



**CAPE BRETON UNIVERSITY  
("UNIVERSITY")**

**MAINTENANCE SAFE WORK MANUAL**

**UPDATED NOVEMBER 2005**

## TABLE OF CONTENTS

1.	ASBESTOS REMOVAL AND IDENTIFICATION .....	1
1.1	Pipe Insulation Removal Using Glove Bag.....	1
1.2	Ballast.....	1
1.3	PCB Storage Barrels .....	2
1.4	Maintenance Program Policy.....	2
1.4.1	Maintenance Program Check .....	3
2.	ELECTRIC WELDING .....	5
2.1	Electric Welding - Setup Checklist .....	5
2.2	Electric Welding - Installation.....	6
2.2.1	Engine Driven Equipment.....	6
2.2.2	Grounding.....	6
2.2.3	Connections and Cables .....	6
2.3	Gas Welding and Cutting - Set-Up.....	6
2.4	Regulator Set Up.....	9
2.4.1	General.....	9
2.5	Electrical Rubber Gloves.....	10
2.6	Electric Welding - Maintenance and Inspection .....	10
2.6.1	General.....	10
2.6.2	Maintenance Personnel.....	11
2.6.3	Welders .....	11
2.6.4	Electrode Holders Inspection .....	11
3	CONFINED SPACE .....	12
3.1	Entry Into Confined Space .....	12
3.2	Hazardous Assessment.....	12
4	DEMOLITION/DISMANTLING .....	16
4.1	General.....	16
4.2	Barricades and Guardrails .....	16
5.	FIRE PROTECTION SPRINKLERS .....	17
6.	GAS WELDING AND CUTTING - CYLINDER STORAGE .....	18
6.1	General.....	18
6.2	Handling Cylinders .....	19
6.3	Welding, Cutting, Burning .....	20
7.	ELECTRIC WELDING - EQUIPMENT USE CHECKLIST .....	22
8.	GAS WELDING AND CUTTING - LEAKING & OVERHEATING CYLINDERS ..	24
8.1	Leaking.....	24
8.2	Acetylene Cylinder Overheating.....	24
9.	GAS WELDING AND CUTTING - LIGHTING UP.....	25

9.1	General.....	25
9.2	Pressure Setting.....	25
9.3	Purge.....	25
9.4	Lighting Up.....	25
10.	GAS WELDING AND CUTTING - SHUT DOWN.....	27
10.1	Shutting Off Torch.....	27
10.2	Closing Down.....	27
11.	GAS WELDING AND CUTTING - OPERATING FAULTS.....	29
11.1	General.....	29
11.2	Backfire.....	29
11.3	Flashbacks.....	29
11.4	Non-Return Valve.....	30
11.5	Flashback Arrestor.....	30
12.	GRINDING WHEELS.....	31
12.1	Wheel Marking.....	31
12.2	Inspection.....	31
12.3	Selection of Wheels.....	31
12.4	Handling.....	31
12.5	Storage.....	32
12.6	Bench and Pedestal Wheel Mounting.....	32
12.7	Straight Wheels.....	33
12.8	Cup Wheels.....	33
12.9	Cone and Plug Wheels.....	33
12.10	Depressed Centre Wheels.....	33
13.	GROUNDS MAINTENANCE.....	34
13.1	General Precautions.....	34
13.2	Personal Protective Equipment.....	34
13.3	Tools.....	34
13.4	Refueling Equipment.....	34
14.	HAND TOOLS.....	36
14.1	General Safe Hand Tool Operation.....	36
14.2	Wrenches.....	37
14.3	Hand Saws.....	38
14.4	Hacksaws.....	39
14.5	Hammers.....	39
14.6	Wood Chisels.....	40
14.7	Pliers.....	41
14.8	Cutting Tools.....	42
14.9	Clamps.....	43
14.10	Snips.....	44
14.11	Pipe Tools.....	45
14.12	Pipe Wrenches.....	45
14.13	Pipe Cutter, Reamers, Threaders.....	46

