. If you're photocopying, be sure that you're not infringing on any copyright laws.

Activities:

- Assessing a Pattern's Level of Difficulty

References and Resources:

For more information on copyright, go to either one of these websites:

For Canadian copyright law: "Copyright Act", Department of Justice Canada, <http://laws.justice.gc.ca/en/C-42/index.html>, accessed July 22, 2009

US copyright / general discussion: "Copyright Infringement and how it affects everybody, Woodworkers Workshop. <http://www.woodworkersworkshop.com/copyright-infringement.php>, accessed July 22, 2009

Sources of Plans and Patterns:

www.freewoodworkingplan.com

www.buideazy.com

<http://absolutelyfreeplans.com>

<http://www.freeww.com>

<https://www.woodcraftplans.com/osc/>

MODULE - Pattern Drawing and Transferring

Junior

Objective:

- To show members how to draw out patterns for simple woodworking projects.

Processing Prompts:

- Why is pattern drawing a useful skill for woodworkers?

Applicability:

Members will be able to take their woodworking to another level. Possessing the ability to see an images or a photo of a project and be able to translate that into an actual product a very accomplished skill.

Background:

As a woodworker, it is a valuable skill to be able to take an object that you have an image of and be able to turn it into an actual product. By learning how to do this, simply at first, members will be able to expand their expertise into areas of more advanced pattern drawing and transferring.

Key Messages:

Transferring a photo or a pattern onto a piece of wood is an effective and efficient way to build simple woodworking projects.

Activities:

- See and Make!
- Transferring

MODULE – Isometric and Orthographic Drawings

Senior

Objective:

- To introduce more advanced members to the benefits of drawing before building, doing isometric and orthographic drawings of simple projects and accurately finding points on a drawing to match points on a project.

Processing Prompts:

- What would be some of the pros of drawing out your project before building it?
- What are some things to keep in mind when you are drawing out your project?

Applicability:

Before members start to build their project, it is useful to first draw their project. Doing so may unearth potential problems such as certain cuts, angles, tools required, wood needed that would have set members back time and money in the actual building process. By doing preliminary drawings, members will go into their project well versed in what to expect and equipped for any obstacles that may arise.

Background:**Isometric Drawings**

- show what an object would look like from one side and a bit below your eyes (like looking down at something sitting on a table)
- are helpful for getting an idea of what the project will look like
- help indicate what type of materials will be needed

Benefits of building a paper or cardboard model of a project:

- it allows you a dry run at the project
- it helps you understand how things fit together
- you can test and adjust size, if necessary
- it helps keep you on track and prevents mistakes
- you can try out different stains on paper instead of wood
- it can encourage you!

Orthographic Drawing

- this type of drawing splits the object into different views: the top, the sides and the front
- an orthographic drawing is drawn accurately and to scale*

* “to scale” means that each measurement on paper is in proportion to a measurement in real life. e.g. One cm on paper = 10 cm in real life.

Benefits of drawing a project before building it:

- it helps you better understand how the project will fit together
- it helps you think through the stages of the project and anticipate what you will be doing and what you will need
- a good drawing makes for a good project

Key Messages:

Isometric drawings are one-dimensional whereas orthographic drawings show the top, the sides and the front of a project. Both types of drawings are helpful in discovering potential problems that may be encountered during the building process, and should be done prior to starting the actual building of the piece.

When doing an isometric or an orthographic drawing it is important to draw your measurements to scale, which means that you have established an on-paper measurement that is equivalent to the real life product, e.g: one cm on paper = two cm on the actual box; this scale would be written as 1:2.

When enlarging a pattern, you can either transfer the pattern by hand or you can use the enlarging function on a photocopier.

Activities:

- Practice Time!
- Grid Work
- Copycat
- Try Your Hand at Freehand

FASTENING, SANDING AND FINISHING

MODULE – Glue

Junior, Intermediate

Objective:

- To introduce members to the pros and cons of using glue as a fastener.

Processing Prompts:

- What are the two most common types of glue for a carpenter to use?
- When is glue an effective fastener? When would it be ineffective?
- What are some tips to keep in mind about the use and storage of glue?

Applicability:

Glue is one of several options when it comes to choosing the proper fastening material. By giving an overview of glue's strengths and weaknesses, members will quickly learn what types of projects are more suited to glue, and what projects are in need of a fastener that is a bit more substantial.

Background:

The two most common glues used in woodworking are white glue and yellow glue (which is also called carpenter's glue).

White glue is an all-purpose glue that works for most woodworking projects. If you require an extra strong joint, choose yellow glue. Yellow glue is more expensive but provides a better bond.

Be sure to instruct members to handle the glue carefully as wood that has glue on it will not accept stain and finish the same way that clean wood will.

It is important to store glue where it will not freeze or be in direct sunlight. Ensure the container is sealed to prevent the entry of air. If the original cap is weak or faulty, try a mariette (which is the screw type cap used to connect electrical wires). The screws in the mariette will dig into the plastic of the spout and block air entry.

Tip: *You can put a large-headed nail into the tip of a glue bottle, and then put on the cap. Pull the nail out to clear the tip out before you use it next time.*

Some woodworkers like to store their small bottles of glue upside down so that the glue is ready to go. (These are woodworkers who are sure that their glue lids are secure!). You can store glue bottles upside down

in a coffee can or even build a wooden holder that looks like a giant toothbrush holder.

How long for glue drying?

Check the label on your glue container. Most glues dry within 24 hours.

Key Messages:

There are two common types of glue used by carpenters for fastening purposes – white glue and yellow glue, which is also referred to as “carpenter’s glue”.

Glue is effective as a fastener when the joint is not bearing a lot of weight on it, (for example, a picture frame). While yellow glue is stronger than white glue, both options are most effective as fasteners when a nail is used to secure the joint, in addition to glue.

Be sure to store your glue at room temperature and out of direct sunlight. Many woodworkers use a mallet as a stopper on the cap to their glue. Some carpenters store their glue upside down so that it is ready to go the next time it is needed.

Activities:

- How Do You Glue That?

MODULE - Epoxy glue

Senior

Objective:

- To introduce more advanced woodworkers to epoxy glue, a much stronger adhesive than regular glue.

Processing Prompts:

- What makes epoxy glue different from white or yellow glue?
- In what types of situations would one use epoxy glue?
- If there are only two common types of glue, what does that make epoxy glue?

Applicability:

By introducing epoxy glue to members, and giving a brief overview of what it does and why it is used, members will be able to use this information to make an educated decision when it comes time to choose the appropriate fastener for their project.

Background:

There are two common types of glue that woodworkers use: white, yellow (also known as carpenter's glue). Epoxy glue, while very effective, is not considered a common glue because it is expensive, and because of the chemical reaction, using epoxy glue is not recommended for younger or more inexperienced members.

White and yellow glues harden due to evaporation. When they harden, they shrink

Epoxy glue does not shrink. It is a strong glue that hardens due to a chemical reaction. It is more expensive than either other glue, so only use it when the situation calls for it, such as joints where there are gaps. Epoxy glue fills up the gaps and then hardens to a very strong finish.

To use epoxy glue, it is necessary to mix two components together. Read the instructions on the epoxy glue container carefully and follow them completely.

It is important that the wood be the same moisture content when gluing it as it will be at time of use.

Key Messages:

Epoxy glue is different from white and yellow glue in that it does not shrink once it hardens. Also, epoxy glue's effectiveness is based on a chemical reaction rather than evaporation.

Epoxy glue is useful when there are gaps at the joint. This is because epoxy glue fills up the gaps and also hardens when it dries.

Activities:

- Glue it Again!

