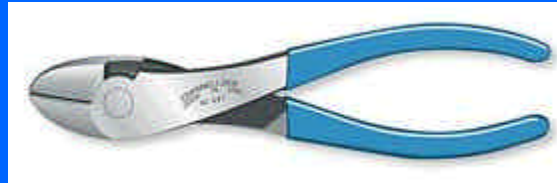




# Hand and Power Tool Safety



# Regulations Covering Hand and Power Tools

## ✓ For General Industry

- ✓ 1910 Subpart P, Hand and Portable Power Tools and Other Hand-Held Equipment.
- ✓ 1910.241, Definitions.
- ✓ 1910.242, Hand and portable powered tools and equipment, general.
- ✓ 1910.243, Guarding of portable powered tools.
- ✓ 1910.244, Other portable tools and equipment.

# What the Regulations Say About Hand Tools

- ✓ Each employer shall be responsible for the safe condition of tools and equipment used by employees, including tools and equipment which may be furnished by employees.
- ✓ Compressed air used for cleaning. Compressed air shall not be used for cleaning purposes except where reduced to less than 30 p.s.i. and then only with effective chip guarding and personal protective equipment.

# What the Regulations Say About Hand Tools

- ✓ Employers shall not issue or permit the use of unsafe hand tools.
- ✓ Wrenches, including adjustable, pipe, end, and socket wrenches shall not be used when jaws are sprung to the point that slippage occurs.
- ✓ Impact tools, such as drift pins, wedges, and chisels, shall be kept free of mushroomed heads.
- ✓ The wooden handles of tools shall be kept free of splinters or cracks and shall be kept tight in the tool.

# General Safety Precautions

- ✓ Employees who use hand and power tools and who are exposed to the hazards of falling, flying, abrasive and splashing objects, or exposed to harmful dusts, fumes, mists, vapors, or gases must be provided with the particular personal equipment necessary to protect them from the hazard.
- ✓ Employees and employers have a responsibility to work together to establish safe working procedures. If a hazardous situation is encountered, it should be brought to the attention of the proper individual immediately.

# General Safety Precautions

- ✓ Appropriate personal protective equipment should be worn due to hazards that may be encountered while using portable power tools and hand tools.



- ✓ Floors should be kept as clean and dry as possible to prevent accidental slips with or around dangerous hand tools.



# Hand Tools

- ✓ Hand tools are non-powered. They include anything from axes to wrenches. The greatest hazards posed by hand tools result from misuse and improper maintenance.



# Hand Tool Misuse

- ✓ The greatest hazards posed by hand tools result from misuse and improper maintenance.
- ✓ Some examples:
  - ✓ Using a screwdriver as a chisel may cause the tip of the screwdriver to break and fly, hitting the user or other employees.
  - ✓ If a wooden handle on a tool such as a hammer or an axe is loose, splintered, or cracked, the head of the tool may fly off and strike the user or another worker.
  - ✓ A wrench must not be used if its jaws are sprung, because it might slip.
  - ✓ Impact tools such as chisels, wedges, or drift pins are unsafe if they have mushroomed heads. The heads might shatter on impact, sending sharp fragments flying.

# Hand Tools

- ✓ The employer is responsible for the safe condition of tools and equipment used by employees but the employees have the responsibility for properly using and maintaining tools.
- ✓ Employers should caution employees that saw blades, knives, or other tools be directed away from aisle areas and other employees working in close proximity. Knives and scissors must be sharp. Dull tools can be more hazardous than sharp ones.