14.14	Gear Pullers .....	46
15.	HOUSEKEEPING & STORAGE .....	48
15.1	General.....	48
15.2	Tools and Maintenance.....	48
15.3	Fire Extinguishers.....	48
16.	LOCKOUT/TAGOUT .....	49
16.1	General.....	49
16.2	When to Lockout .....	49
16.3	Lockout Equipment.....	49
16.4	Lockout/Tagout Test Procedure .....	49
16.5	Lockout/Tagout.....	50
16.6	Return to Service.....	50
16.7	Lockouts for Confined Spaces .....	50
16.8	Summary .....	50
17.	MANUAL MATERIALS HANDLING .....	51
17.1	Transferring Weight .....	51
18.	MATERIAL HANDLING .....	52
18.1	Compressed Gases.....	52
18.2	WHMIS.....	52
18.3	Labels.....	53
18.4	Material Safety Data Sheets.....	53
19.	METALWORKING MACHINES.....	55
19.1	General.....	55
19.2	Metal Saw (Cold).....	56
19.3	Metal Saws (Hot).....	58
20.	PORTABLE EXTENSION CORDS.....	60
20.1	General.....	61
21.	PORTABLE GRINDERS.....	61
21.1	General.....	61
21.2	Bench and Pedestal Grinders .....	62
22.	PORTABLE LADDERS.....	64
22.1	General.....	64
22.2	Extension Ladders.....	65
22.3	Stepladders .....	66
22.4	Inspection .....	67
22.5	Fixed Access Ladders .....	68
23.	USE OF PORTABLE LADDERS .....	70
23.1	Storage and Handling.....	71
23.2	Securing Portable Ladders.....	72

23.3	Extension Set-Up.....	72
24.	POWERED HAND TOOLS.....	74
24.1	Basic Electrical Safety.....	74
24.2	Tools.....	74
24.3	Power Cords.....	74
24.4	Drills .....	75
24.4.1	Working with Small Pieces.....	76
24.4.2	Choosing the Proper Bit or Attachment.....	76
24.5	Belt Sanders.....	77
24.6	Sabre Saws, Jig Saws & Reciprocating Saws.....	78
24.6.1	Cutting.....	78
24.6.2	Starting an External Cut .....	78
24.6.3	Starting an Inside Cut.....	79
24.7	Chain Saws .....	79
24.7.1	General.....	79
24.8	Circular Saws .....	80
24.9	Planers .....	81
24.9.1	Secure Work .....	81
24.9.2	Cutting.....	82
24.10	Routers.....	82
24.10.1	Cutting.....	83
24.11	Explosive Actuated Fastening Tools .....	83
24.12	Care and Servicing of Tools.....	84
24.13	Use of Tools .....	84
24.14	Use of Projectile .....	84
24.15	Use of Charge Cartridges.....	85
24.16	Air Powered.....	85
24.17	Air Hoses.....	85
24.17.1	Operation .....	86
24.17.2	Air Cleaning .....	86
25.	ROLLING SCAFFOLDS .....	87
26.	SCAFFOLDS - METAL.....	88
26.1	General.....	88
27.	VEHICLE SAFETY .....	89
27.1	General.....	89
27.2	Vehicle Parking .....	89
27.2.1	General.....	89
27.2.2	Practice .....	90
27.3	Vehicle Report.....	90
28.	WELDING - EYE AND FACE PROTECTION.....	91
28.1	General.....	91
28.2	Screens .....	91

29.	WELDING - PROTECTIVE CLOTHING .....	92
29.1	General.....	92
30.	WELDING - VENTILATION.....	93
30.1	General.....	93
31.	WOODWORKING MACHINES .....	94
31.1	Band Saw .....	94
31.2	Wood Turning Lathes.....	95
31.3	Jointer/Planers .....	96
31.4	Shaper.....	97
31.5	Sanders .....	99
31.6	Push Sticks.....	100
31.7	Mitre Saws.....	100
31.8	Table Saws.....	102

## 1. ASBESTOS REMOVAL AND IDENTIFICATION

### 1.1 Pipe Insulation Removal Using Glove Bag

- (1) Place tools necessary to remove insulation in tool pouch. Wrap the bag around the pipe and close zippers. Seal bag to pipe with cloth straps.
- (2) Arrange insulation in bag to obtain full capacity of bag.
- (3) Insert nozzle of spray pump into bag through valve and wash down pipe and interior of bag. Wet surface of insulation in lower section of bag.
- (4) If bag is to be removed along pipe, loosen straps, move bag, re-seal to pipe using double-pull zipper to pass hangers.
- (5) To remove bag after completion of stripping, pull waste container over glove bag before removing from pipe.
- (6) After removal of bag ensure that pipe is free of all residue. Remove residue with wet cloth.
- (7) Seal exposed surfaces of pipe and ends of insulation with lagging to seal in any residue filers.
- (8) Gloves and bags must be double bagged for disposal in labeled waste bags.

