

**Woodworking
Tools**

Jigsaws and Reciprocating Saws



Teacher's Guide

SHOPWARE

Introduction

This Teacher's Guide provides information to help you get the most out of *Jigsaws and Reciprocating Saws*, part of the *Woodworking Tools* series. The contents in this guide will allow you to prepare your students before they use the program, assist them as they navigate through the contents, and present follow-up activities to reinforce the material's key learning points.

Woodworking Tools is a 16-part series of programs that address the safe operation of the most popular and useful types of woodworking tools. Each program delves into a different tool, including its purpose and associated parts. It teaches students how to choose the proper blade or bit for the task and perform the various woodworking operations that can be accomplished with a particular tool. The 16 videos in this series enable and encourage students to safely and creatively use power tools to their maximum proficiency.

Jigsaws and Reciprocating Saws is a 16-minute video targeted to teenagers and young adults. Its content is appropriate to such curriculum areas as Technology Education, Trade, and Industrial Education. In addition, the information presented in this series could also be presented in vocational/technical schools or adult education courses that focus on shop, carpentry, woodworking, or construction education and research.

Learning Objectives

After watching each video program in the series, students will be able to:

- Identify which tools are best for which job in the wood shop.
- Understand how to safely operate a variety of woodworking tools.
- Demonstrate how to safely clean, maintain, and sharpen a variety of woodworking tools.
- Explain how to change and adjust bits, blades, and other elements of a variety of woodworking tools.

Educational Standards

The *Jigsaws and Reciprocating Saws* video program correlates with the following standards:

- The competency standards for Core Curriculum and Carpentry from the National Center for Construction Education & Research;
 - The State Standards of Essential Knowledge and Skills for Trade and Industrial Education (Construction-Maintenance Systems, High School) for the State of Texas;
 - The Technology Education Standards (Tools, Resources, and Technological Processes) for the State of New York.
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- 2.0 Career Cluster: Architecture and Construction Careers in designing, planning, managing, building and maintaining the built environment. (*Competency Standards for Core Curriculum and Carpentry from the National Center for Construction Education & Research.*)
 - The student knows the function and application of the tools, equipment, technologies, and materials used in construction carpentry. The student is expected to safely use hand and

power tools and equipment commonly employed in carpentry. The student demonstrates knowledge of new and emerging technologies that may affect construction carpentry. (*Texas State Standards on Building Carpentry: Essential Knowledge and Skills for Trade and Industrial Education—Construction-Maintenance Systems, High School*)

- The student knows the function and application of the tools, equipment, technologies, and materials used in mill and cabinetmaking. The student is expected to safely use hand and power tools and equipment commonly employed in mill and cabinetmaking; properly handle and dispose of humanly and/or environmentally hazardous materials used in mill and cabinetmaking; utilize the proper procedures in sawing, planing, shaping, turning, boring, mortising, and sanding various types of woods; demonstrate knowledge of numerically-controlled and computer-controlled production devices; and demonstrate knowledge of new and emerging technologies that may affect mill and cabinetmaking. (*Texas State Standards on Mill and Cabinetmaking: Essential Knowledge and Skills for Trade and Industrial Education—Construction-Maintenance Systems, High School*)
- The student applies technological knowledge and skills to design, construct, use, and evaluate products and systems to satisfy human and environmental needs. The student uses a variety of materials and energy sources to construct things; understands the importance of safety and ease of use in selecting tools and resources for a specific purpose; and develops basic skills in the use of hand tools. (*New York State Standards on Technology Education—Tools, Resources, and Technological Processes*)

Program Summary

Regardless of whether a student wants to gain an overall understanding of the myriad of wood-working tools available in today's wood shops, or just focus on one specific tool's features and capabilities, the *Woodworking Tools* series will be an invaluable visual learning aid. By emphasizing safety issues, the series allows students to understand not only which tools are best for each kind of job in the wood shop, but also how to operate, clean, maintain, and sharpen the wood-working tools for maximum efficiency and safety.

The *Woodworking Tools* video program series consists of sixteen titles:

- Table Saws
- Cutoff Saws
- Radial Arm Saws
- Band Saws and Scroll Saws
- Routers
- Jointers
- Planers
- Lathes
- Power Nailers
- Drill Presses
- Drills and Drivers
- Stationary Sanders

- Circular Saws
- Jigsaws and Reciprocating Saws
- Rotary Tools, Bench Grinders, and Sharpeners
- Building a Workcenter

Jigsaws and Reciprocating Saws presents an overview of the features and blades of these two types of power cutting tools, and demonstrates how to operate them safely.