MODULE – Clamping

Junior, Intermediate

Objective:

- To increase members awareness about different clamps and their individual uses.

Processing Prompts:

- What types of clamps are there?
- What are clamps used for?
- What could be a potential problem with using a clamp if it is not used properly?

Background:

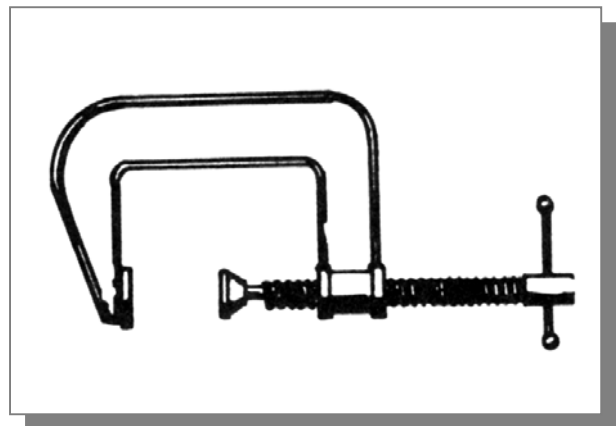
Choose a means of clamping pieces of wood that will keep them snug without damaging the wood.

Woodworkers use clamps, pieces of inner tube, rope, clothespins and other contraptions to secure the wood while the glue dries. Allow the project to dry well before proceeding to the next step of construction.

The combination of glue on a metal clamp can make a stain on wood. Cover metal clamps with masking tape where glue might touch them.

Types of Clamps**C-Clamps**

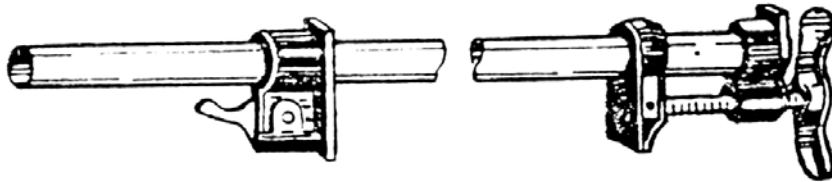
These are small c-shaped items that are used to hold two boards together for boring holes, gluing or making a saw guide. Tighten the screw to increase pressure. To prevent dents in the wood, put a piece of scrap wood between the clamp and the good wood.

**Hand Screw Clamps**

These clamps have two long parallel bolts that are adjusted separately. They are used for jobs that are too big for C-clamps. To adjust the pressure, screw the bolts in opposite directions.

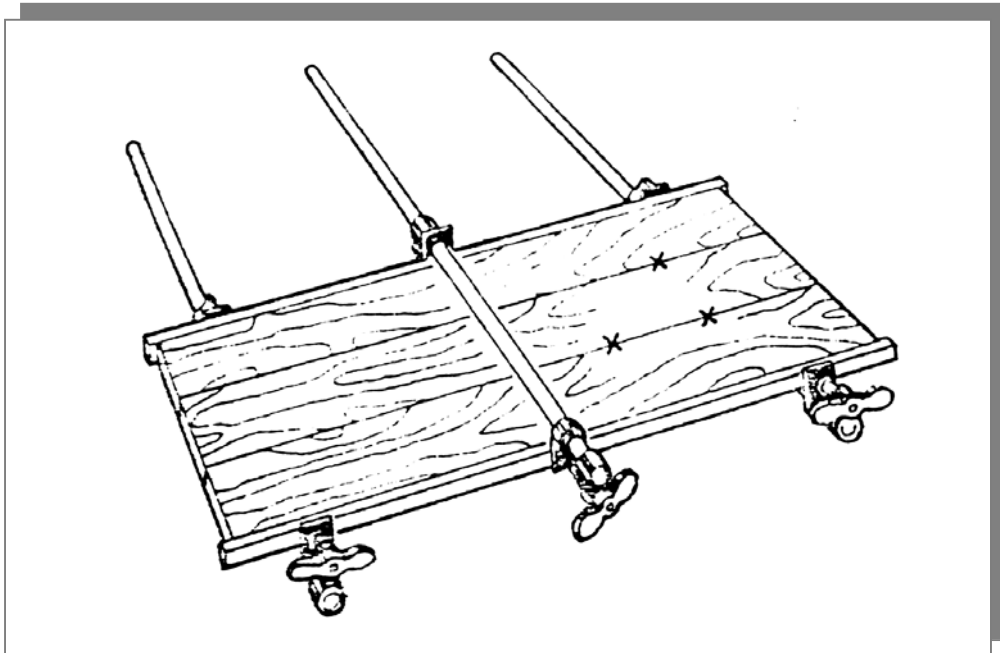
Pipe Bar Clamps

These clamps come in a range of lengths. Adjust the clamp to fit the project by moving the adjustable stop back and forth along the bar. Increase pressure by turning the crank screw.



Adjustable Bar Clamp

This also called a cabinet clamp. It adjusts by turning the handle and can be used for the same purposes as the pipe bar clamp.



Clamping Tips

- keep clamps clean or you will be pressing grease and dirt into the wood fibres.
- protect wood surfaces by putting a piece of felt or scrap wood under the clamp.
- use a piece of Styrofoam against an irregular piece of wood when clamping. It will press into and hold the wood without marring.
- try pieces of inner tube as clamps for irregular pieces of wood.

Key Messages:

There are four different kinds of clamps: c-clamps, hand screw, pipe bar and adjustable bar clamps.

Clamps are used to hold in place the piece of wood that is being glued. Clamps also help to ensure successful adhesion and thorough drying.

Be sure to cover metal clamps with masking tape if there is potential for glue to come into contact with the clamp as the combination of glue and a metal clamp can make a stain on wood.

Activities:

- Clamping Your Style

MODULE – DOWELS

Intermediate, Senior

Objective:

- To show members the benefits of using dowels in their projects.

Processing Prompts:

- What do you think it is about a dowel joint that makes it be strong?
- Are there any negative aspects to using a dowel joint?
- What are the different types of dowels?

Applicability:

Not only is learning about dowels necessary in order to understand joinery techniques, but also it will provide increased awareness regarding the strength of a product (tables, chairs, dressers, etc.).

Background:

Dowels are used to fasten pieces of wood together and to strengthen joints. They can be cut from dowel rods or purchased by the piece. There are three different types of dowels: plain, spiral and grooved.

Dowel holes are cut with a drill press or with a hand drill, guided by a doweling jig.

How to determine a dowel's diameter:

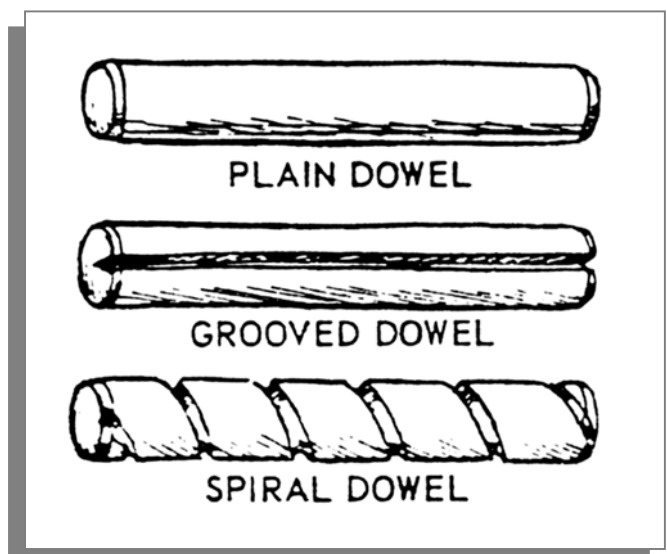
You should be able to insert the dry dowel into the dowel hole easily by hand. If it is too tight, the glue will be rubbed off as the dowel is inserted.