### 1.2 Ballast

#### Ballasts Containing PCBs

- (1) Identify the ballast by looking at the markings on it. These markings identify manufacturer, type, year produced, PCB or non PCB.
- (2) If you can not get the information you need contact the manufacturer of the ballast.
- (3) Once confirmed PCBs are present before removing, place something on the floor in case the PCBs drip. Wear proper gloves and eye protection.
- (4) After removal place ballast in plastic bag and dispose of in a PCB barrel on site.
- (5) If no PCB barrel is on site you can transport up to 3 ballasts in plastic bags to a site with a barrel.

- (6) Ballasts manufactured after 1979 do not contain PCB.
- (7) Ballasts that do not contain PCBs can be disposed of in the regular garbage.

### 1.3 **PCB Storage Barrels**

- (1) Good quality 200 litre steel drum, 16 gauge or thicker.
- (2) Properly labeled can be viewed from all-round top and bottom.
- (3) Oil dry put on bottom before any ballast are put in.
- (4) Leave ballast 3" from top of drum for air movement when full.
- (5) Only ballasts from University buildings to be put in barrel.
- (6) Only ballasts from University owned buildings to go in the barrels, no ballasts to be excepted from outside contractors.

### 1.4 **Maintenance Program Policy**

The University will ensure all tools, vehicles and equipment are inspected for defects, faults or damage before use each day by the assigned worker. All tools will be further inspected at the end of each workweek. Tools determined to be not in good working order will be immediately tagged and removed from service. All tools removed from service will be inspected and repaired by qualified personnel.

#### Equipment Inventory

- Vehicles
- Hoisting Equipment
- Power Tools
- Hand Tools
- Ladders
- Scaffolding
- Power Cords
- Temporary Lighting Equipment
- Temporary Heating Equipment
- Personal Protective Equipment
- Ropes
- Hoses
- Clamps



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Maintenance Safe Work Manual

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- Hitches
- Other Accessories

**1.4.1 Maintenance Program Check**

A check of these items shall be done and recorded. The check should be done according to the safe work practices and the OH&S Act and regulations. Additional maintenance may be required on some items. If an employee finds a defective tool or equipment, he/she must make the supervisor aware of it immediately. Note: Items not in good repair must be repaired or replaced.

<b>Items</b>	<b>OK</b>	<b>Problem Description</b>	<b>Repaired By/Date</b>
Hand Tools:			
Power Tools (Stationary):			
Power Tools (Portable):			
Air Tools:			

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Maintenance Safe Work Manual

Items	OK	Problem Description	Repaired By/Date
Lifting/Blocking Equipment:			
Vehicles/Trailers:			
Other:			

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Maintenance Safe Work Manual

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Items	OK	Problem Description	Repaired By/Date

**2. ELECTRIC WELDING**

**2.1 Electric Welding - Setup Checklist**

**DO**

- (1) Locate welding leads away from main power leads to prevent accidental contact with high voltage.
- (2) Cover the lug terminals to prevent shorting out by a metal object.
- (3) Locate equipment so that it will not be tampered with by unauthorized personnel.
- (4) Minimize welding machine exposure to corrosive fumes, welding sparks or excessive dust.
- (5) Locate power switches where they can be quickly disconnected in an emergency.
- (6) Clear combustible materials from work area. Cover combustible objects with a fire-resistant blanket if you cannot move them.
- (7) Use only a proper earthing clamp or bolted terminal.
- (8) Have a fire extinguisher nearby.
- (9) Ensure welding machine is grounded.

**DO NOT**

- (1) Do not block walkways. Welding leads should run above head level or be covered so that they are not a tripping hazard. Locate leads and cables so they do not obstruct passageways, ladders and stairways.
- (2) Do not locate welding equipment near overhead cranes or work aisles.
- (3) Do not ground welding equipment to chains, hoists, or elevator cables.

