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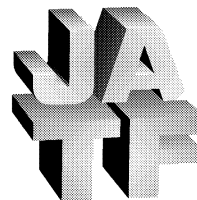
STUDENT'S GUIDE

ower Tool Safety Awareness I

A Curriculum for Members of The
International Union of Painters
and Allied Trades



International Union
of Painters and Allied Trades
Joint Apprenticeship and Training Fund
1-800-276-7289



*A Curriculum for the
members of the
International Union
of Painters and Allied Trades AFL-CIO-CLC*

The IUPAT JATF Educational Program, which involves this series of instructional materials in conjunction with classroom or correspondence-type instruction and on-the-job training, is provided to help maintain a constant supply of qualified workers for the industry. Everyone who enters the trade makes a definite commitment to themselves as well as to the employer. This includes a commitment to work diligently, to learn new techniques as well as improve on those already learned, to maintain an attitude which promotes learning, and to exercise a high degree of maturity in all matters related to the job.

These instructional materials are provided as a supplement to the on-the-job training everyone receives while performing their job. Every journeyman and apprentice must seek to learn from any source at their disposal in a continuing effort to enhance and upgrade their skills. The Industry is in a constant state of change and only through efficient and continued education will our trades remain state-of-the-art.

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Version 2, January 2000
by

**The International Union of Painters and Allied Trades
Joint Apprenticeship and Training Fund**
1750 New York Avenue NW, 8th Floor
United Unions Building
Washington, DC 20006

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Printed in U.S.A.

ACKNOWLEDGMENTS

We are extremely grateful to the following manufacturers and organizations for providing time, photographs, illustrations, and other materials for this book.

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OBJECTIVES

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By the completion of this module the student should be able to:

- Identify the appropriate types of personal protective equipment (such as hearing, eye, or dust protection) and determine when this equipment should be used.
- Demonstrate and/or describe all general safety rules for power tools and follow them.
- Explain the importance of using guards during the operation of power tools.
- Explain the importance of using a properly rated extension cord.
- Demonstrate and/or describe how to properly “ground” a power tool.

NOTES

Many of the tools used in the trades are considered power tools. Power tools can save hundreds of labor hours. They can also be extremely dangerous if used improperly. This topic is not designed to instruct in the step-by-step operating instructions of each power tool. This topic does highlight general safety rules associated with all power tools. To learn each tool's proper operation methods thoroughly read the instruction or owner's manual. Basic safety precautions apply to all power tools and must be followed to reduce the risk of fire, electric shock and personal injury. The following guidelines should be kept in mind whenever power tools are used:

GENERAL SAFETY RULES FOR ALL POWER TOOLS

1. **Know Your Power Tool** (see Figure 1)
-Read the owner's manual and follow all safety instructions. Learn the proper applications of the tool, the limitations, and the specific potential hazards associated with that tool.
2. **Keep Guards in Place** -Keep all guards in place and in proper working order.



Figure 1—Know Your Power Tool

3. **Keep Work Area Clean** (see Figure 2) -Always keep the work area clean. Cluttered areas and benches invite accidents.



Figure 2—Keep Work Area Clean and Well Lit

4. **Avoid Dangerous Environments** (see Figure 3) -Don't expose power tools to the rain. Don't use power tools in damp or wet locations. Do not use power tools when flammable liquids or gases are present. Keep the work area well lit.



Figure 3—Avoid Dangerous Environments

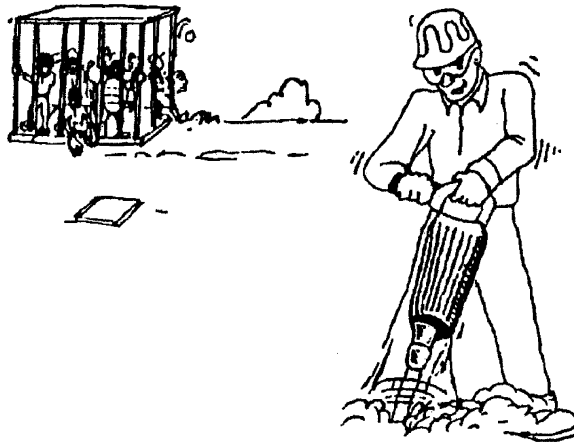


Figure 4—Keep Visitors Away

5. **Keep Visitors Away** (see Figure 4) -All visitors should be kept a safe distance from the work area. Do not let visitors come in contact with power tools or extension cords.