Main Topics

Topic 1: Introduction

The program's host, Pete Bilotta, introduces the viewer to both the jigsaw and the reciprocating saw.

Topic 2: Overview

In this section, Pete explains how the two types of tools work by reviewing their motion and action.

Topic 3: Blades

The important considerations for blade selection, namely, TPI, tooth set, and blade construction, are discussed in detail. Then, Pete reviews both how to change a blade and how to prolong blade life.

Topic 4: Safe Operating Techniques for Jigsaws

The host demonstrates how to crosscut a board, make a bevel cut, cut a circle, cut an opening in wall paneling to accommodate electrical outlets, and make a plunge cut. He also shows how to use a scroll blade to cut a tight curve and a standard blade to do the same in a thick piece of material.

Topic 5: Safe Operating Techniques for Reciprocating Saws

In this section, the viewer learns how to make a plunge cut, cut a piece of metal, and adjust the saw base to help get the maximum use from blades.

Topic 6: Key Points

The program concludes with an overview of the key points that have been discussed.

Fast Facts

- The first jigsaw puzzles were made using an unpowered jigsaw.
- A jigsaw is similar to the rasp and the chisel in that it is usually used in a more artistic fashion than other saws that can only cut in straight lines.
- In the past, what are now usually called scroll saws were often referred to as jigsaws.

- Cordless jigsaws are convenient in areas where extension cords are difficult to use. They're best suited to cutting wood and wood products, and are available in both 12 volt and 18 volt models. Corded jigsaws don't depend on batteries for power and are better suited for tough cutting jobs or continuous use. Their motors range from 3.5 to 6 amps.
- In addition to High Speed Steel (HSS) and bi-metal blades, there are other materials available: cobalt steel blades are harder than HSS or bi-metal blades and should last longer; carbide grit blades are used to cut masonry board; and scrolling blades are narrower than typical jigsaw blades and can make tighter turning cuts.
- HSS is a superior material to the older high carbon steel in that it can withstand higher temperatures without losing its temper (hardness). Because of this, HSS can cut metal at a higher speed than high carbon steel (hence, the name high speed steel).
- Reciprocating blades are available in a variety of lengths and thicknesses according to the material to be cut, including pruning blades and blades that cut nails.
- The blade-stroke on a reciprocating saw is generally about one inch to 1 1/4" per stroke.
- Always use caution when using a reciprocating saw to cut through a wall in a remodeling project. The blade will not only cut through the sheet rock, but may also accidentally cut into plumbing or wiring underneath.
- In 1952, Milwaukee Electric Tool Co. introduced the first reciprocating saw, called the Sawzall.

Vocabulary Terms

Allen wrench: A tool consisting of an L-shaped bar with a hexagonal head, used to turn screws with hexagonal sockets.

bevel: Two surfaces meeting at an angle other than 90°.

bevel scale: A scale that indicates tilt settings.

bi-metal blade: A blade that consists of two different metals, such as a strip of high speed steel welded to a carbon steel backing, making it suitable for both metal and wood applications.

crosscutting: The process of cutting a board at approximately a right angle to the grain direction.

cutting oil: Liquid or paste that helps prolong the life of a blade by reducing cutting temperature.

dowel: A fastener that is inserted into holes in two adjacent pieces and holds them together.

eccentric: A part of the gear housing assembly that moves the shaft back and forth as the gear turns to produce carving action.

full-face shield: A shield that provides the highest level of eye protection from flying chips and debris.

hearing protection: Ear muffs, plugs, or pods that protect one's hearing.

High Speed Steel (HSS) blades: Blades usually used for cutting hardwoods, such as oak and cherry, and non-ferrous metals, steel, reinforced plastic, and chipboard.

jigsaw: A sawing machine with a narrow, vertically reciprocating saw used to cut circles, curves, and intricate patterns in thin boards and other materials.

kerf: A groove or notch made by a cutting tool.

orbital action: When the blade moves side to side as well as up and down. The added motion allows the saw to cut through stock faster.

plunge cut: A cut made in the interior of the workpiece that receives another piece to form a joint.

reciprocating saw: A portable power saw with a straight blade that moves back and forth like a jigsaw but is much more powerful and versatile. If fitted with the correct blade it can cut through virtually anything, but makes rougher cuts compared with other types of saws; thus, it is generally used for demolition work.