How to determine the length of the dowel:

Dowels are usually cut 1/4 inch shorter than the combined length of the two dowel holes. When you press the two pieces of wood together on the dowel, you do not want the dowel holding them apart!

How to decide which dowel to use:

Choose between a plain dowel, a dowel with a longitudinal groove or a spiral-grooved dowel. The grooves help the air trapped in the hole to escape and can help the glue to spread inside the hole, making



8 Section 8 – Fastening, Sanding & Finishing

for a stronger joint.

Do a dry run with the dowels in your project before applying glue!

Key Messages:

There are three different types of dowel – plain, grooved or spiral.

Before inserting the dowel, one needs to decide on the proper diameter, length and type of dowel.

MODULE – JOINERY

Intermediate, Senior

Objective:

- To take what members have learned regarding dowels and apply to joinery techniques.

Processing Prompts:

- How important is choosing the correct joinery technique?
- Other than esthetics, is there really a difference between one technique and another?
- What makes a joint be stronger than another one? What sort of elements will you look for to determine a joint's quality?
- The types of joints I like the appearance of:
- The types of joints I appreciate for their strength:
- The types of joints I am going to practice making:

Background:**Introduction**

A variety of joints have been designed and used by woodworkers. They vary in procedure, strength, appearance and skill required to make them. Some of the techniques used by pioneers with crude tools are still holding today!

When buying wooden furniture, the quality of joint used indicates the strength and

Different joints are suitable for different purposes.

After choosing the correct joint for your project go about researching how to properly construct it. Glue and clamp it securely.

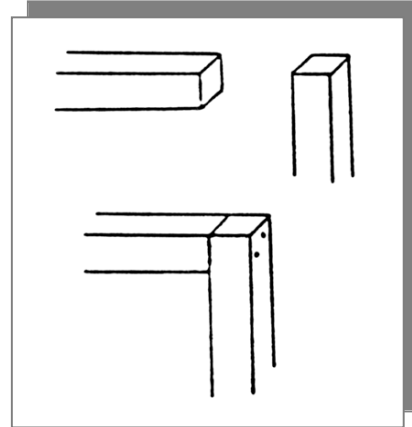
Dovetail

The dovetail joint requires no fasteners – it consists of a series of pins cut into the end of one wood piece, and a series of tails cut into the end of the other wood piece that interlock snugly. This joint can be very strong if done correctly.

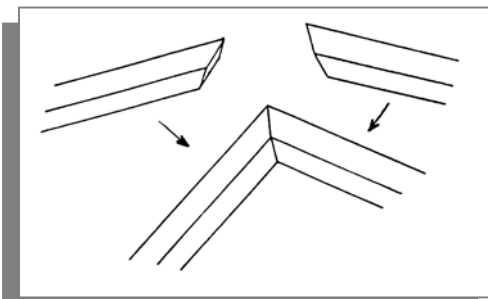


Butt Joint

This joint is the easiest and also the weakest. It is usually the first joint most of us make. You might see this kind of joint in a birdhouse or feeder because those items do not need to have extremely strong joints. Sometimes the butt joint is reinforced by dowels or corner braces.



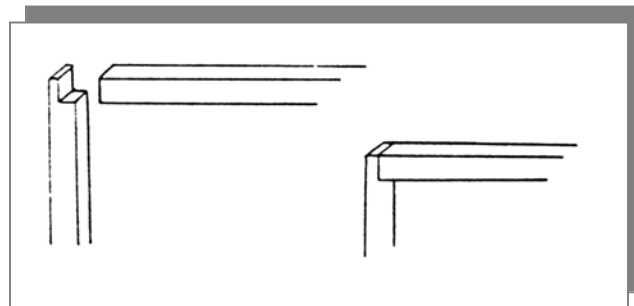
Mitre Joint



The mitre is a type of butt joint. The wood is cut at a precise angle using a mitre saw and mitre box. It looks better than a butt joint and is a bit stronger though it can be tricky to clamp.

Picture frames and doorframes often use this type of joint because it is a good way to join

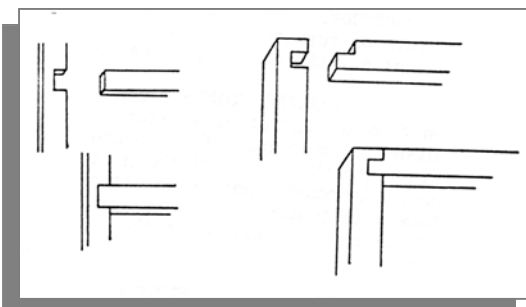
ornamental wood. You will notice that picture frames are pinned or reinforced at the corners for extra support.



Rabbet Joint

This type of joint is often used for drawer fronts in cabinetwork. A cut is made at the end of a board so it will fit into another one.

Dado Joint



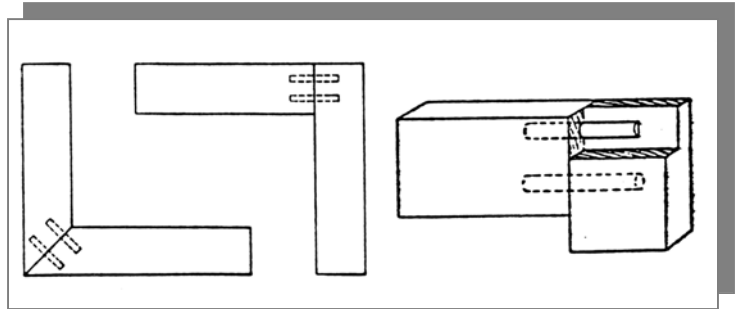
A dado joint is like a rabbet joint, except that the joint is made in the middle part of the board, not the end.

This is a strong joint, because there is a lot of surface contact. Dado joints are used to make slots for shelves and other spots needing good support.

Dowelled Joint

Pioneers used to make their own dowels to avoid having to buy nails. Dowels are hardwood pins that come in a variety of sizes. Holes are drilled and lined up to fit dowels tightly.

A dowelled joint is any joint that is reinforced with dowels (short, round pegs). Butt joints are the most frequently dowelled joint. Most table legs are attached to the frame with dowels.



Sometimes dowels snap at a point of stress (this is why people tell us not to tip our chairs back). The old dowel has to be removed (with a drill or careful chiseling), the hole cleaned and re-glued. The replacement dowel is sometimes a bit larger than the original.

Key Messages:

There are six types of joints: dovetail, butt, mitre, rabbet, dado and dowelled.

Each technique has its own set of pros and cons; determining which one to use will be likely be dictated by the project that you're making.

Activities:

- Joint Poster Creation

References & Resources:

Wikipedia, "Dovetail Joint", <http://en.wikipedia.org/wiki/Dovetail> accessed July 22, 2009

MODULE – Sanding Grits and Grades Junior, Intermediate, Senior

Objective:

- To have members learn about proper sanding grits and grades, as well as proper technique, set up and clean up.

Processing Prompts:

- Why is sanding important to a finished piece of woodworking?
- What might happen if something isn't sanded properly, or the wrong grade of sandpaper is used on a project?
- Why is it important to do proper clean up of the dust left from sanding, both in the workshop as well as prior to continuing on with the finishing process?

Applicability:

It is important to take pride in your work, especially after having worked so hard on something. Sanding helps to give nearly-finished pieces of woodwork a more polished and smooth finish, and it will also give you an appreciation for pieces that you see in the future because you will be able to note a proper or poor sanding job – this may be the make or break decision with some of your future purchases, as well as judging placements (see the “Judging” information in the Activity Guide for more information concerning this aspect of woodworking).