6. **Store Idle Tools** (see Figure 5) When not in use, tools should be stored in a dry environment.



Figure 5—Store Idle Tools

7. **Don't Force Tools** (see Figure 6)
-Never force power tools; they will do the job better and safer at the rate for which they are designed.

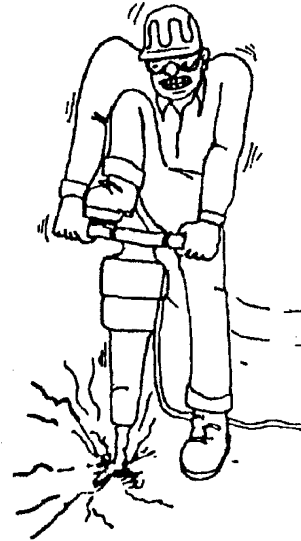


Figure 6—Don't Force Tools

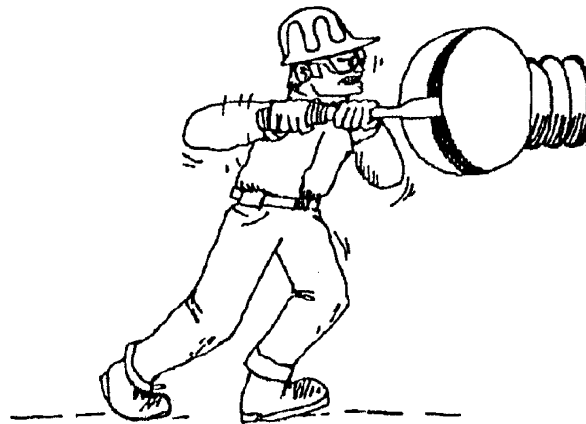


Figure 7—Use The Right Tool

8. **Use the Right Tool** (see Figure 7) -Don't force a small tool or attachment to do the job of a heavy duty tool. Don't use a tool for a purpose for which it's not designed, such as, using a router to drill holes.

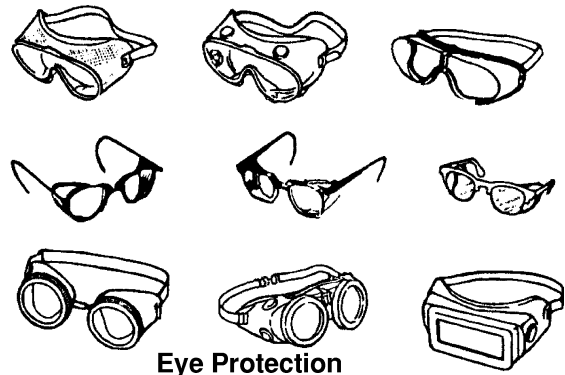
9. **Dress Properly** (see Figure 8) -Don't wear loose clothing or jewelry. They can get caught in moving parts. Rubber gloves and insulated non-skid footwear are recommended when working outdoors. Wear protective hair covering to contain long hair.



Figure 8—Dress Properly

10. **Use Eye Protection**

(see Figure 9) -Use eye protection at all times. Use a face shield when using a bench grinder, disc grinders, abrasive type blades, routers, and other tools that generate flying sparks, metal chips, etc. Also, use a proper dust mask or a respirator if dust is created during a cutting operation.



Eye Protection



Face Shields

11. **Wear Hearing Protection**

(see Figure 9) -Always wear hearing protection when using power tools.



Muffs



Plugs



Sponges



Dust Mask



Respirators

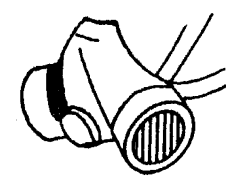


Figure 9—Safety Equipment

12. **Don't Abuse Cords**

(see Figure 10) -Never carry a tool by its cord or yank it to disconnect it from the receptacle. Keep all cords away from heat, oil and sharp edges.