reverse tooth blade: A blade made for cutting on the downstroke, designed to reduce splintering on the top surface of veneers and plywood.

scroll blade: A blade with a narrow body designed exclusively for cutting tight curves.

scrolling feature: A feature of some jigsaws, which allows a blade to swivel independently of the saw. A tight radius is cut by turning a knob on top of the saw, rather than turning the saw itself.

straightedge: A rigid flat rectangular bar, as of wood or metal, with a straight edge for testing or drawing straight lines.

teeth per inch (TPI): The number of teeth per inch on a blade. Blades with fewer teeth cut faster but leave a rough edge, while blades with more teeth cut slower but produce a smoother finish.

tooth set: Also called a blade profile, it is a factor that affects cutting performance. The most common blade profiles are the wavy set and the raker set. In a wavy set, groups of three teeth are alternately set in opposite directions, and separated by a single straight tooth. In a raker set, the teeth are grouped in threes, with the teeth set right, left, and center.

vises: A clamping device, usually consisting of two jaws closed or opened by a screw or lever, used to hold a piece in position.

Pre-Program Discussion Questions

1. For what purpose is a jigsaw primarily designed? For what would you use a reciprocating saw?
2. What does the motor drive in a jigsaw? What does it drive in a reciprocating saw?
3. Why do you think it would be important to have variable speed control on a saw?

Post-Program Discussion Questions

1. What are the three most important considerations to keep in mind when selecting a blade?
2. What is another name for “tooth set”? What are the most common tooth sets? What are the two basic types of blade construction?
3. Explain the three kinds of motion or action that occur with jigsaws and reciprocating saws.
4. How do you change the blade on older jigsaws and reciprocating saws? On newer models?
5. What are ways to extend the life of saw blades?

Individual Student Projects

- Have students practice cutting various materials such as hardwoods, non-ferrous metals, steel, reinforced plastic, and chipboard. Ensure that they try both high speed steel and bi-metal blades. Then, have them write a paper or create a presentation on which type of blade they prefer for each material, and why.

Group Activities

- As a class, review and practice the procedure for changing a blade on an older jigsaw. Then, change the blade on a new model to demonstrate how much easier the process is.
- Divide your class into small groups and assign them one of the following tasks to be done using a jigsaw: Crosscut a board; Make a bevel cut; Cut a circle; Cut an opening in wall paneling to accommodate electrical outlets; Make a plunge cut. Have each group discuss, practice, and write down the steps necessary to complete the task, and conclude the activity by demonstrating the safe and proper techniques for the other groups.

Internet Activities

- Have your students research possible projects on the Web sites listed later in this guide, locating steps in the project that call for the use of jigsaws and reciprocating saws.

Assessment Questions

- Q1:** *Fill in the blanks with either “orbital action,” “reciprocating motion,” or “rotary motion”:*
The _____ of an electric motor is converted into _____ at the blade. And _____ allows the blade to move in and out of the cut so the saw can cut more aggressively but reduce blade wear.
- Q2:** What are the three most important considerations to keep in mind when selecting a blade?
- Q3:** Ideally, how many teeth should be in contact with the material at all times?
- Q4:** In general, what is the TPI of wood cutting blades?
- Q5:** When cutting metals, you should use a blade with at least _____ TPI.
- Q6:** *Fill in the blanks with either “fewer” or “more”:* Blades with _____ teeth cut slower but produce a smoother finish, while blades with _____ teeth cut faster but leave a rough edge.
- Q7:** *Fill in the blanks with “raker,” “wavy,” “general-purpose,” or “metal cutting”:*
In a _____ set, the teeth are grouped in threes, with the teeth set right, left and center; this is common on _____ blades. In a _____ set, groups of three teeth are alternately set in opposite directions, and separated by a single straight tooth; this is best suited for _____ cutting blades.
- Q8:** True or False: Reciprocating saw blades may be installed with the teeth facing up or down.
- Q9:** When using a jigsaw to cut a circle, what you should you ensure before starting the saw?
- Q10:** True or False: Since most jigsaw blades are designed to cut on the downstroke, always make your cuts with the best side of the piece facing up. This will limit any splintering to the back side of the piece.
- Q11:** True or False: If you’re using a reverse tooth blade, which is made for cutting on the downstroke, make sure the best side of the workpiece faces up.
- Q12:** True or False: When making a plunge cut with a jigsaw, never use a scroll blade or a reverse tooth blade.