Background:

We sand wood to smooth the rough edges and scratches left by cutting it. Sanding also makes a project look and feel to be of better quality.

Sandpaper is gritty material glued onto paper. It comes in a range of coarseness. Use coarse sandpaper when starting to sand a project. Use finer sandpaper when you are getting to the final stages of sanding.

Sandpaper coarseness is expressed as grit. The lower the number of grit, the coarser the paper. The higher the number, the finer the grit. For example, 80-grit sandpaper is much coarser than 120-grit sandpaper. The grit number is printed on the back of the sandpaper. Many project plans will suggest what grit of sandpaper to use.

Sandpaper comes in standard sheet sizes of 22cm by 28cm. We divide these sheets into four pieces to use with a sanding block. Don't ever use your scissors to cut sandpaper - it will dull the blades and the scissors' owner will never let you forget it! Who needs that? Instead, use an Exacto-knife for more precision and less dulling!

Sandpaper (Putting it into practice)

Using a standard sheet size of sand paper, have members follow the steps listed below:

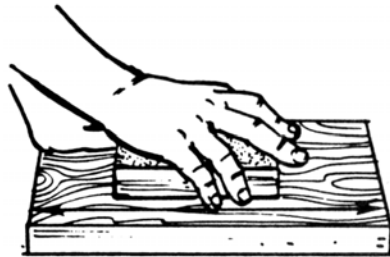
- Fold the sandpaper in half with the grit side out. Crease it on the fold. Slice it on the paper side with a knife.
- Fold the two halves. Cut them again. You will have four pieces of sandpaper to use in your hand-sanding block.
- Before you use your sandpaper, roll the paper, grit side out, to break up the glue on the paper a bit.
- Tap sandpaper on the back to clear dust.
- Wipe your work off with a lint-free cloth.

Hand Sanding Block

Use a hand sanding block to make the best use of your sandpaper. A sanding block helps you put even pressure on the wood you are sanding. This prevents you making grooves in your project with the sandpaper.

You can either make or buy a hand-sanding block. A hand-sanding block is a piece of wood about 2cm by 11cm by 12cm, with a bit of carpet or rubber glued to the bottom.

The sandpaper is held against the carpet or rubber so there is a bit of give when sanding.



Wrap the sandpaper around the bottom of the block of wood (paper side against the carpet or rubber) and hold it on with your fingers. Start sanding with your coarser grit sandpaper (80-grit) and finish with your finer sandpaper (120-grit).

Always sand **with** the grain, if you don't, you will scratch the wood.

Activities:

- Make a Sanding Block
- Grit Sampler

MODULE: Power Sanders

Intermediate, Senior

Objective:

- To teach members the proper care and use of different types of power sanders.

Processing Prompts:

- What job might require the use of a power sander?
- How can you tell when to use a power sander, and when to use a sanding block or plane?

Background:**Power Sanders**

Hand sanding is the ultimate and most precise sanding that wood can receive. But we often use sanding machines to do some of the work. Choose the correct machine to do the job.

Sanding machines can be heavy and require a certain amount of strength and stamina. If you find yourself getting tired, stop.

Most woodworking shops have two kinds of power sanders - the belt sander and the vibrating sander. Some shops will also have an orbital sander. They are used for larger sanding jobs and can use a variety of grits of sandpapers. Power sanders can do the job faster. They can also make mistakes faster and deeper than hand sanding!

Belt Sander

Belt sanders operate with a circle of sandpaper powered by a small motor. The sandpaper comes in a range of grits. These can be quite heavy. The belt sander has a loop of sandpaper that is fitted and snug over two wheels attached to the motor.

Belt sanders are quite powerful, noisy and can cause injury. Your leader will demonstrate belt sanders. As with all tools, make sure the sander has finished working before setting it down.

Vibrating Sander

Vibrating sanders work by shaking or vibrating a piece of sandpaper attached to a plate that is attached to its motor. Use a vibrating sander to smooth wood surfaces and take out scratches. Most use a quarter of a sheet of sandpaper. Vibrating sanders are considered to be safer than belt sanders.

When using a vibrating sander, do not lean on it. That would wear out the bearings and also probably do a terrible job of sanding. Move the sander over the project with the grain of the wood with just the weight of the sander and your hand on it. Make sure it has stopped moving before you set it down.

Orbital Sanders

Orbital sanders sand in a circular motion, with up to 20,000 spins in a minute. As with other sanders, use caution, as its high speed could also mean 20,000 scratches a minute.

How to Change the Sandpaper

Each power sander has slightly different ways to change the sandpaper.

Ask for a demonstration or read the manual for the power sander you are going to use.

Tips for Using a Sander

- Turn on the sander before touching the wood.
- Land it gently on the wood.
- Sand with the grain.
- Overlap your work a bit each time.
- Wear dust protection. Work outside when possible.
- Lift the sander off the wood, then turn it off.
- Make sure the sander has stopped completely before setting it down.
- Your sanding is only as good as your sandpaper. If your paper is worn out, replace it!
- Sand lightly. You can always sand again. You cannot replace a layer of wood that you hastily removed.

Things to Be Mindful of When Using a Power Sander

- work only in dry conditions with electrical tools
- use grounded cords in good condition
- keep the sandpaper surface away from skin

Key Messages:

Power sanders are used for larger sanding jobs and can use a variety of grits of sandpapers. While they get the job done quicker than a hand sander would, they can also make mistakes faster and deeper than hand sanding.

There are two types of power sanders: belt and vibrating. The belt sander has a loop of sandpaper that is fitted and snug over two wheels attached to a motor. Vibrating sanders work by shaking or vibrating a piece of sandpaper attached to a plate that is attached to its motor. Use a vibrating sander to smooth wood surfaces and take out scratches and do not lean into a vibrating sander, the weight from your hand will suffice.

Activities:

- Power Sander Discussion
- Practice Using a Power Sander

MODULE: Stationary Belt Sander

Intermediate, Senior

Objective:

- To teach members the proper care and use of the stationary belt sander.

Processing Prompts:

- What is the purpose of the disc sander?
- What safety considerations should you remember when using the belt sander?

Background:

The stationary belt sander is another versatile, powerful tool. Many stationary belt sanders also feature a disc sander attached to the front. The disc is helpful for squaring ends and sides of wood pieces. As this is a high-speed machine, exercise great caution when using it. It can sand your fingers as fast as a piece of oak.

Use a stationary belt sander to square or round edges of wood parts. You can also shape smaller parts of wood with this machine.

When pushing wood into the belt, push slowly so you do not overtax the machine. When putting pressure on the belt, move the wood from side to side so the belt does not heat up or wear out on one spot.

Key Messages:

The stationary belt sander is a versatile, powerful tool. Many are also equipped with a disc sander, which is attached to the front. The disc is helpful for squaring ends and sides of wood pieces.

Do not overtax the machine by pushing the wood too fast and be sure to move the wood from side-to-side when you are using it to make sure that the belt does not heat up and that your wood does not get worn out in one spot.

MODULE - Dust Management & Protection Junior, Intermediate, Senior

Objective:

- To teach members the importance and methods of dust management and protection.

Processing Prompts:

- Give other examples of when dust management might be an issue, besides during woodworking activities.
- What might happen if you do not practice proper dust management?

Applicability:

Preventing the inhalation of tiny particles of wood and dust is very important, as wood dust inhalation can cause allergic reactions, respiratory problems, symptoms, and possibly cancer.

Background:

Sanding Tiny Pieces of Wood

Glue some sandpaper onto a piece of plywood. Hold your small piece of wood and rub it against the sandpaper, rather than rubbing the sandpaper against the object.