- (4) Do not locate equipment with machine base in water. Thoroughly dry and test machine before using.
- (5) Do not overload machine or force cables to carry currents beyond their rated capacity.
- (6) Do not ground to pipelines carrying gas or flammable liquids, or to conduits carrying electric wires.
- (7) Do not coil or loop cables around your body.
- (8) Do not allow leaks and condensation to run back in the machine. Use cooling water line drip loops.

## **2.2 Electric Welding - Installation**

### **2.2.1 Engine Driven Equipment**

- (1) Locate on a level base protected from weather. Block wheels to prevent movement. Equipment used outside may require temporary shelter.
- (2) Ensure fuel tank has no leaks and cooling fan is guarded.
- (3) Conduct engine exhaust outside when used inside.

### **2.2.2 Grounding**

- (1) Ground according to manufacturers' instructions.
- (2) Check that the welding machine frame is grounded with special attention to ground connectors.
- (3) Do not ground to pipelines carrying gases, flammable liquids or electrical conductors.
- (4) Keep plugs and sockets connecting welding machines to power clean and free of moisture.
- (5) De-energize electric power when connecting power plug to the power socket.
- (6) Stand well away from plug and socket when power is turned on.
- (7) Wear eye protection.

- (8) Install caps on plugs and sockets when not in use.

### 2.2.3 Connections and Cables

- (1) Locate main switch near equipment so power can be shut off easily.
- (2) Locate main power lines overhead and connect them to each machine location.
- (3) Spread out welding cable prior to use. Check weld lead cables for damaged insulation and lead cables for exposed conductors. Check welding cables for full insulation along their length.
- (4) Ensure welding cable is large enough to carry the current required. As the total length of cable in the welding circuit increases, the current carrying capacity of that cable decreases. Therefore, for a given application, it may be necessary to increase the cable size.
- (5) Replace weld lead spliced within 3 m (10 ft.) of the electrode holder.
- (6) Check for leaks in gas hoses if metal inert gas (MIG) or tungsten inert gas (TIG) welding.
- (7) Inspect equipment periodically for loose or corroded connections, cable damage, dirty or ineffective jaws of electrode holders, and ground clamps.
- (8) Connect to the transformer or generator with the proper plugs or lugs.
- (9) Do not use bolts for clamping stranded or plaided conductors. They usually work loose.
- (10) Use proper cable couplings to extend leads.

### 2.3 Gas Welding and Cutting - Set-Up

#### Equipment Connection

- (1) Oxygen cylinders have right turning valves and connections. Fuel cylinders have left turning valves and connections.
- (2) “Crack” open cylinder valves slightly and then close immediately (except hydrogen gas). This blows out dust and grit that could restrict the gas flow or damage the regulator.
- (3) Attach the oxygen and fuel gas regulators to their cylinders. Tighten nuts with a proper wrench. Never force poor fitting connections.

- (4) Install non-return valves and flashback arrestors on the torch and regulator end of the hoses.
- (5) Connect the green (black) hose to the oxygen regulator and the red hose to the fuel gas regulator.
- (6) Connect torch green hose to the oxygen inlet and red hose to the fuel gas inlet. Finger tighten hose nuts before using a wrench. The wrench may damage unprotected threads.

### **Checklist**

#### **DO**

- (1) Keep cylinders upright in a cylinder trolley for firm support.
- (2) Examine hoses before use for signs of damage. Secure connections with clips or crimps. Check connections and on-return valves regularly.
- (3) Stand to one side of regulator face when opening the cylinder valve outlet. Open cylinder valves slowly.
- (4) Open cylinder valves only with approved keys or hand wheels. Do not use excessive force to open or close cylinder valve.
- (5) Select the proper welding head or mixer, tip or cutting nozzle from charts supplied by the manufacturer and screw it firmly into the torch.
- (6) Use table tops made of fire brick or steel plate. Regular brick may pop or explode from heat. Keep flames and hot metal off concrete.
- (7) Leave the valve wrench on the fuel gas cylinder whenever the valves are open. This permits emergency shut-off of the gas.