Assessment Questions Answer Key

Q1: *Fill in the blanks with either “orbital action,” “reciprocating motion,” or “rotary motion”:*

The _____ of an electric motor is converted into _____ at the blade. And _____ allows the blade to move in and out of the cut so the saw can cut more aggressively but reduce blade wear.

A1: The **rotary motion** of an electric motor is converted into **reciprocating motion** at the blade. And **orbital action** allows the blade to move in and out of the cut so the saw can cut more aggressively but reduce blade wear.

Q2: **What are the three most important considerations to keep in mind when selecting a blade?**

A2: When selecting a blade, the most important considerations are teeth per inch (TPI), tooth set, and blade construction.

Q3: **Ideally, how many teeth should be in contact with the material at all times?**

A3: Whether you’re using a jigsaw or a reciprocating saw, ideally, there should be three teeth in contact with the material at all times.

Q4: **In general, what is the TPI of wood cutting blades?**

A4: Generally, wood cutting blades have 6 to 12 teeth per inch.

Q5: **When cutting metals, you should use a blade with at least _____ TPI.**

A5: When cutting metals, use a blade with at least 18 teeth per inch.

Q6: *Fill in the blanks with either “fewer” or “more”:* **Blades with _____ teeth cut slower but produce a smoother finish, while blades with _____ teeth cut faster but leave a rough edge.**

A6: Blades with **more** teeth cut slower but produce a smoother finish, while blades with **fewer** teeth cut faster but leave a rough edge.

Q7: *Fill in the blanks with “raker,” “wavy,” “general-purpose,” or “metal cutting”:*

In a _____ set, the teeth are grouped in threes, with the teeth set right, left and center; this is common on general-purpose/metal cutting blades. In a _____ set, groups of three teeth are alternately set in opposite directions, and separated by a single straight tooth; this is best suited for general-purpose/metal cutting blades.

A7: In a **raker** set, the teeth are grouped in threes, with the teeth set right, left and center; this is common on **general-purpose** blades. In a **wavy** set, groups of three teeth are alternately set in opposite directions; this is best suited for **metal cutting** blades.

Q8: **True or False: Reciprocating saw blades may be installed with the teeth facing up or down.**

A8: This statement is true. Reciprocating saw blades may be installed with the teeth facing up or down to suit your cutting requirements.

Q9: When using a jigsaw to cut a circle, what you should you ensure before starting the saw?

A9: Before starting the saw, be sure the blade is not contacting the material.

Q10: True or False: Since most jigsaw blades are designed to cut on the downstroke, always make your cuts with the best side of the piece facing up. This will limit any splintering to the back side of the piece.

A10: This statement is false. Since most jigsaw blades are designed to cut on the upstroke, always make your cuts with the best side of the piece facing down to limit any splintering to the back side of the piece.

Q11: True or False: If you're using a reverse tooth blade, which is made for cutting on the downstroke, make sure the best side of the workpiece faces up.

A11: This statement is true.

Q12: True or False: When making a plunge cut with a jigsaw, never use a scroll blade or a reverse tooth blade.

A12: This statement is true.

Additional Resources

About.com: Woodworking

<http://woodworking.about.com>

Encarta Encyclopedia: Woodworking

http://encarta.msn.com/encyclopedia_761570306/Woodworking.html

Inside Woodworking: Free Online Woodworking Magazine

<http://www.inside-woodworking.com/tools/PowerTools.html>

WoodNet.net: The Woodworker's Online Resource

<http://www.woodnet.net/tips/index>

Woodworker's Information and Plans for Woodworkers: WOOD Magazine

<http://www.woodmagazine.com>

Woodworking Shop Safety Tips

http://www.wood-worker.com/articles/shop_safety.htm

Woodzone.com

<http://www.woodzone.com/tips.htm>

Available from Films Media Group • www.filmmediagroup.com • 1-800-257-5126

Multimedia Woodshop Safety

- Windows/Macintosh CD-ROM #20466

Multimedia Woodshop Safety uses video and animation sequences, along with still photos, to provide an overview of shop practices including stationary woodworking equipment, portable power and hand tools, as well as material storage and handling. In addition to the usual shop safety practices, the user is also reminded of the hazards of horseplay, loose clothing, and lack of concentration on the job. As the viewer moves into the arenas of stationary woodworking equipment and power tools, he is guided through an inspection for evidence of loose fittings, bad wiring and/or grounding, and poor tool use of lathe, drill press, and band and bench saws. The program segment dealing with materials storage offers ideas which facilitate safety and accessibility. Issues of wood stacking, container labeling, chemical mixing, hazardous materials handling, and lighting are addressed. Part of the Series *Shop Safety*. A Shopware Production. ©1996.