Dust Management

Sanding produces very fine dust particles. It is the smallest dust particles (the ones that are too small to even see) that can cause the most damage to the lungs of woodworkers.

Dust particles less than 10 microns are the most dangerous because they can get into the alveoli of the lungs. To give you an idea of size, a human hair is approximately 100 microns in diameter.

Keeping Dust at a Minimum with Power Sanders

It is best to trap dust at the source. Many sanders have a dust attachment. Keep this on and empty it regularly.

- Wear a proper respirator.
- If weather permits, do your sanding outside.
- The woodworker above is sanding outside. She could still benefit from wearing dust protection.

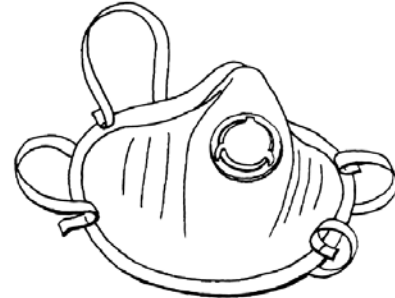


- Sweep often.
- Vacuum dust up regularly with the shop vacuum.
- If your work area has a dust management system, clean out the filters regularly.

Dust Protection

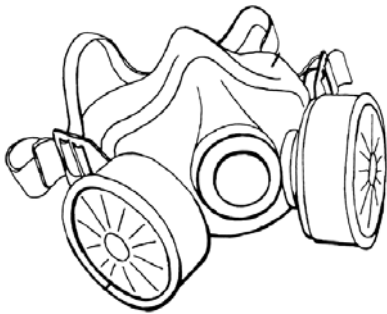
Disposable Paper Filter Masks

Many disposable paper filter masks do not filter out particles smaller than 10 microns, which is the dangerous size. It is difficult to get a good seal with these masks. They should only be worn for short-term use – and only when a respirator is not available.



Reusable Respirators

Reusable respirators provide a good seal against the face and the filters can be replaced when dirty. They filter out the smaller particles. A good fit is crucial for a respirator to work properly.



Key Messages:

The lower the grit number, the higher the coarseness of sandpaper. Always use the higher grit of paper after the lower grit. This ensures a smooth, even finish.

Always sand with the grain to prevent scratches.

Dust management and protection are two principles of sanding you must consider. The dust particles that are created by sanding are less than 10 microns in diameter; particles that are this small have the potential to be damaging to a woodworker's lungs.

References & Resources:

“Safety and Health Topics -Wood Dust”. U.S. Department of Labor
<http://www.osha.gov/SLTC/wooddust/index.html>, accessed August 13, 2009.

Activities:

- Filter Fashion Show
- Micron Examination

MODULE – Finish Application and Safety Junior, Intermediate, Senior

Objective:

- To explain to members the reasons for applying a finish, and the safety involved with doing so.

Processing Prompts:

- Is applying a finish necessary? Why or why not?
- What are important safety tips to keep in mind when applying a finish to a woodworking project?

Applicability:

Finishes represent the “individuality” of woodworking. Two people can have identical projects, but if one has been lacquered while the other one has had the rag-rolling technique applied to it. Suddenly, these two identical pieces are quite different and represent two different sets of preferences.

Background:

At this point, you’ve now picked your pattern and your wood, worked on the piece using the appropriate tools and implement the appropriate safety procedures. You have selected a fitting fastening and joining application and you have your project with the correct grade of sandpaper.

And now you’re onto finishes, which is the last step in the project-completion process. When finishing a project, it is very important to work in a dust free area. Otherwise, your project will have dust and hair etc. stuck all over it!

We finish a wood project to protect it and to improve its appearance. Finishes either penetrate the wood or sit on the surface.

Finishing Tips:

- Choose a finish according to the appearance of the wood and how the project will be used.
- Use rubber or latex gloves to protect skin.
- Provide adequate ventilation.
- Rags or steel wool that are damp with oil can combust, so be sure to put whatever was used to apply the finish in a bucket of water or a metal container with a tight lid and place it outside.
- Dispose of any leftover products according to local laws and with respect to the environment.

Types of Finishes

Some woodworkers are tempted to rush the finishing of projects. Yet it is the finishing that can make or break your project! Take the time to choose and execute your finishing technique. It will pay off.

1. Penetrating Finishes

- Stains and preservatives soak into the wood fibres so that you can still see the grain and feel the wood.
- To remove the stain or preservative, you have to actually remove the wood fibres they have penetrated.
- Penetrating oils include: linseed, tung, teak, Danish, Swedish and polyurethane oils. Oil alone will darken wood.
- Penetrating oils are easy to maintain but are not as resilient of a finish as others may be.

How to Apply Penetrating Finishes (for inside use only)

Supplies

Safety glasses, lint free cloths, good quality small paintbrush, finish, 340-grit silicon-carbide paper or 0000 grade steel wool, rubber or latex gloves.

Procedure

- Brush a coat on the surface. Make sure the grain is evenly wet.
- Rub in the oil. First use a circular motion, and then change it to follow the grain.
- Let it dry. (Check the container for proper length of time.)
- Lightly sand with the paper or steel wool.
- Apply more coats (an additional 1 to 3 coats is average), lightly sanding between coats, until you are satisfied with the finish.
- After the final coat, use a small piece of steel wool to give the surface a fine sheen.
- Rub briskly with a soft, clean cloth.

2. Surface Finishes

- Paint, varnish, shellac and lacquer are surface finishes.
- Varnish, shellac, lacquer are clear and allow you to see the grain of the wood, whereas paint has colour and hides the wood.

The Benefits of Varnish, Shellac and Lacquer

- Shows off the grain and colour of wood
- Looks more natural

Benefits of Paint

- Can cover up flaws in the wood
- Can cover up errors in workmanship

- Can disguise wood filler
- Can match existing furniture
- Is often washable

How to Stain

- Read the instructions for applying oil. Stains apply in a very similar fashion.
- Use a cloth for small items, and a brush for larger projects.
- Read the container for drying times.
- Does your stain require a protective coat? Read the container for suggestions about compatible protective coats.

How to Varnish

- Prepare the wood finish. It must be clean and smooth. If necessary, fill any holes and cracks. To clean, wipe with mineral spirits.
- Brush varnish against the grain. Then, brush diagonally. Then, brush with the grain.
- When completely dry, use fine silicone-carbide paper to smooth the finish.
- Repeat with another layer or two of varnish, until you are satisfied with the result.

How to Paint

Supplies

Newspaper, paint, clean paintbrush, old clothes to wear, something to paint, cleaning solvent.

Procedure

- Protect your work surface with newspaper.
- Mix your can of paint. (If you just bought it, they will offer to shake it for you. Shaking can cause bubbles in your topcoat.) Make sure it is well mixed, right to the bottom of the can.
- Make sure the object you are painting is clean and free of dirt and grease, or the paint will not stick well. If necessary, clean the surface with mineral spirits.
- Dip only the tip of the brush into the paint (no more than 1/3 of the brush.)
- Start painting in the corners and work out from there. Paint the flat, easy bits last.
- Brush the paint with the grain in easy strokes. Keep going until the paint starts to get too thin.
- Re-dip your brush and continue.
- Do not put too much on at once. Sometimes you have to let the first coat dry and apply a second coat.
- If painting two colours next to each other, let the first colour dry completely before starting the second coat. Be patient!

3. Specialty Finishes

Splattering

Protect your work area. Apply a coat of primer and paint on your project. Let them dry completely. Use either an old toothbrush or small paintbrush to do the splattering.

