

Lesson #1: Pneumatics Tools Safety

Objectives

Students will be able to...

- Identify the major components of both the pneumatic nailer and stapler and be able to demonstrate the safe operation of each tool.

Common Core Standards

LS 11-12.6
RSIT 11-12.2
RLST 11-12.2
Health and Safety 6.0, 6.1, 6.2, 6.3, 6.4, 6.5, 6.6
Responsibility and Flexibility 7.7
Technical Knowledge and Skills 10.0, 10.2
Demonstration and Application 11.1
Cabinetmaking and Wood Products Pathway A 4.1
Residential and Commercial Construction Pathway D2.1, D3.1

Materials

Pneumatic Tool Safety Notes
Safety Precautions Worksheet
YouTube video <https://www.youtube.com/watch?v=Ns30kLGvYNY>

Lesson Sequence

Introduction to Pneumatic Nailers and Staplers

We have discussed that tools fall into one of two basic groups: hand and power tools. All of the power tools that we have used to this point have been powered by a single source of energy; electricity. But electricity is not the only power source we have at our disposal. We are going to learn about another class of power tools. Instead of being powered by electricity, these tools are powered by air. More specifically; compressed air. Tools powered by compressed air are known as pneumatic tools.

- Read through the *Pneumatic Tool Safety Notes* as a class. Highlight important information and fill in *The Safety Precautions Worksheet* (25 minutes).

- Watch a *YouTube video* <https://www.youtube.com/watch?v=Ns30kLGvYNY> answers any questions that students may have (15 minutes).
- Finish filling in the questions on the safety precautions worksheet from the information in the video (10 minutes).

Assessment

Check for understanding throughout the lesson by questioning students. Pick random students to answer. Monitor student's answers on safety precautions and review as a class.

Accommodations/Modifications

Check for Understanding
One on One Support
Extra Time If Needed

Pneumatic Tool Safety Notes

Pneumatic tools are powered by compressed air. Common air-powered hand tools include jackhammers, chipping hammers, wrenches, grinders, and nail guns. There are several dangers associated with the use of pneumatic tools.

Shock Potential: Air powered tools are not grounded or double insulated, so if you contact a live wire while working with a pneumatic tool, you can be shocked. Make certain all electric power in the immediate work area is isolated.

Air pressure: With air-powered tools, air may be delivered at varying pressures and flows. If the pressure/flow exceeds the manufacturer's rating, the tool itself could over-speed, delivering too much torque or other excessive force. This is hazardous due to the increased possibility of tool or work piece breakage. Inadequate pressure or flow could also result in an underperforming tool. This may prompt you to apply excessive force in your work, possibly causing tool breakage and injury. Adjust your air pressure to the manufacturer's rating. Make sure hoses are of the correct inside diameter and are not kinked or crushed. Your compressor and receiver must have enough capacity to deliver air in an amount enough to properly operate all attached tools.

Whipping Hose Danger: If an electric cord were to break, there is generally not much danger unless you meet the conductors. However, a severed air hose can whip around violently until the air is shut off. You may be injured by the whipping hose or while scrambling to get out of its way.

Protect the hose from physical damage: When using quick disconnect type fittings, install the male end on the tool. Pneumatic tools must be checked to see that the tools are fastened securely to the air hose to prevent them from becoming disconnected. A short wire or positive locking device attaching the air hose to the tool may also be used and will serve as an added safeguard. If an air hose is more than 1/2-inch (12.7 millimeters) in diameter, a safety excess flow valve must be installed at the source of the air supply to reduce pressure in case of hose failure. In general, the same precautions should be taken with an air hose that are recommended for electric cords, because the hose is subject to the same kind of damage or accidental striking, and because it also presents tripping hazards.

Attachments: When using pneumatic tools, a safety clip or retainer must be installed to prevent attachments such as chisels on a chipping hammer from being ejected during tool operation. Pneumatic tools that shoot nails, rivets, staples, or similar fasteners and operate at pressures more than 100 pounds per square inch (6,890 kPa), must be equipped with a special device to keep fasteners from being ejected, unless the muzzle is pressed against the work surface.