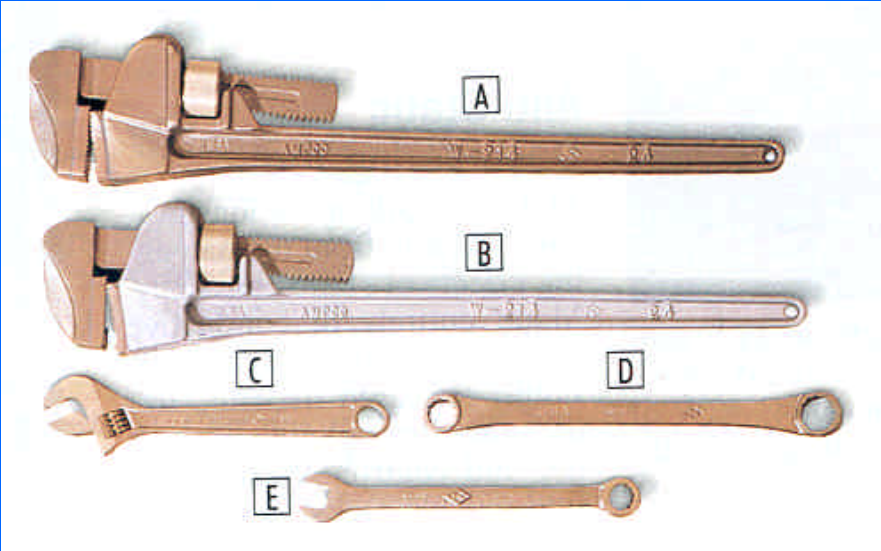
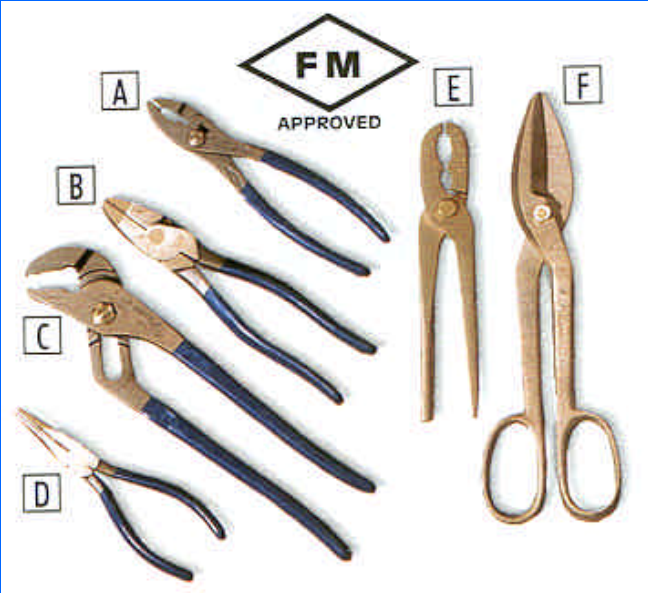
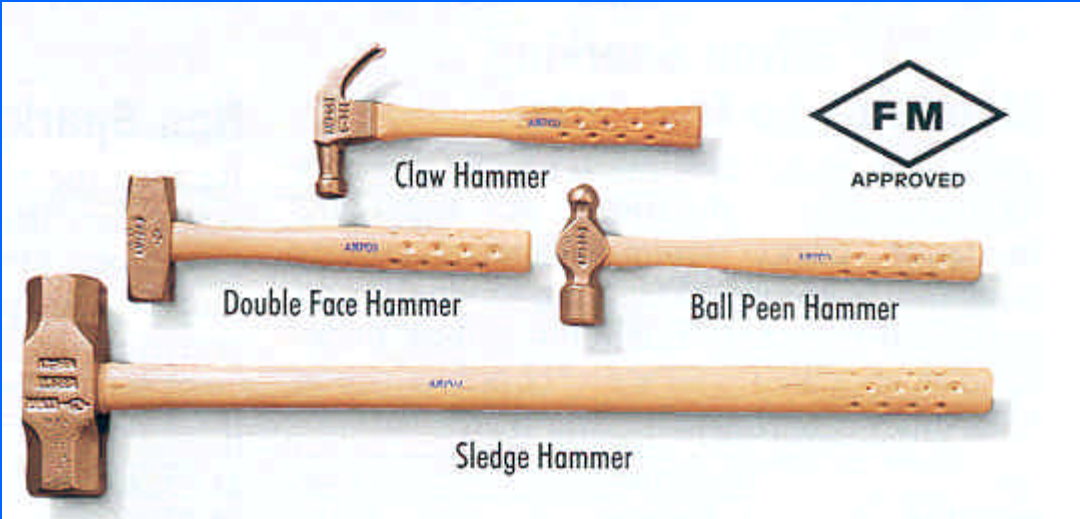
# Basic Hand Tool Safety Rules

- ✓ Around flammable substances, sparks produced by iron and steel hand tools can be a dangerous ignition source. Where this hazard exists, spark-resistant tools made from brass, plastic, aluminum, or wood will provide for safety.