Practice first! Choose a different color. Load the brush, scrape off the excess then pull the bristles back with a small piece of wood, so that the paint will spray. Or, you can tap the brush with a piece of wood.

Once you have mastered this technique to your satisfaction, splatter paint onto your project. You can make the splattering as thin or thick as you like. You can also mask an area or use a stencil to produce a splattered pattern. Have fun!

Stippling

Use a stippling brush, marine sponge or paper towel on your project while the paint is still wet. You might want to practice this technique on something else first, but there is no wrong way to do it!

Rag Rolling

Roll a dry, clean rumpled rag through the paint! Doesn't that sound funny? You can also dip the rag into paint and then daub it onto a clean, dry surface. Try both!

Dragging

No, this does not require a car and a rope. Drag a comb tool through wet paint. Clean off the tool after each pass. This is especially attractive when you use a different color of wet paint over top of dry paint.

Marine Sponge

Dip your sponge into a bit of diluted paint, then wring it almost dry. Touch your project with the sponge, turning it in various ways. Try this with several colours!

Permanent Markers

Test your markers on a sample of the wood your project is made of, to see if the markers will spread or bleed into the wood. If it does and you do not like that, apply an acrylic sealer to the project first.

Markers work best on light coloured woods. The wood grain often shows through markers.

Plan your design first, on a piece of paper exactly the same size as the project.

Key Messages:

Applying a finish is the last step in the building of a woodworking project. Whether or not members choose to apply a finish is an individual decision and is likely dependant on the “look” that they are hoping to achieve with that particular project.

Use rubber or latex gloves when applying a finish, and make sure that there is adequate ventilation. Rags or steel wool that are damp with oil can combust, so be sure to put your application tool in a bucket of water or a metal container with a tight lid and place the container outside.

Penetrating finishes include: linseed, tung, teak, Danish, Swedish and polyurethane oils. These all serve to sink into the fibres of the wood, causing the wood to darken. Examples of surface finishes are: varnish, shellac lacquer and paint. Varnish, shellac and lacquer all coat the wood, allowing you to still see and feel the wood’s texture. A sampling of specialty finishes includes: splattering, stippling, rag rolling, dragging, marine sponge, permanent markers. These are for those who may be slightly more daring and have experience with applying both penetrating and surface finishes.

Applying finishes to your woodworking project can make or break the appearance of a finished piece, and so it is important to try out several different techniques before settling on the right one – varying degrees of skill-level may weigh in on your decision initially, but don’t be afraid to experiment!

Activities:

- Feature Finishes
- Finishing Stations

MODULE – Clean Up**Junior, Intermediate, Advanced****Objective:**

- To teach members the importance and techniques of cleaning up after applying finish.

Processing Prompt:

- What are the consequences of not cleaning up after finishing?

Applicability:

Cleaning up after finishing, as with any woodworking activity, is as much a part of the process as sawing, hammering, or other elements.

Background:**Clean up after Painting**

- Clean up immediately after finishing your painting. The longer you leave it, the harder the job will be.
- Rub the brush against the side of the can to squeeze out excess paint.
- There will probably be paint in the groove on the top of the can. Scoop this out and scrape it back into the can. The lid will fit on better this way and your paint will not dry out.
- Check on the can about cleaning procedures. Follow those instructions.
- Most paints you will use for these projects require a solvent for clean up. Paint thinner works as a solvent. Pour a bit of solvent into a clean can and swish the brush in it. You may have to change the solvent a few times until the brush appears to be clean.
- Tap the brush to get rid of the excess solvent. Brush it on dry newspaper until it appears dry.
- Dispose of the solvent soaked papers in metal container with lid, outside any building. Solvent-soaked rags can burst into flames by spontaneous combustion.

Cleaning your Hands

- Put a bit of paint thinner on a cloth or paper towel and rub on paint spots until they are gone. Do not pour paint thinner on your skin. Apply liquid soap (without water) and rub and scrub.
- When the paint thinner appears to be gone, then use warm water on your hands. Put on some skin cream to protect your skin from chapping.
- Dispose of the papers or cloths in a metal container with a lid outside the building.

Key Messages:

Clean-up is a very important part of finishing – you want to tackle it immediately (even if it might be more tempting to sit and stare at the beautiful project that you

8 Section 8 – Fastening, Sanding & Finishing

have just created!) because if any of the finishes are left for too long (especially paint) on the bristles of a brush, you may very well be in the market for a new brush set.

Also, as many finishes may be extremely flammable (remember the section in safety logos?), proper disposal is key to ensuring your safety, as well as the safety of the workshop area where you applied your chosen finish.

GLOSSARY

Annual growth rings

The layer of growth that a tree adds in one year. The annual growth rings can be seen in the end grain of lumber.

Backsaw (Mitre Saw)

A rectangular blade, with a stiffening metal strip on the top edge. Used with a mitre box to cut exact angle cuts.

Bandsaw

A blade with a loop of steel with teeth on one edge. The blade is driven and held in place by two large wheels. Metal shields cover the wheels and most of the blade. The blade runs through and guides to keep it straight.

Bark

The outermost, protective, layer of a tree composed of dead cork and other elements.

Bevel Cut

An angled cut through a board.

Belt sanders

A sander worn on a belt. Operate with a circle of sandpaper powered by a small motor. The sandpaper comes in a range of grits.

Brad

A thin wire nail with a small head or a slight side projection instead of a head.

Brace and Bit

We use this tool to drill larger holes. The bits have three parts - a square or rounded end that fits into the chuck; a spiral shaft, and a screw-tipped end.

Butt Joint

A woodworking joint where the edges of two boards are placed against each other.

Calibrated

The process of establishing the relationship between a measuring device and the units of measure. This is done by comparing a device or the output of an instrument to a standard having known measurement characteristics.

Chamfer

A chamfer is a beveled edge that connects two surfaces. If the surfaces are at right angles, the chamfer will typically be symmetrical at 45-degrees.

Chisel

Chisels are sharp wood knives that are used to remove unwanted strips of wood. The end of the blade is the sharp part that cuts with a pushing action. The tip of the blade is slanted or beveled. Most chisel work is done with the bevel side down against the wood.

Clamp

A tool used to keep an object in a fixed position.

Combination Square

This has several uses: to check if a board is flat, or if it is level, to check angles, to measure depth, to lay out a line parallel to the edge of a board.

Common Nails

These have a big head and are very thick.

Common Saw

Has about eight teeth per inch (2.54 cm.). Use this saw to cut across the grain of a board.

Dado Joint

A joint that is made in the middle part of the board, not the end. This is a strong joint, because there is a lot of surface contact. Dado joints are used to make slots for shelves and other spots needing good support.

Deciduous

Trees that shed their foliage annually. Commonly referred to as hardwood.

Dovetail Joint

A method of joining wood at corners by the use of interlocking pins and tails.

Dowel

A cylindrical wooden pin that is used to reinforce a wood joint. There are three different types of dowels: plain, spiral and grooved.

Dowelled Joint

Dowels are hardwood pins that come in a variety of sizes. Holes are drilled and lined up to fit dowels tightly.

Dragging

A finishing technique that involves pulling a comb through wet paint and proceeding to wipe the paint-coated comb teeth across your project.

Edge guide

A straightedge that is used to guide tools, such as a circular saw or router, along a work piece.

Finishing Nails

These have a smaller head than a common nail and are thinner. Finishing nails are usually set into the wood, the hole is then covered up with putty so that it does not show.

Frame Saw

Used for making curved cuts. A frame holds the fine blade firmly. The coping saw is the most common type of frame saw.

Featherboard

A piece of wood with thin "fingers" that holds a board against a fence or down against the table of a power tool, such as a table saw or router.