Figure 10—Don't Abuse Cords

13. **Secure Work** (see Figure 11) -Use clamps or a vise to hold work instead of your hands. It's a much safer practice and it frees both hands to operate the tool.

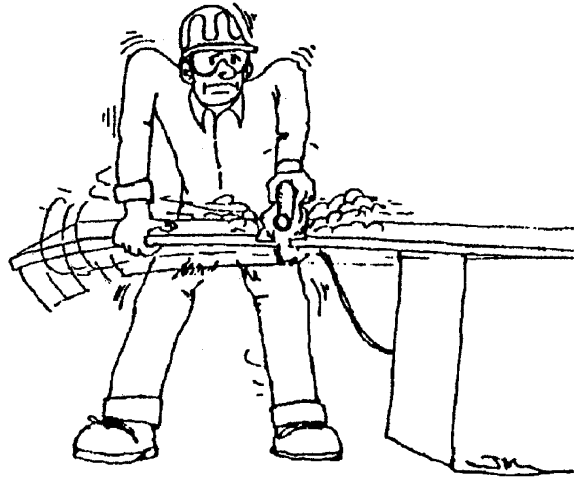


Figure 11—Secure Work

14. **Don't Overreach** (see Figure 12) - Keep proper footing and balance at all times.

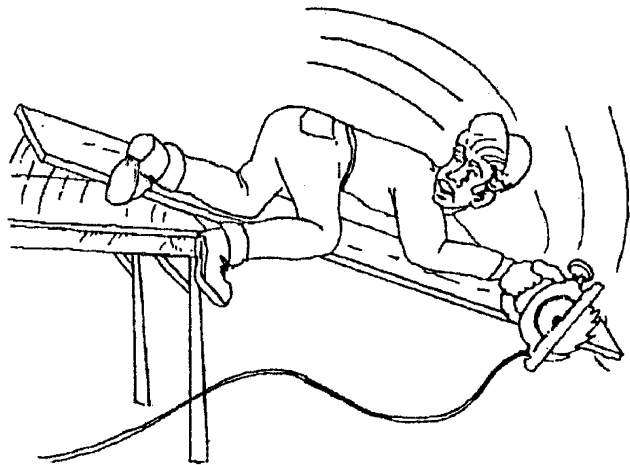


Figure 12—Don't Overreach

15. **Disconnect Tools** (see Figure 13) -When the power tool is not in use, before servicing, when changing accessories, such as blades, bits, cutters, etc. always first DISCONNECT the tool from the power source.

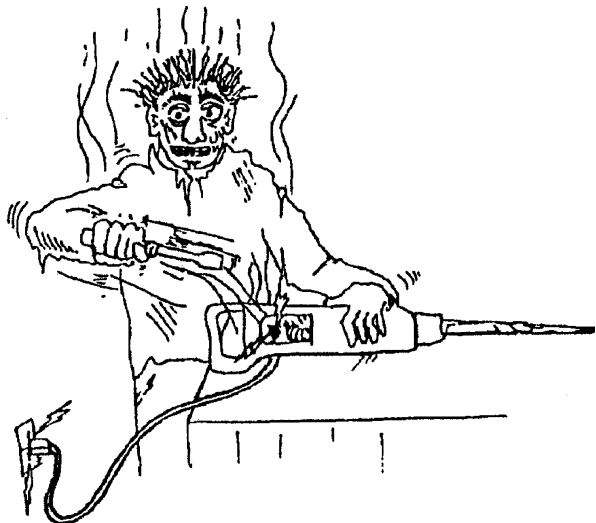


Figure 13—Disconnect Tools

16. **Remove Adjusting Keys and Wrenches** (see Figure 14) -A good habit to form is to always check and make sure that all keys and adjusting wrenches are removed from any tool before turning it on.