# What Are Spark Resistant Tools

- ✓ "Non-sparking", "spark-resistant" or "spark-proof" tools are names given to tools made of metals such as brass, bronze, Monel metal (copper-nickel alloy), copper-aluminum alloys (aluminum bronze), copper-beryllium alloys (beryllium bronze), and titanium.
- ✓ Preferred "non-sparking" metals have less tensile strength than steels usually used to make tools. A lower tensile strength means the metal has less strength or resistance to tearing apart when stretched under test conditions.
- ✓ It also means that these tools are softer, wear down more quickly than ordinary steel tools, and have to be dressed more frequently.

# Some Non-Sparking Tools



# Today's Power Tools

- ✓ Offer more power, adaptability and dependability than ever before.
- ✓ With enhanced tool performance comes the responsibility to address power-tool safety issues.
- ✓ Maintenance management professionals and technicians responsible for specifying and using power tools have a responsibility to check out a tool's safety features, then ensure that manufacturer safety precautions and common sense are followed at all times.

# Hazards of Power Tools

- ✓ All hazards involved in the use of power tools can be prevented by following five basic safety rules:
  - ✓ Keep all tools in good condition with regular maintenance.
  - ✓ Use the right tool for the job.
  - ✓ Examine each tool for damage before use.
  - ✓ Operate according to the manufacturer's instructions.
  - ✓ Provide and use the proper protective equipment.

# General Safety Guidelines for Power Tools

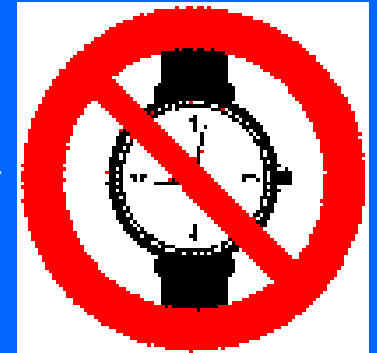
- ✓ The following information offers general safety guidelines for power tools
- ✓ Individual manufacturers' tool owner/operator manuals, shipped with tools and accessories, are recommended as a final source for proper procedures for specific tool use.

# General Safety Guidelines for Power Tools

- ✓ Know the power tool.
  - ✓ Operators must read and understand the owner's manual.
  - ✓ Labels affixed or included in the shipping container must be read and understood.
- ✓ Ground all tools unless double insulated.
- ✓ Avoid dangerous environments. Do not use power tools in a damp, wet and/or explosive atmosphere -- fumes, dust or flammable materials.

# General Safety Guidelines for Power Tools

- ✓ Be aware of all power lines and electrical circuits, water pipes, and other mechanical hazards in your work area, particularly those below the work surface, hidden from the operator's view, that may be contacted.
- ✓ Wear proper apparel. Do not wear loose clothing, dangling objects or jewelry. Long hair must be restrained. Gloves should not be worn when operating certain power tools. Check appropriate tool manuals.



# General Safety Guidelines for Power Tools

- ✓ Power tools can be hazardous when improperly used.
- ✓ There are several types of power tools, based on the power source they use:
  - ✓ electric, pneumatic, liquid fuel, hydraulic, and powder-actuated.
- ✓ Employees should be trained in the use of all tools - not just power tools. They should understand the potential hazards as well as the safety precautions to prevent those hazards from occurring.

# General Safety Guidelines for Power Tools

- ✓ The following general precautions should be observed by power tool users:
- ✓ Never carry a tool by the cord or hose.
- ✓ Never yank the cord or the hose to disconnect it from the receptacle.
- ✓ Keep cords and hoses away from heat, oil, and sharp edges.
- ✓ Disconnect tools when not in use, before servicing, and when changing accessories such as blades, bits and cutters.

# General Safety Guidelines for Power Tools

- ✓ All observers should be kept at a safe distance away from the work area.
- ✓ Secure work with clamps or a vise, freeing both hands to operate the tool.
- ✓ Avoid accidental starting. Workers should not hold a finger on the switch button while carrying a plugged-in tool.

# General Safety Guidelines for Power Tools

- ✓ Tools should be maintained with care. They should be kept sharp and clean for the best performance. Follow instructions in the user's manual for lubricating and changing accessories.
- ✓ Be sure to keep good footing and maintain good balance.
- ✓ The proper apparel should be worn. Loose clothing, ties, or jewelry can become caught in moving parts.
- ✓ All portable electric tools that are damaged shall be removed from use and tagged "Do Not Use."