Grain

The size, alignment, and color of wood fibres in a piece of lumber.

Grit

A measure of the size of abrasive particles used in the manufacturing of sandpaper. Grit can also be measured as the number of particles in an square inch of sandpaper surface.

Hand Drill

This is a great tool that looks like an eggbeater! It has a clamp at one end called a chuck that will hold different sizes of smaller drill bits. It is powered by turning the crank.

Hand Saws

Hand saws have a metal blade with teeth and a handle made of wood or plastic. The teeth cut a path (kerf) through the wood. Saws have set teeth. This means that the teeth are bent alternately from side to side, so that the kerf is wider than the actual saw. This helps prevent the saw getting stuck when cutting wood.

Hammer

A tool meant to deliver an impact to an object. The most common uses are for driving nails, fitting parts, and breaking up objects. Hammers are often designed for a specific purpose, and vary widely in their shape and structure.

Hardwood

Hardwoods come from deciduous trees with broad leaves and which produce seeds from true flowers. Hardwoods include oak, elm, maple, cherry and teak.

Imperial System of Measurement

Traditional system of weights and measures used officially in Great Britain from 1824 and used in Canada until the adoption of the metric system. The United States' customary system of measurement is derived from the Imperial system.

Increment Borer

A hollow, auger-like instrument used to bore into the tree trunk to remove a wood core that shows the tree's growth rings. A way for experienced woodworkers to tell the age of a tree without having to cut it down.

Intarsia

A form of wood inlaying that is similar to marquetry.

Isometric

A drawing that made to approximate a perspective, as in to give an idea of it. For the purpose of this project, an isometric drawing shows what an object would look like from one side and a bit below your eyes (like the perspective you would have if you were looking down at something on a table).

Jig

A device used to make special cuts, guide a tool, or aid in woodworking operations.

Kerf

The groove left in a board when cut by a saw blade. Also referred to as the “saw cut”.

Kickback

When a work piece is thrown back, in the opposite direction the cutter is turning.

Knot

A part of the tree where a branch has been over grown by the tree and incorporated into its trunk.

Lumber

Logs that have been sawn, planed and cut to length.

Marking Gauge

A device used to mark out lines for cutting and other operations.

Measuring Tapes

These come in various sizes, colours and lengths. They are very handy and can even measure a curved surface. The tip of the measuring tape must be securely fastened, or it will give an inaccurate measurement.

Metric System

The decimal measuring system with the metre, litre, and gram (or kilogram) as units of length, volume and mass. A user-friendly system in that it works in multiples of 10 (and is therefore divisible by 10).

Mitre gauge

A tool that slides in a slot on a power tool such as a table saw, router table, band saw, etc. A mitre gauge can be adjusted to different angles and is used to slide the stock past the blade.

Mitred Corner

A corner joint formed by cutting bevels of equal angles at the ends of each piece of material. Usually both sides of a mitred corner are beveled at a 45-degree angle to form a 90-degree corner.

Nail Set

Used to push the head of a finishing nail or brads into the wood a bit further so that the hole can be covered up with putty.

Nuisance Filter

Is a disposable paper filter mask that is used when sanding in order to filter out small wood particles created as a result of sanding. Nuisance filters screen out particles that are smaller than 10 microns, which are the size of lung-harming wood particles.

Orbital Sanders

An electric sander that moves in a circle up to 20,000 spins in a minute.

Orthographic

This drawing type of drawing splits the object into different views, such as the top, the sides and the front. It is also drawn to scale.

Pencil Compass

Use the compass to draw circles for projects. Set the compass so that the pencil tip and needle point meet when the compass is closed. Always have a piece of cardboard or scrap wood under the compass point so you do not scratch surfaces underneath.

Penetrating Finishes

Wood treatments that soak into the wood fibres so that the grain of the wood can still be seen.

Pilot Hole

A pilot hole is a smaller hole drilled into a material prior to a larger hole being drilled, widening the hole to the desired width.

Power Drills

Power drills speed up the job of drilling holes. Most drills will also work in reverse, which is very helpful if you have to remove screws with a special bit.

Power Sanders

Most woodworking shops have two kinds of power sanders - the belt sander and the vibrating sander. They are used for larger sanding jobs and can use a variety of grits of sandpapers. Power sanders can do the job faster than sanding by hand.

Pulp Trees

Small trees and saplings that will be ground to produce paper. Lumber farmers often over-plant their acreage and remove smaller trees for pulp as the crop matures.

Rag Rolling

A finishing technique that involves rolling a dry, clean ruffled rag through the paint and over the piece that you would like to see finished using this technique.

Rabbet

A cut partway through the edge of a board that is used as a part of a joint.

Radial Shrinkage

Shrinkage in a piece of lumber that occurs across the growth rings as it begins to dry.

Rasp

Woodworkers use rasps to shape wood and smooth rough surfaces. Rasps look like a coarse file with a handle on one end. Rasps quickly remove excess wood with their coarse teeth. A rasp only removes wood as it moves forward. Pick it up and lift it back to the start, to take another stroke. Rasping is done before sanding.

Respirator

A mask worn over the face to prevent dust and wood particles from being inhaled. Respirators, if they selected and fitted properly over the face, will filter out dust particles down to 1 micron. The respirator packaging should indicate the level of protection and the hazard addressed.

Rip Saw

Has half as many teeth than the common saw. Use the rip saw to cut along the length of a board.

Router

It is designed to cut across and along wood edges. Examples of router work include table edges, signs, grooves and clean-cut holes.

Sandpaper

A sheet of abrasive-coated paper that is used for smoothing rough surfaces

Scratch Awl

Use a scratch to mark wood precisely for cutting. An awl is extremely sharp and strong.

Screwdriver

A tool with a shaped tip to fit into the head of a screw. The most common screwdrivers in Canada are the slot, the Robertson and the Phillips.

Shim

A thin slip or wedge of metal, wood, etc., used for filler to drive into crevices.

Slab

A broad flat piece of wood cut directly from the log, often with bark on both edges.

Softwoods

Generally lumber from a conifer such as pine or cedar. The name softwood does not refer to the density of the wood. There are some hardwoods, such as Balsa, which are softer than some softwoods, like Southern Yellow Pine.

Splattering

A finishing technique that involves using an old toothbrush or paint brush to speckle paint all over your nearly-finished product.

Steel Combination Square

A combination square can measure for both 45 and 90-degree angles. It can be used to measure for mitre joints. This tool is also adjustable.

Steel Utility Square or Framing Square

Builders use this square to construct buildings. Its greater length makes it more accurate.

Surface Finishes

Paint, varnish, shellac and lacquer are all examples of surface finishes.

T-Bevel

Used to layout mitres or to test mitred corners or beveled or chamfered edges. Another valuable use is duplicating an existing angle: loosen the screw to free the blade. Find the angle you are checking, then tighten the screw

Try Square

This tool looks like a ruler with a handle attached at a right angle (90 degrees).

It is used to test if two surfaces are at 90 degrees. This is important because most woodworking projects assume that parts are square (positioned at a right angle) to each other.

Vibrating Sander

Vibrating sanders work by shaking or vibrating a piece of sandpaper attached to a plate that is attached to its motor.

Warp

A defect in lumber characterized by a bending in one or more directions.

Yellow Glue

Also known as “carpenter’s glue” and is an excellent fastening agent.

Glossary Resources

Wood Zone web site: www.woodzone.com/glossary-5.htm#sectU

California Forest Products Commission: www.calforests.org/glossary.html

Online Encyclopedia Britannica: <http://www.britannica.com>

Canadian Oxford Dictionary, 2006

APPENDIX

Conversion Charts

Note: although Canadian building codes are often in metric, lumberyards in Canada generally use the U.S. imperial system – check with your lumberyard to make sure your figures add up.