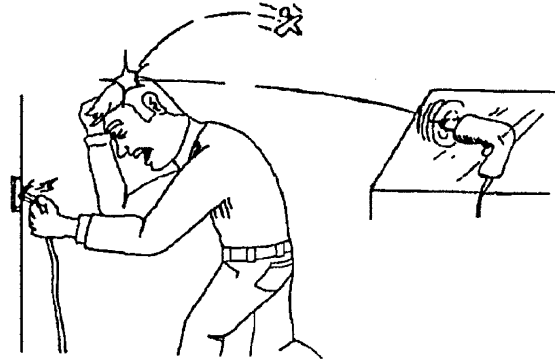


Figure 14—Remove Adjusting Keys And Wrenches

17. **Maintain Tools with Care** (see Figure 15) -Keep tools sharp and clean at all times for the best and safest performance. Follow the manufacturer's instructions concerning lubricating the tool and changing the accessories. Keep handles dry, clean and free of oil or grease. Inspect switches, cord and plug connections, and extension cords prior to each use and have them repaired or replaced by an authorized service facility if damaged. Check all moving parts for alignment and binding as well as for breakage and improper mounting. Damaged parts should be repaired or replaced by an authorized service facility unless otherwise indicated in the instruction book. CAUTION: DO NOT USE CARBON TETRACHLORIDE, or, any other cleaning solvent that may ignite or damage the casing of the tool. When using any solvent, proper protective equipment must be used.



Figure 15—Maintain Tools With Care

18. **Avoid Accidental Starting** (see Figure 16) -Never carry a plugged-in tool with your finger on the switch. Be sure the switch is turned off before plugging in a tool. Do not use a tool if the on or off switch is defective.

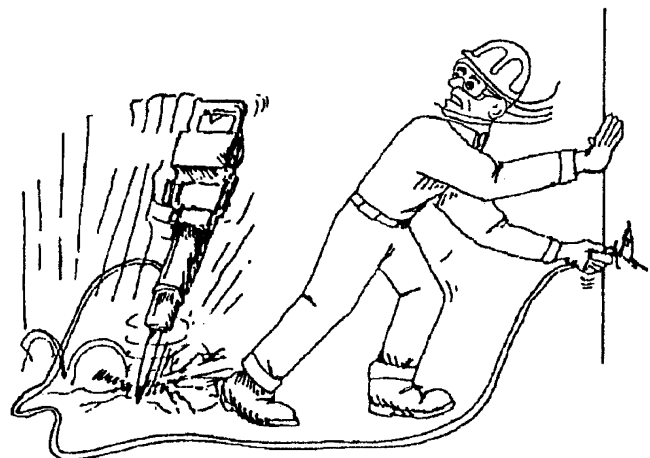


Figure 16—Avoid Accidental Starting

19. **Keep Hands Away From Cutting Edges and All Moving Parts** (see Figure 17)

20. **Never Leave a Tool Running Unattended.** Turn Off the Power -Don't leave a tool until it has come to a complete stop.

21. **Never Stand on a Tool** - Serious injury could occur if the tool is tipped or if the cutting edge of the tool accidentally comes in contact with clothing, other tools, or skin. Figure 16

22. **Guard Against Electric Shock** (see Figure 18) - Prevent body contact with pipes and other grounded surfaces.

23. **Ground All Tools** Unless They Are Double Insulated (see Figure 19) -If the tool is equipped with a three prong plug, it should be plugged into a three hole electrical receptacle. If an adapter is used to accommodate a two hole receptacle, the grounding ear must be attached to the known ground. Never remove the third prong. Electric power operated tools shall either be approved double insulated, be properly grounded, or used with a ground fault circuit interruptor (GFCI).



Figure 17—Keep Hands Away From Cutting Edges And All Moving Parts



Figure 18—Guard All Tools Unless They Are Double



Figure 19—Ground All Tools Unless They Are Double Insulated

24. **Use the Tool's Insulated Surfaces** -Double-insulated tools have two separate insulation barriers between the operator and the electrical current for greater safety. Never hold or support a power tool on its metal surfaces such as on a drill chuck. Hold the tool only by the plastic handles to prevent shock if the tool should come in contact with a "live" wire. A double-insulated or grounded tool may be made live if the blade or bit comes in contact with live wiring. Always check the work area for live wires and hold the tool by the insulated surface when making "blind" or plunge cuts.

25. **Cracked Housings or Handles** -Do not use a power tool if the plastic housing or handle is cracked or deformed. Cracked or deformed parts may lead to the operator receiving an electric shock. The tool must be "red" tagged and removed from service until it can be repaired by a qualified repair person.