# General Safety Precautions- Electric Tools

- ✓ Employees using electric tools must be aware of several dangers; the most serious is the possibility of electrocution.
- ✓ Among the chief hazards of electric-powered tools are burns and slight shocks which can lead to injuries or even heart failure.



# General Safety Precautions- Electric Tools

- ✓ Under certain conditions, even a small amount of current can result in fibrillation of the heart and eventual death.
- ✓ A shock also can cause the user to fall off a ladder or other elevated work surface.

# General Safety Precautions- Electric Tools

- ✓ Electric tools must either have a three-wire cord with ground and be grounded, be double insulated, or be powered by a low-voltage isolation transformer.
- ✓ Double insulation is more convenient. The user and the tools are protected in two ways: by normal insulation on the wires inside, and by a housing that cannot conduct electricity to the operator in the event of a malfunction.

# General Safety Precautions- Electric Tools

- ✓ These general practices should be followed when using electric tools:
  - ✓ Electric tools should be operated within their design limitations.
  - ✓ Gloves, if kept clear of rotating parts, and safety footwear are recommended during use of electric tools.
  - ✓ When not in use, tools should be stored in a dry place.
  - ✓ Electric tools should not be used in damp or wet locations.
  - ✓ Work areas should be well lighted.

# Power Tool Accessories and Attachments

- ✓ There's a variety of accessories available for use on or with power tools.
- ✓ Caution must be exercised when selecting and using any accessory with any power tool.
- ✓ Choosing the wrong accessory or using an accessory incorrectly can result in serious injury.

# Power Tool Accessories and Attachments

- ✓ Don't use an accessory or attachment unless:
  - ✓ The power tool manufacturer recommends its use on the product;
  - ✓ The accessory limitations and specifications -- such as speed, size, mounting and guarding requirements, etc. -- match the limitations and specifications of the power tool as shown in the owner/operator's manual; and,
  - ✓ The use of accessory does not require the removal of or defeating of any guards, barriers or other safety-related devices on the power tool, unless they are replaced by other appropriate guards or protective devices.
  - ✓ Unplug tools before installing, adjusting and changing any accessory or attachment of any kind.

# Powered Abrasive Wheel Tools

- ✓ Powered abrasive grinding, cutting, polishing, and wire buffing wheels create special safety problems because they may throw off flying fragments.
- ✓ Before an abrasive wheel is mounted, it should be inspected closely and sound- or ring-tested to be sure that it is free from cracks or defects.
- ✓ To test, wheels should be tapped gently with a light non-metallic instrument. If they sound cracked or dead, they could fly apart in operation and so must not be used. A sound and undamaged wheel will give a clear metallic tone or "ring."

# Failure to Ring Test

- ✓ Failure to ring test could result in a disintegrating wheel.
- ✓ This could lead to serious injury or death.



Spindle guard removed for better viewing

# Powered Abrasive Wheel Tools

- ✓ To prevent the wheel from cracking, the user should be sure it fits freely on the spindle.
- ✓ The spindle nut must be tightened enough to hold the wheel in place, without distorting the flange.
- ✓ Follow the manufacturer's recommendations. Care must be taken to assure that the spindle wheel will not exceed the abrasive wheel specifications.
- ✓ Due to the possibility of a wheel disintegrating (exploding) during start-up, the employee should never stand directly in front of the wheel as it accelerates to full operating speed.

# Powered Abrasive Wheel Tools

- ✓ Portable grinding tools need to be equipped with safety guards to protect workers not only from the moving wheel surface, but also from flying fragments in case of breakage.
- ✓ In addition, when using a powered grinder:
  - ✓ Always use eye protection.
  - ✓ Turn off the power when not in use.
  - ✓ Never clamp a hand-held grinder in a vise.

# Portable Circular Saws

- ✓ Among professionals, the circular saw is probably the most commonly used power saw and perhaps the most commonly abused.
- ✓ Familiarity should not breed carelessness.
- ✓ The following are specific safety musts when using any portable circular saws.

# Portable Circular Saw

## Safety Precautions

- ✓ Always wear safety goggles or safety glasses with side shields complying with the current national standard and a full face shield when needed. Use a dust mask in dusty work conditions. Wear hearing protection during extended periods of operation.
- ✓ Don't wear loose clothing, jewelry or dangling objects, including long hair, that may catch in rotating parts or accessories.
- ✓ Don't use a circular saw that is too heavy for you to easily control.