Airless spray guns that atomize paints and fluids at pressures of 1,000 pounds or more per square inch (6,890 kPa) must be equipped with automatic or visible manual safety devices that will prevent pulling the trigger until the safety device is manually released.

Eye protection: is required, and head and face protection are recommended for individuals working with pneumatic tools. Safety glasses are important for two reasons (1) is to deflect possible ricocheting nails, and (2) is to deflect collation. Collation is the material used by the nail manufacturers to hold the nails in the proper position (be it stacked one on top of the other as in a stick or wrapped up as in a coil) for firing from the gun. Collation comes in different types; the most common collation for framing nailers is usually plastic or wire. Typically, plastic is used to hold sticks of nails together, while wire is used to hold coils of nails together. Plastic collation shatters as the nails it holds are driven sending sharp little bits of shrapnel flying in all directions. Wire collation is welded to the nails and is typically used to hold nails in a coil because it is highly flexible. Like plastic collation, the wire is broken and ejected as the nail is driven. It is not uncommon for carpenters to receive minor cuts while driving nails that are held together with either type of collation. Screens must also be set up to protect nearby workers from being struck by flying fragments around pneumatic chippers, riveting guns, staplers, or air powered drills. Compressed air guns should never be pointed toward anyone. A chip guard must be used when compressed air is used for cleaning.

Noise Levels: Pneumatic tools discharge exhaust air at the tool itself or nearby. Frequently, this air is not muffled and therefore pneumatic tools can be much noisier than electric tools. As prolonged exposure to loud noise can damage your hearing, precautions should be taken. Either effective mufflers can be installed on the exhaust or hearing protection should be worn.

Fatigue and strains: Use of heavy pneumatic jackhammers can cause fatigue and strains. Heavy rubber grips reduce these effects by providing a secure handhold. Workers operating a pneumatic jackhammer must wear safety glasses and safety shoes that protect them against injury if the jackhammer slips or falls. A face shield also should be used.

Pneumatics/Pneumatic Equipment Maintenance and Safety

Properly maintained equipment is safe equipment. Part of proper maintenance for all tools includes keeping them clean. Pneumatics is no exception. All guns, compressors, hoses, safety glasses, etc. should be kept clean and free of dirt, sawdust, and other contaminants. If available, cap and/or plug all fittings while not in use.

When handled properly, pneumatic tools are very safe to operate. But it is up to you, the tool operator, to ensure you use them in the correct (safe) manner. Statistics from the United States Center for Disease Control show that every year, approximately 37,000 people are injured seriously enough with a pneumatic nailer or stapler that they need to go to the emergency room. Amazingly, almost half of these injuries (40% or 14,800) occur among consumers, i.e. the general population; not professionals using the tools day in and day out. Unfortunately, as with most work injuries, 99% percent of these are probably avoidable. The operator failed to use the tool in the proper manner.

Remember most work accidents are not accidents; someone deliberately caused the problem through laziness, neglect, or incompetence. Don't ever let yourself or someone else get hurt because of your/their failure to follow proper safety procedures. Safety is everyone's responsibility.

Pneumatic Tools Safety Precautions Worksheet

Identify safety precautions used when operating pneumatic tools.

1. Define Pneumatic tool:

2. There are several dangers associated with the use of pneumatic tools.

3. Pneumatic tools must be checked to see that the tools are fastened securely to the air hose to prevent them from becoming disconnected. _____ attaching the air hose to the tool must also be used and will serve as an added safeguard.

4. Eye protection is required, and head and face protection are recommended for employees working with pneumatic tools

_____.

5. Use common sense when operating compressed air tools. Never spray above the neck or point tools in the direction of someone Stay clear of tool exhaust _____.

6. The same precautions should be taken with an air hose that are recommended for electric cords, because the hose is subject to the same kind of damage or accidental striking _____.

Pneumatic tools that shoot nails, rivets, staples, or similar fasteners and operate at pressures more than _____ square inch (6,890 kPa), must be equipped with a special device to keep fasteners from being ejected, unless the muzzle is pressed against the work surface.

7. Activity-Develop 10 safety rules for using the pneumatic air tools in our shop.