26. **Grinding Wheels** -Make sure that the RPM on the grinder does not exceed the RPM of the wheel.

27. **Use Side Handles** (see Figure 20) -Use side handles when supplied with a tool for control and safety. Side handles are commonly found on 1/2" drill motors, hammers or concrete drills.

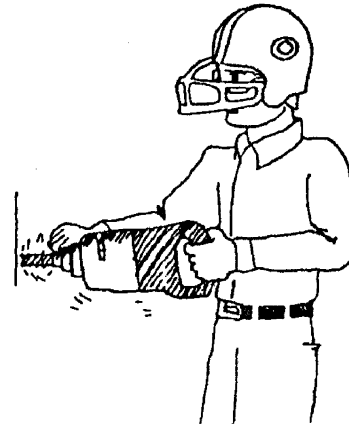


Figure 20—Use Side Handles

28. **Stay Alert** -Watch what you are doing and use common sense. DO NOT talk unnecessarily to others while operating any power tool. DO NOT operate power tools when you are tired.

29. **Use Only Those Tools That Are In Good Condition** -Maintain the tools and use them properly.

30. Report the Following Unsafe Conditions

- Defective or broken insulation on the electrical cord
- Improper or poorly made connections to terminals
- Broken or defective plug
- Loose or broken switch
- Brushes sparking
- Cracked or broken housing or handles

31. **Do Not Operate Tools While Under the Influence of Drugs, Alcohol, Medication, Or When Ill** (see Figure 21) - Remember, your health is too important to take unnecessary risks.



Figure 21—Do Not Operate Tools While Under The Influence Of Drugs, Alcohol, Medication, or When Ill

32. **Outdoor Use Extension Cords** -If a power tool is to be used outdoors, use only extension cords that are intended for this use. They must be marked or rated with the suffix W-A (for UL) or W (for CSA) following the cord type designation to specify that the cord is rated for outdoor use.

33. **Voltage Warning** (see Figure 22) -Before connecting any tool to a power source (receptacle, outlet, etc.) be sure that the voltage supplied is the same as that specified for the tool. A power source with voltage greater than that specified can result in **SERIOUS INJURY** to the user as well as damage to the tool. Using a power source with voltage less than the nameplate rating is harmful to the tool's motor.

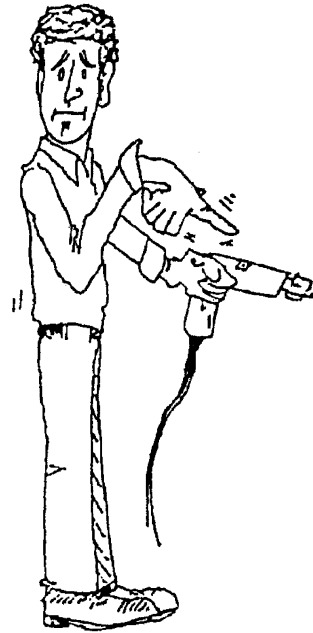


Figure 22—Voltage Warning

34. **Use Safety Equipment** -When using power saws, everyone in the work area should wear proper eye protection with side shields in compliance with current safety standards. Hearing protection should also be worn. If dust is created during a cutting operation, a proper dust mask or a respirator should be worn. Hard hats, face shields, etc. should be used when specified or necessary. Keep a fire extinguisher nearby.

35. **Protect Others** -Protect others in the work area from debris such as chips and sparks. Provide barriers or shields as needed.

36. **Check for Damaged Parts** (see Figure 23) -Inspect guards and other power tool parts before each use. Check for misalignment, binding of moving parts, improper mounting, broken parts and any other conditions that may effect the safe operation of the tool. If abnormal noise or vibration occurs, turn the tool off immediately and have the problem corrected before further use. Do not use a damaged tool. Tag damaged tools "DO NOT USE" until proper repairs are made. Any repair work should be performed by trained service personnel. For all repairs, insist on only identical replacement parts.