# Portable Circular Saw

## Safety Precautions

- ✓ Be sure the switch actuates properly. It should turn the tool on and return to the off position after release.
- ✓ Use sharp blades. Dull blades cause binding, stalling and possible kickback. They also waste power and reduce motor and switch life.
- ✓ Use the correct blade for the application. Check this carefully. Does it have the proper size and shape arbor hole? Is the speed marked on the blade at least as high as the no-load RPM on the saw's nameplate?

# Portable Circular Saw

## Safety Precautions

- ✓ Is the blade guard working? Check for proper operation before each cut. Check often to ensure that guards return to their normal position quickly. If a guard seems slow to return or hangs up, repair or adjust it immediately. Never defeat the guard to expose the blade by, for example, tying it back or removing it.
- ✓ Before starting a circular saw, be sure the power cord and extension cord are out of the blade path and are long enough to freely complete the cut. Keep aware of the cord location. A sudden jerk or pulling on the cord can cause loss of control of the saw and a serious accident.

# Portable Circular Saw

## Safety Precautions

- ✓ For maximum control, hold the saw firmly with both hands after securing the workpiece. Clamp workpieces. Check frequently to be sure clamps remain secure.
- ✓ Avoid cutting small pieces that can't be properly secured and material on which the saw shoe can't properly rest.
- ✓ When you start the saw, allow the blade to reach full speed before contacting the workpiece.
- ✓ When making a partial cut, or if power is interrupted, release the trigger immediately and don't remove the saw until the blade has come to a complete stop.

# Portable Drills

- ✓ Available in a variety of types and capacities, portable power drills are undoubtedly the most used power tools.
- ✓ Because of their handiness and application to a wide range of jobs, drills often receive heavy use.
- ✓ For this reason, you'll need to check with care your drill's capacity limitations and accessory recommendations.

# Portable Drill Safety Precautions

- ✓ Check carefully for loose power cord connections and frays or damage to the cord. Replace damaged tool and extension cords immediately.
- ✓ Be sure the chuck is tightly secured to the spindle. This is especially important on reversible type drills.
- ✓ Tighten the bit securely as prescribed by the owner/operator's manual. The chuck key must be removed from the chuck before starting the drill. A flying key can be an injury-inflicting missile.

# Portable Drill Safety Precautions

- ✓ Check auxiliary handles, if part of the tool. Be sure they are securely installed. Always use the auxiliary drill handle when provided. It gives you more control of the drill, especially if stalled conditions occur. Grasp the drill firmly by insulated surfaces.
- ✓ Always hold or brace the tool securely. Brace against stationary objects for maximum control. If drilling in a clockwise -- forward -- direction, brace the drill to prevent a counterclockwise reaction.
- ✓ Don't force a drill. Apply enough pressure to keep the drill bit cutting smoothly. If the drill slows down, relieve the pressure. Forcing the drill can cause the motor to overheat, damage the bit and reduce operator control.

# Miter Box Saws and Chop Saws

- ✓ Because of the saw's downward cutting motion, stay alert to keeping hands and fingers away from the blade's path.
- ✓ Be sure all guards are in place and working. If a guard seems slow to return to its normal position, adjust or repair it immediately.
- ✓ Use only recommended size and RPM rated blades.
- ✓ When installing or changing a blade, be sure the blade and related washers and fasteners are correctly positioned and secured on the saw arbor.

# Pneumatic Tools

- ✓ Pneumatic tools are powered by compressed air and include chippers, drills, hammers, and sanders.
- ✓ There are several dangers encountered in the use of pneumatic tools.
- ✓ The main one is the danger of getting hit by one of the tool's attachments or by some kind of fastener the worker is using with the tool.
- ✓ Eye protection is required and face protection is recommended for employees working with pneumatic tools.

# Pneumatic Powered Tools

- ✓ Tool retainer. A tool retainer shall be installed on each piece of utilization equipment which, without such a retainer, may eject the tool.
- ✓ Airhose. Hose and hose connections used for conducting compressed air to utilization equipment shall be designed for the pressure and service to which they are subjected.

# Pneumatic Powered Tools

- ✓ Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming accidentally disconnected.
- ✓ Safety clips or retainers shall be securely installed and maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.
- ✓ All pneumatically driven nailers, staplers, and other similar equipment provided with automatic fastener feed, which operate at more than 100 p.s.i. pressure at the tool shall have a safety device on the muzzle to prevent the tool from ejecting fasteners, unless the muzzle is in contact with the work surface.