Approximate Conversions from Standard / US Units to Metric (SI) Units

When you know	Multiply by	To get
Length / Distance		
Inches (in, ")	25.4	Millimeters (mm)
Feet (ft, ')	0.305	Metres (m)
Yard (yd)	0.914	Metres (m)
Mi (miles)	1.61	Kilometres (km)
Area		
Square inches (in ²)	645.2	Square millimeters (mm ²)
Square feet (ft ²)	0.093	Square metres (m ²)
Square yard (yd ²)	0.836	Square metres (m ²)
Acres (ac)	0.405	Hectares (ha)
mi ²	2.59	Square kilometers (km ²)
Volume		
Fluid ounces (fl oz)	29.57	Milliliters (mL)
Gallons (gal)	3.785	Litres (L)
Cubic feet (ft ³)	0.028	Cubic metres (m ³)
Cubic yards (yd ³)	0.765	Cubic metres (m ³)
Mass		
Ounces (oz)	28.35	Grams (g)
Pounds (lb)	0.454	Kilograms (kg)
Short tons - 2000 lb (T)	0.907	Megagrams - or "metric ton" (Mg or "t")
Temperature		
Fahrenheit (°F)	(F-32) x 5 / 9 or (F-32) / 1.8	Celsius (°C)

Source: Adapted from Science Made Simple.

http://www.sciencemadesimple.com/metric_conversion_chart.html

Approximate Conversions from Metric (SI) Units to Standard / US Units

When you know	Multiply by	To get
Length / Distance		
Millimeters (mm)	0.039	Inches (in, ")
Metres (m)	3.28	Feet (ft,')
Metres (m)	1.09	Yard (yd)
Kilometres (km)	0.621	Mi (miles)
Area		
Square millimeters (mm ²)	0.0016	Square inches (in ²)
Square metres (m ²)	10.764	Square feet (ft ²)
Square metres (m ²)	1.195	Square yard (yd ²)
Hectares (ha)	2.47	Acres (ac)
Square kilometers (km ²)	0.386	mi ²
Volume		
Milliliters (mL)	0.034	Fluid ounces (fl oz)
Litres (L)	0.264	Gallons (gal)
Cubic metres (m ³)	35.314	Cubic feet (ft ³)
Cubic metres (m ³)	1.307	Cubic yards (yd ³)
Mass		
Grams (g)	0.035	Ounces (oz)
Kilograms (kg)	2.202	Pounds (lb)
Megagrams - or "metric ton" (Mg or "t")	1.103	Short tons - 2000 lb (T)
Temperature		
Celsius (°C)	1.8 Celsius + 32	Fahrenheit (°F)

Source: Adapted from Science Made Simple.

http://www.sciencemadesimple.com/metric_conversion_chart.html

References

- Alberta 4-H Woodworking Member Manuals and Leaders' Guides, Level 1-3
- Alberta Forest Products: http://albertaforestproducts.ca/industry/facts_figures.aspx
- Baylor, Chris. About.com: <http://woodworking.about.com/od/plywood/p/Plywood.htm>. 2008.
- Baylor, Chris. About.com: <http://woodworking.about.com/od/plywood/p/PlywoodGrades.htm>. 2008
- Bridgewater, Alan and Gill. 100 Keys to Woodshop Safety. Popular Woodworking Books. 1996
- Canadian Forest Service, National Resources Canada: <http://cfs.nrcan.gc.ca/index/forestindustryinCanada>
- Canadian Forests: <http://www.canadian-forests.com>
- Canada Global Warming: www.canadaglobalwarming.com/
- CBC Digital Archives: <http://archives.cbc.ca/environment/>
- Canada's Safety Council: <http://www.safety-council.org/info/OSH/firstaid.html>
- Canadian Standards Association (CSA) www.csa.ca
- Environment Canada, Youth. www.on.ec.gc.ca/community/youth/ec-educators-e.html
- Forest Products Association of Canada: www.certificationcanada.org/english
- Forest Stewardship Council (FSA): www.fscus.org
- Hermosa Beach City School District – Scroll Saw Safety. <http://hbcasd.org/safety/scrollsaw.pdf>. Accessed September 8, 2009
- Hutcheson, Rick. Rick Hutcheson's Scrollsaw Information. <http://www.scrollsaws.com/>. Accessed September 7, 2009. Includes free scroll saw tip videos, and patterns available for purchase.
- Trees are Good – Tree Care Information: http://www.treesaregood.com/treecare/tree_benefits.aspx
- Idaho Forest Product Commission: www.idahoforests.org/wood_you.htm
- Idaho Forest Product Commission, “Forests Are for Kids” page: <http://www.idahoforests.org/kids1.htm>
- Industry Canada website, the Canadian Forest Industries. <http://www.ic.gc.ca/eic/site/fi-if.nsf/eng/home>
- Peters, Rick. Woodworker's Guide to Wood. Sterling Publishing Company. 2000.

Popular Mechanics: Scroll Saw Comparison.

http://www.popularmechanics.com/home_journal/workshop/1274521.html.

Accessed September 7, 2009.

Pro Woodworking Tips: Scroll Saws.

http://www.prowoodworkingtips.com/Scroll_Saws.html. Accessed September 7, 2009

Ontario Forest Industries Association: http://www.ofia.com/faq/pulp_paper.html

Real Trees 4 Kids: www.realtrees4kids.org/sixeight/stemsrings.htm

Red Cross: <http://www.redcross.ca/article.asp?id=620&tid=021>

“Safety and Health Topics -Wood Dust”. U.S. Department of Labor

<http://www.osha.gov/SLTC/wooddust/index.html>, accessed August 13, 2009.

Sawdustmaking 101 – Scroll Saws.

http://sawdustmaking.com/USING%20SCROLL%20SAWS/scroll_saw.htm. Accessed

September 8, 2009

Science Made Simple.

http://www.sciencemadesimple.com/metric_conversion_chart.html

Scroll Saw Goodies. <http://www.scrollsawgoodies.com/> Accessed September 7, 2009.

Includes a range of online tutorials.

Shopsmith Inc. Woodworking Tools and Accessories.

<http://www.shopsmith.com/academy/scrollsaw/021003.pdf>. Accessed September 7, 2009

Sizes. <http://www.sizes.com/tools/nails.htm>.

St. John’s Ambulance: <http://www.sja.ca/Alberta/Training/AtHome/Pages/default.aspx>

St. Louis County’s (Minnesota) website: [www.co.st-](http://www.co.st-louis.mn.us/slcportal/Portals/0/Departments/Land/People%20and%20forests/lisfro)

[louis.mn.us/slcportal/Portals/0/Departments/Land/People%20and%20forests/lisfro](http://www.co.st-louis.mn.us/slcportal/Portals/0/Departments/Land/People%20and%20forests/lisfro)
[mtrees.pdf](http://www.co.st-louis.mn.us/slcportal/Portals/0/Departments/Land/People%20and%20forests/lisfro)

Sustainable Forestry Initiative Program (SFI): www.sfiprogram.org

United States Environmental Protection Agency:

<http://epa.gov/climatechange/kids/greenhouse.html>

Valcourt Installations, Inc.

<http://www.valcourtinstallations.com/hardwood%20page3.html>

Wikipedia: Scroll Saws. http://en.wikipedia.org/wiki/Scroll_saw. Accessed September 7, 2009

Wood Zone. <http://www.woodzone.com/properties.htm#sectH>

Work Safe BC: <http://www2.worksafebc.com/Safety/Home.asp>