

## WORKING WITH PORTABLE TOOLS

### Types

Types of portable tools used in the workplace include hand-held tools, air powered hand tools and portable electric tools. Common examples of each are listed below.

Hand Held	Air Powered	Electric
<ul style="list-style-type: none"><li>▪ Pliers</li><li>▪ Wrenches</li><li>▪ Hammers</li></ul>	<ul style="list-style-type: none"><li>▪ Jack hammers</li><li>▪ Wrenches</li><li>▪ Sprayers</li></ul>	<ul style="list-style-type: none"><li>▪ Grinders</li><li>▪ Impact wrenches</li><li>▪ Drills</li></ul>

### Hazards

Common hazards associated with portable tools include:

- Dust/flying particles (eyes)
  - Sprains and strains (wrist, hand, arm, shoulder)
- Flying chips, particles, pieces of material

### Hazards Associated with Portable Electric and Air-Powered Hand Tools

- Entanglement
- Noise
- Dust
- Vibration (vibration-induced white finger)

### Hazards Specific to Portable Electric Tools

- Electric shock, electrocution, burns
- Heat, sparks (fire)

### Hazards Specific to Air-Powered Hand Tools

- Whipping of the hose
- Compressed air entering the body

## WORKING WITH PORTABLE TOOLS

### Controls

#### Ergonomic Considerations

- Ensure that workers do not have to bend their wrist when using tools:
  - provide tools equipped with handles designed to keep the wrist straight
  - design tasks to allow workers to keep their wrists straight

#### Wrist Bent - Poor



#### Wrist Straight - Better



- Ensure that workers will not strain their wrist when using tools:
  - provide tools with two handles
  - provide tools that have most of their weight in or close to the handle
  - provide lightweight tools that can be easily supported by one hand
  - if the tool weighs more than 0.5 kg (approximately 1lb), support it with a counter-balance harness



- Ensure that workers have a good grip on the tool.
  - The handle of the tool should:
    - have grips that allow the hand to wrap around the handle easily
    - be longer than the width of the hand
    - have triggers large enough for gripping with 2-3 fingers
    - be rounded and smooth (with no grooves) to prevent any pressure points
- Instruct workers to:
  - hold the tool as close to the body as possible
  - rest their hands by laying the tool down or inserting it in a holster when not in use
- To control the hazard of vibration, provide:
  - low-vibration tools

## WORKING WITH PORTABLE TOOLS

- cork, rubber or plastic coverings for tool handles
- anti-vibration gloves

### Safe Use of Tools

Some of the hazards associated with these tools can be controlled through their proper use and care.

Train employees in safe practices and rules for the use of these tools and make sure they are followed

### Hand-Held Tools

- Ensure that the right tool is used for the right job
- Inspect tools for wear before they are used
- Use a vise to secure an object to be cut
- Wear appropriate personal protective equipment (PPE)

### Portable Electric Tools

- Check the nameplate to ensure that the power source is correct for the tool
- Test tools before starting work
- Inspect tool for safety
- Check that ground pin is in place and there are no cuts in the cord
- Check that tool is double insulated
- Make sure switch is operating freely. Keep finger off switch when carrying the tool
- Check that guards are in place and functional
- Avoid accidental starting
- Remove adjusting keys/wrenches before turning a tool on or plugging it in
- Pull out power plug when tool is not in use, when adjusting or making changes
- Hold tool firmly
- Hoist tools up a ladder instead of carrying them
- Store tool safely

### DO NOT

- Work where floor is wet or damp without extreme precautions
- Operate grinding wheels at speeds above their rating
- Use the cord to unplug the tool or to lift it
- Use tools where flammable gases or vapours are present

## WORKING WITH PORTABLE TOOLS

- Make improvised repairs (e.g., with tape) or work on makeshift platforms
- Use tools with missing or defective guards
- Hang cord over sharp edges, through water, where they can be run or tripped over
- Use tools in flammable or combustible confined spaces

### Air-Powered Hand Tools

- Use clean, dry air to power the tool
- Keep tool clean, lubricated and maintained according to manufacturer's instructions
- Use hoses designed to resist abrasion, cutting, crushing, interior deterioration and failure from continuous flexing
- Only use attachments and accessories recommended by the manufacturer
- Ensure that connected hoses have automatic shut-off couplers or that a small chain is attached to each side of the coupler to prevent whipping if the coupler fails
- Review manufacturer's instructions before using a tool
- Operate tools at air pressures recommended by the manufacturer
- Match the speed rating of accessories with that of the tool – avoid over-speeding
- Shut off the air and release the pressure before disconnecting a hose. There should be an automatic, quick-release mechanism
- Starting the tool:
  - check for loose parts and clean the air filter
  - check hose for cuts, wear or other damage
  - lubricate unless an airline lubricator is used
  - blow out the hose to remove moisture and dirt and clean the nipple before connecting
  - check fittings for proper connection
  - ensure closure of control valve to prevent whipping and open gradually for the same reason
  - check air pressure at the tool against manufacturer's recommendations
  - close the stop valve in the airline when changing tools; never kink the hose to save time
  - check the tool retainer and guards

### Training

*Ontario's Occupational Health and Safety Act* requires that every precaution be taken to ensure the safety of workers (ss.25, 27).