# Pneumatic Powered Tools

- ✓ The manufacturer's safe operating pressure for hoses, pipes, valves, filters, and other fittings shall not be exceeded,
- ✓ The use of hoses for hoisting or lowering tools shall not be permitted.
- ✓ All hoses exceeding 1/2-inch inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure.

# Pneumatic Tools



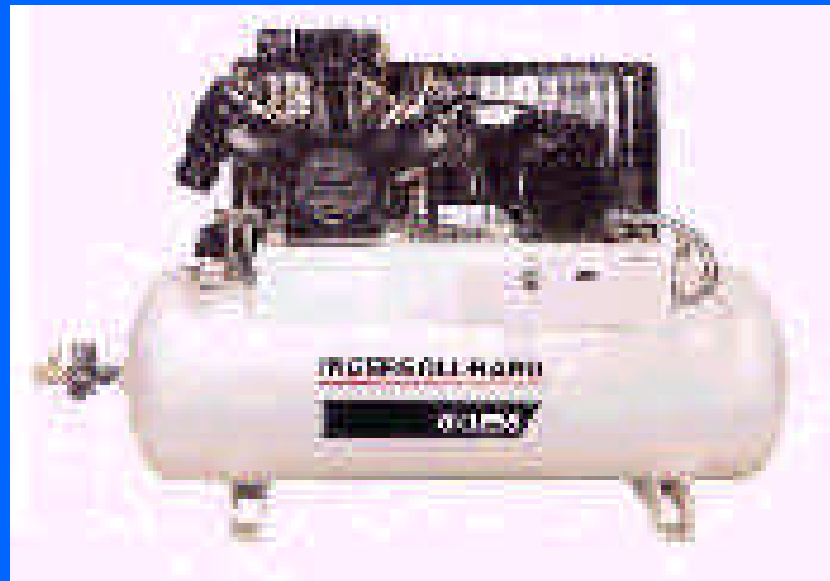
- ✓ Noise is another hazard. Working with noisy tools such as jackhammers requires proper, effective use of hearing protection.
- ✓ When using pneumatic tools, employees must check to see that they are fastened securely to the hose to prevent them from becoming disconnected.
- ✓ A short wire or positive locking device attaching the air hose to the tool will serve as an added safeguard.

# Pneumatic Tools

- ✓ A safety clip or retainer must be installed to prevent attachments, such as chisels on a chipping hammer, from being unintentionally shot from the barrel.
- ✓ Screens must be set up to protect nearby workers from being struck by flying fragments around chippers, riveting guns, staplers, or air drills.
- ✓ Compressed air guns should never be pointed toward anyone. Users should never "dead-end" it against themselves or anyone else.

# Caring for the Compressed Air System

- ✓ Using pneumatic tools requires an efficient compressor system to adequately power the tools.
- ✓ Several basic guidelines should be followed to insure efficient and continued operation of the compressor.



# Compressor System Guidelines

1. Before making or breaking any air connection, always turn off the air supply. Use the valve to turn off the air - Never kink the hose as a shortcut! Kinking the hose may damage or even rupture the air hose.
2. Protect the air hose from damage. Move it out of the way of vehicles so that it isn't run over. Also, be sure not to drag hoses around sharp corners.
3. Be sure to use the proper size air hose and fittings to keep air pressure at a maximum throughout the entire line. Most manufacturers recommend 90 psi at the tool.

# Compressor System Guidelines

4. To ensure the best connection, clear any dirt off the nipple before connecting the air hose to the tool.
5. When the tool is connected, check the hose and all connections for leaks or damage before using the tool.
6. Maintain a clean, dry, regulated source of air to operate air tools at peak performance. Filters, regulators, and lubricators should be used to keep the air system working at its best.

# Contaminates in the Compressor System

- ✓ The most common problem is water in compressed air
- ✓ All air contains a certain amount of moisture and impurities which can cause problems when it condenses in the air. Condensed water vapor and dirt left in the air line may result in the following problems:
  - ✓ Sluggish tool operation, and more frequent repair and replacement of parts
  - ✓ Poor results in spraying and other types of finishing work
  - ✓ Washing away of required lubricants
  - ✓ Moisture left in lines exposed to cold weather may freeze and obstruct proper air flow