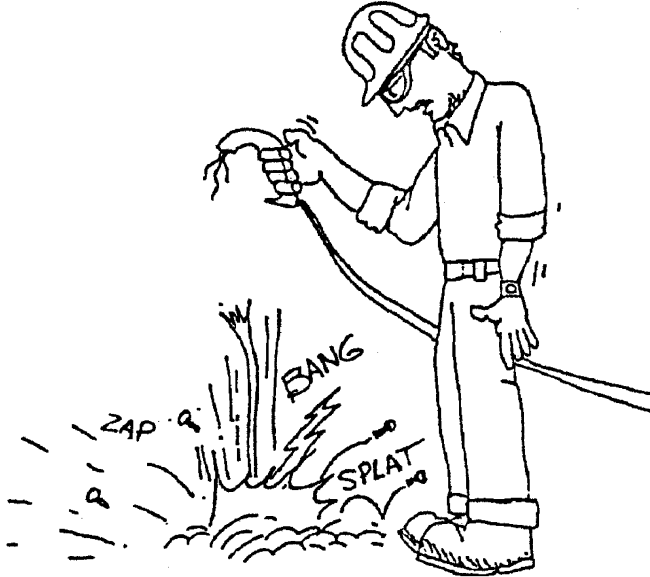


Figure 23—Check For Damaged Parts

USING GUARDS

USING GUARDS

Today, manufacturers' of shop-use power tools would not sell equipment without the appropriate guarding in place. In addition, decals are applied to the power tool to alert the user of the hazards involved in using equipment not properly guarded. Instruction manuals are also provided explaining explicitly the hazards of using power tools without appropriate guards. The mark of a professional is not that he can cheat disaster by working without safeguards; the mark of a professional is refusing to work without safety devices and finding better ways of working with all safeguards in place. Keep blade guards in place and in working order. Never clamp or tie the guard into the open position. Figure 23

No competent foreman or supervisor would ever approve of a machine that lacked safeguards. No competent operator would ever attempt to take a shortcut just because the boss isn't looking. Both should know that a "shortcut" to save a few minutes often leads to a lifetime of regrets.

EXTENSION CORDS

Replace damaged or worn cords immediately. Figure 24 shows the correct size of cord to use depending on the cord length and the nameplate amperage rating of the tool. Also remember that as the distance from the electrical outlet increases, so should the wire size or gauge. If in doubt, use the next heavier gauge of extension cord. An undersized cord will cause a drop in the line voltage which could result in a loss of power and overheating (the smaller the gauge number, the heavier the cord).

It is also important to remember that the smaller the gauge number of the wire, the greater the capacity of the cord. In other words, a 14 gauge cord can carry a higher current than a 16 gauge cord. If more than one extension cord is to be used at one time to make up the total length of the cord, be sure that each cord contains at least the minimum wire size required. If you are using one extension cord for more than one tool, add the nameplate amperes and use the sum to determine the required minimum wire size. Figure 24

| | | Length of Cord in Feet | | | | | | | | | |
|-------------------------|-------|------------------------|--------|---------|---------|---------|---------|---------|---------|---------|----------|
| | | 115V | 25 Ft. | 50 Ft. | 100 Ft. | 150 Ft. | 200 Ft. | 250 Ft. | 300 Ft. | 400 Ft. | 500 Ft. |
| Nameplate Ampere Rating | | 230 V | 50 Ft. | 100 Ft. | 200 Ft. | 300 Ft. | 400 Ft. | 500 Ft. | 600 Ft. | 800 Ft. | 1000 Ft. |
| Nameplate Ampere Rating | 0-2 | 18 | 18 | 18 | 16 | 16 | 14 | 14 | 12 | 12 | 12 |
| | 2-3 | 18 | 18 | 16 | 14 | 14 | 12 | 12 | 10 | 10 | 10 |
| | 3-4 | 18 | 18 | 16 | 14 | 12 | 12 | 10 | 10 | 8 | 8 |
| | 4-5 | 18 | 18 | 14 | 12 | 10 | 10 | 8 | 8 | 6 | 6 |
| | 5-6 | 18 | 16 | 14 | 10 | 10 | 8 | 6 | 6 | 4 | 4 |
| | 6-8 | 18 | 16 | 12 | 10 | 8 | 8 | 6 | 6 | 4 | 4 |
| | 8-10 | 18 | 14 | 12 | 8 | 8 | 6 | 6 | 4 | 4 | 2 |
| | 10-12 | 16 | 14 | 10 | 8 | 6 | 6 | 4 | 4 | 2 | 2 |
| | 12-14 | 16 | 12 | 10 | 8 | 6 | 6 | 4 | 4 | 2 | 2 |
| | 14-16 | 16 | 12 | 10 | 8 | 6 | 4 | 4 | 4 | 2 | 2 |
| | 16-18 | 14 | 12 | 8 | 8 | 6 | 4 | 4 | 2 | 2 | 2 |
| 18-20 | 14 | 12 | 8 | 6 | 6 | 4 | 4 | 2 | 2 | 2 | |