Using an electric or air powered tool in a flammable atmosphere can cause an explosion and is perhaps the second most dangerous hazard.

## WORKING WITH PORTABLE TOOLS

To help avoid serious injury, include the following in any training program.

- What to use the tool for and how to hold and operate it
- Hazards of improper use
- Manufacturer's directions
- Protective equipment to be used
- Operating problems that could happen (e.g., binding, seizing, breakage)
- Pre-use checks to be carried out
- How to evaluate possible environmental hazards (e.g., flammability of substances, lighting, water)
- Use of attachments – proper selection (size, speed) and installation
- Inspection procedures
- Health effects of noise and vibration and what is being done to control the noise and vibration produced by tools used in the workplace
- How to transport and store the tools
- The safety devices (e.g., guards) on the tool
- **Electric Powered Tools:** Training on the hazards of working with electricity
- **Air Powered Tools:** Training on the hazards of working with compressed air

### Maintenance

Review manufacturer's instructions before establishing maintenance procedures. A planned program of maintenance will include the following:

#### Common Maintenance Steps

- Standard written procedures for each type of tool
- Availability and condition of guards
- Check with operators if any unusual situations are suspected
- Replace worn parts
- Adjustments as recommended by the manufacturer
- Re-sharpen blades, bits, etc., in accordance with manufacturer's instructions
- Check for damage to frame or parts
- Check chucks, collets, etc.
- A final visual check
- Regular inspection, cleaning and oiling of tools

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## WORKING WITH PORTABLE TOOLS

### Maintenance Steps Specific to Portable Electric Tools

- Check of grounding protection or double insulation
- Inspect of extension cords and plugs
- Inspect motor for damage or for parts that need to be replaced
- Inspect of switches
- Test for short circuits
- After inspecting and reassembling the tool, test it for “ground” before releasing it
- Tag and record

Please see **Inspection Report – Portable Electric Hand Tools** later in this document.

### Maintenance Steps Specific to Air-Powered Hand Tools

- Disconnect the tool from the airline
- Inspect hoses and couplings
- Clean as recommended by the manufacturer (no flammable or toxic solvents)
- Inspect valves
- Replace of worn parts
- Maintenance records

Please see the **Tool Inspection Checklist – Air- Powered Hand Tools** later in this document.

## WORKING WITH PORTABLE TOOLS

### Inspection Report – Portable Electric Powered Tools

The checklist below is a sample which you may modify in keeping with your own needs. Although primarily for a maintenance or department check, it may be useful for a pre-shift check as well.

Tool No:	Type:	Dates of Inspection											
Location:	Material:												
Date Purchased:	Length:												
<input checked="" type="checkbox"/> Acceptable	<input checked="" type="checkbox"/> Unacceptable												
Grounding/double insulation OK													
Plug and cord free from defects													
Switch operates freely													
Guard in good repair and operates correctly													
No wobble in shaft													
Adjusting key available													
Brushes not sparking excessively													
No burrs on casing													
Attachments suitable (re speed, size)													
Flexible shaft in good condition													
Proper storage available													
Tool shaft turns freely													
No grease, metallic dust on tool													
Ventilating slots are clean													
Certification:													
INITIALS OF PERSON MAKING INSPECTION													

Notes:

## WORKING WITH PORTABLE TOOLS

### Tool Inspection Checklist – Air Powered Hand Tools

This sample checklist may be used as a pre-shift check, a maintenance check, or a department check. Adapt it to suit your own needs.

Department:	Dates of Inspection											
<input checked="" type="checkbox"/> Acceptable <input type="checkbox"/> Unacceptable												
Tool guards in place and functional?												
Safety chain operative?												
Tool parts not broken or prematurely worn (e.g., teeth, gears)?												
Bits and tools properly sharpened?												
Tool spindle turns freely?												
Tool properly lubricated?												
Throttle (trigger) functioning correctly?												
Motor runs freely?												
Pistons running correctly?												
Speed regulator/governor properly maintained?												
Hose and couplings in good condition?												
Air flows freely from exhaust?												
Motor vanes in good repair?												
Air motor and throttle valve free of dirt?												
No air leaks at or in tool?												
Air pressure rating clearly marked (if not 90 psig)?												
Noise level of tool controlled?												
Vibration of tool controlled?												
Operating manual and written work procedures available to operator?												
Proper tool storage facilities provided?												
Maintenance and repair records kept?												