Portable Power Woodworking Tools

- VHS/DVD-R #26093
- 9-part series

This series features the most popular and useful types of woodworking tools. Students learn the safe operation of each tool, the different models and their purpose, the parts, choosing the proper blade or bit for the task, and the various woodworking operations that can be accomplished

with each tool. A Meridian Production. The series includes: Biscuit Joiner | Circular Saws | Drills | Jigsaws | Power Plane | Reciprocating Saw | Router Bit Magic | Routers | Sanders. (14-20 minutes each)

Safety First: Woodworking Safety

- VHS/DVD-R #14464
- Closed captioned

Covers the most common hand tools and their proper applications. The importance of a clean working environment, preventive maintenance on machinery, and using the correct tool for each job is covered in detail. Also covered are how to check power cords for defects, sharpening and replacing saw blades, and correct body position when using equipment. Part of the series *Safety First: Shop Safety*. A Cambridge Educational Production. (30 minutes) ©1995.

Woodworking

- VHS/DVD-R #26839
- 19-part series

This comprehensive library of low-cost woodworking videos provides all of the information your students need in the world of woodworking, from types of wood, to cutting techniques, to workshop safety. Each video covers a specific topic clearly and comprehensively, giving enormous flexibility in the classroom. Use videos to complement your lesson plans, to introduce new material, to review safety procedures, or as a handy reference for students who need additional help. A Meridian Production. The series includes: Cabinet Doors and Hinges | Cabinet Drawers | Chamfers and Bevels | Crosscutting | Cutting Curves and Circles | Dados and Rabbets | Gluing and Clamping | How to Safely Build with Pressure Treated Wood | Joinery | Measuring Hardwoods | Miter Joints | Outdoor Uses of Pressure Treated Wood | Preparing Hardwood to Use | Rippling | Safety in the Workshop | Smoothing Wood | Uses of Hardwood | Using Veneers | What Is Hardwood. (8-14 minutes each)

Woodworking Equipment Safety

- VHS/DVD-R #20422
- 15-part series
- Closed captioned

This series of fifteen live-action videotapes shows students the proper safety procedures for the set-up and use of stationary and portable woodworking equipment. Viewers are guided through the step-by-step procedures for using safety guards, clamping devices, protective equipment, and more. An excellent series for introducing new students to the joys of safe woodworking and also as a refresher course for experienced craftsmen. A Shopware Production. The series includes: Router Safety | Portable Drill Safety | Saber Saw Safety | Portable Circular Saw Safety | Portable Sander Safety | Drill Press Safety | Scroll Saw Safety | Shaper Safety | Wood Lathe Safety | Jointer Safety | Thickness Planer Safety | Band Saw Safety | Radial Arm Saw Safety | Table Saw Safety | Disk/Belt Sander Safety. (13-33 minutes each)

Woodworking Power Tools

- VHS/DVD-R #26837
- 5-part series
- Closed captioned

This series of live-action videotapes details both basic and advanced operational techniques for each of the five most important and useful woodworking power tools. Clear, sharp, color video graphically portrays the proper operation of each machine, and the correct use of its associated accessories. Close-ups detail how each machine performs cutting, forming, or shaping operations. Shaping procedures and considerations are stressed throughout, emphasizing the proper use of each machine's safety guards. Personal safety procedures and equipment are also thoroughly covered, along with proper housekeeping methods which can help assure that accidents do not occur. This series is recommended for all woodworking students as well as the home craftsman. A Meridian Production. The series includes: Band Saw: Operation & Safety | Jointer/Surfacer & Accessories: Operation & Safety | Radial Arm Saw: Operation & Safety | Table Saw & Accessories: Operation & Safety | Wood Lathe & Accessories: Operation & Safety. (14 minutes each)

Woodworking Tools

- VHS/DVD-R #26836
- 7-part series

This series explains the basic operation of each woodworking tool, how each is adjusted, how blades are changed, and how each is used for specialty operations. Safety is stressed throughout. A Meridian Production. The series includes: Band Saw | Drill Press | Jointer | Planer | Shaper | Table Saw: Safety and Basic Operation | Table Saw: Specialty Operations. (7-26 minutes each)



2572 Brunswick Pike, Lawrenceville, NJ 08648

www.shopware-usa.com

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