Figure 24—Recommended Extension Cord Sizes

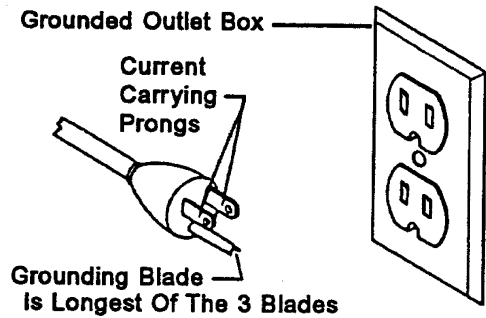
Grounded tools require a three wire extension cord. Always protect extension cords from sharp objects, excessive heat and damp or wet areas. Make sure that the cord is located so that it will not be stepped on, tripped over or otherwise subjected to damage or stress.

GROUNDING POWER TOOLS

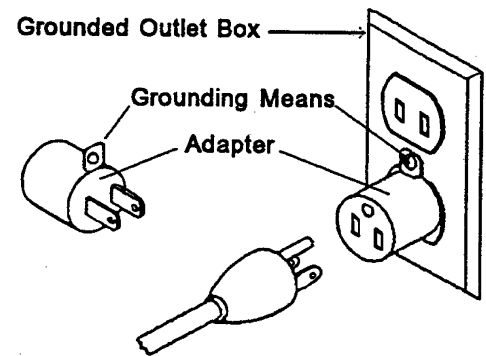
Tools marked “grounding required” have a three wire cord and three prong grounding plug. The plug must be connected to a properly grounded outlet (see Figure 25).

If the tool should electrically malfunction or breakdown, grounding provides a low resistance path to carry electricity away from the user reducing the risk of electric shock.

Figure 25 also illustrates a temporary adapter that is available for connecting grounded plugs to two prong outlets. The green rigid ear or lug extending from the adapter must be connected to a permanent ground such as a properly grounded outlet box or receptacle. A temporary adapter should only be used until a properly grounded outlet can be installed by a qualified electrician.



DO NOT USE 2 PRONG!!



Residential Only

Figure 25—Proper Grounding Of Power Tools

If there is any doubt as to whether the tool is properly ground, use a ground fault circuit interruptor (GFCI). If the ground is faulty, it will trip the GFCI. If the GFCI trips, call a qualified electrician.

Improperly connecting the grounding wire can result in the risk of electric shock. Do not modify the plug provided with the tool. Never remove the grounding prong from the plug. Do not use the tool if the cord or plug is damaged. If damage has occurred, have it repaired by a qualified service person before the tool is used further.

PRACTICE PROBLEMS

PRACTICE PROBLEMS:

1. Why must the work area be kept clean?
2. Where should power tools be stored when not in use?
3. What is meant by “dressing properly” to operate power tools?
4. When and what type of protective equipment should be worn during power tool operations?
5. Why should a power tool be grasped only on its insulated surfaces?
6. What unsafe power tool conditions should be reported?
7. As the distance from the electrical outlet increases so should the _____ of the extension cord.

NOTES

REVIEW

1. What should be read before operating any power tool?
2. Why should clamps or a vise be used to secure work?
3. When should the power tool be disconnected from the power source:
4. Who should make repairs to a power tool?
5. Why should you avoid bodily contact with grounded surfaces?
6. What type of extension cord should be used outdoors?
7. Where can the power tool's voltage requirements be found?
8. What could be the outcome of using an undersized extension cord?
9. What must be determined when using more than one extension cord to make up the total cord length?