## WORKING WITH PORTABLE TOOLS

### Tool Selection Checklist

“NO” responses indicate potential problem areas, which should receive further investigation.

Tool Characteristics		Y	N	Comments
<b>Posture</b>				
Can you keep your wrist in a neutral (straight) position while using the tool? <i>Bend the tool, not the wrist.</i>				
Does the workplace layout and type of tool (pistol grip vs. in-line) allow for a neutral posture of the wrists, elbows, and shoulders?				
Does the tool allow adequate visibility of the work?				
Can you wrap your fingers around the handle so the thumb and forefinger slightly overlap? <i>Recommended Diameter: 30 – 45 mm (power grip), 5 – 12 mm (precision grip).</i>				
<b>Force</b>				
Are frequently used tools weighing more than 2.3 kg counterbalanced?				
Is the tool's centre of gravity close to the centre of the grip (i.e., balanced)?				
Can you squeeze the tool handles (e.g., pliers) comfortably? <i>Recommended grip span: 60 – 90 mm.</i>				
Does the tool handle extend beyond the palm? <i>Recommended Length: minimum 115 – 120 mm + 10 mm with glove use.</i>				
Is the tool handle comfortable to grip, free of deep grooves or sharp edges?				
Does the tool grip/handle prevent slipping during use?				
With larger/heavier tools, does the tool have two handles for better manipulation and easier handling?				
Does the tool have a trigger strip, rather than a trigger button? <i>Recommended Length: 51 mm for 2 to 3-finger activation.</i>				
Is the tool well maintained?				

## WORKING WITH PORTABLE TOOLS

Tool Characteristics	Y	N	Comments
<b>Repetition</b>			
Are power tools used whenever possible?			
Does the tool mechanism reduce repetitive motions (e.g., pliers with spring return, ratchets)?			
Is the proper tool used for the task?			
Can the tool be used with either hand comfortably? <i>Tool should be symmetrical or easily altered.</i>			
Does each power tool have its own power source (i.e., to avoid switching connections frequently)?			
<b>Vibration</b>			
Are low vibration tools used? <i>Choose tools with an internal mechanism that minimizes vibration at the source.</i>			
Can the tool be adjusted to the lowest setting possible to reduce vibration?			
Does the tool's handle dampen exposure to vibration? <i>Choose handles that are covered with cork, rubber, plastic, or plastic bonded to steel.</i>			
Are vibration dampening gloves available for the operator?			
<b>Cold</b>			
Is the air exhaust vented away from the operator's hand?			
Is the tool's handle material non-porous, non-slip, and non-conductive?			
Can glossy paint or polished surfaces be avoided?			

References:

Canadian Centre for Occupational Health & Safety's infograms F02, G02.  
Mital, A; Kilbom, A. (1992). Design, selection, and use of hand tools to alleviate trauma of the upper extremities. Part 2 – The scientific basis (knowledge base) for the guide. International Journal of Industrial Ergonomics, 10, 7-21.

## WORKING WITH PORTABLE TOOLS

### Applicable Legislation for Electric Portable Tools

Regulation for Industrial Establishments made under the *Occupational Health and Safety Act* (Reg. 851):

- s.40 Electrical Equipment Certification
- s.43 Tools type, near live conductors
- s.44 Grounding connection for electric tools
  - s.44.1 For tools used outdoors or in wet locations – Requirement for ground fault circuit interrupters
  - s.44.2 Investigation and removal of ground faults that pose a hazard
- s.139 Noise

### References

Canadian Standards Association (CSA) Standards:

- C22.2 No. 71.1-M89 (R 2004): Portable Electric Tools
- C22.2 No. 71.2: Electric Bench Tools
- CAN/CSA-Z94.3-07: Eye and Face Protection
- CAN/CSA-Z195-02: Protective Footwear

### Applicable Legislation for Air-Powered Hand Tools

Regulation for Industrial Establishments made under the *Occupational Health and Safety Act* (Reg. 851):

#### s.66

A compressed air or other compressed gas blowing device shall not be used for blowing dust or other substances:

- a) from clothing worn by a worker except where the device limits increase in pressure when the nozzle is blocked
- b) in such a manner as to endanger the safety of any worker using a vacuum cleaner or brush instead.

#### s.79-86

Use of PPE or clothing

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