#### **DO NOT**

- (1) Do not connect a hose longer than needed. Keep hose from becoming kinked or tangled.
- (2) Do not use tape to repair a leaky hose.
- (3) Do not have oil or grease on any welding and cutting equipment. Oil or grease may cause an explosion.





## 2.4 Regulator Set Up

### 2.4.1 General

- (1) Make sure the regulator inlet threads match the cylinder valve outlet threads. Connect the regulator to the cylinder's outlet valve.
- (2) Release the pressure-adjusting screw on the regulator by turning counter-clockwise. Open the downstream line to the air to drain the regulator of gas.
- (3) Open the cylinder valve slightly to let the needle in the cylinder contents gauge move up slowly. On an oxygen cylinder, open the cylinder valve fully, but on an acetylene cylinder turn valve only 1 1/2 times.
- (4) When closing down, shut the cylinder valve and open torch valve before slackening the pressure-adjusting screw.
- (5) If a regulator shows excessive pressure "creep" replace immediately. "Creeping" of a regulator is shown by a gradual increase in pressure after the torch valves are closed. To check for "creep", close the welding or cutting torch valves while the regulator is open and check for increase in indicated pressure. Refer to manufacturers' operating manuals.

### **Checklist**

#### **DO**

- (1) Stand to one side and away from regulator gauge faces when opening cylinder valves.
- (2) Leave key wrenches on cylinders in use, so they can be closed quickly.
- (3) Ensure connections between the regulators and cylinder valves are tight.
- (4) Check accuracy of regulator pressure gauge at least yearly.

#### **DO NOT**

- (1) Do not use pipe wrenches or pliers for attaching regulators to cylinders. Use wrench of proper size.
- (2) Do not open cylinder valve until the regulator is drained of gas and the pressure-adjusting screw on the regulator is fully released.

- (3) Do not thaw a frozen regulator with a flame. Use warm water.
- (4) Do not interchange regulators for a gas with similar equipment intended for use with other gases.
- (5) Do not use oil or grease as a lubricant for tight threads. Any oil or grease on a regulator or fittings may cause an explosion.
- (6) Do not release the pressure-adjusting screw when there is pressure in the hose and the hose torch valve is closed. The valve diaphragm will be damaged.

## 2.5 **Electrical Rubber Gloves**

### **General**

- (1) All gloves must be suitable for authorized and qualified personnel, adequately rated for at least 10Kv.
- (2) Only personnel who are familiar with the use of and storage of these gloves shall use them.
- (3) Always make sure your hands are clean of oil or any other substance that could break down the rubber in these gloves.
- (4) Gloves must be stored and maintained in a serviceable condition, and remain in their protective carrying case when not in use.
- (5) Gloves shall be tested by an approved testing facility every 6 months.
- (6) Damaged gloves shall not be worn.

## 2.6 **Electric Welding - Maintenance and Inspection**

### 2.6.1 **General**

- (1) Ensure that the welding equipment has required power supply capacity and is grounded. Only qualified electricians should install and repair electrical equipment.
- (2) Provide properly sized fuses or circuit breakers for overload protection. Size for the machine current requirements.
- (3) Locate main power terminals inside welding machine cover. Ensure

terminals are accessible only with tools.

### 2.6.2 Maintenance Personnel

- (1) Inspect regularly and keep records. Check oil level and moisture content in oil-cooled transformers.
- (2) Prevent overheating. Check with portable ammeters to ensure that load current has not increased beyond the capacity of the welding machine, cable or torch.
- (3) Clean equipment according to manufacturer's recommendations.
- (4) Ensure welding set has adequate ventilation and internal cooling fans, if present, are operating properly.

### 2.6.3 Welders

- (1) Check daily all external connections. Report defective electrode holders and guns, insulation overheating or suspected defects.
- (2) Ensure all connections are tight and contact areas are clean.
- (3) Check welding leads for damage.
- (4) Report and clean up all fuel leaks in engine driven equipment. Ensure exhaust gases are vented.
- (5) Avoid spilling fuel when filling tanks (clean up spills).
- (6) Connect cables sized for maximum welding amperage.

### 2.6.4 Electrode Holders Inspection

- (1) Check for:
  - (a) Loosened metallic screws in the holder.
  - (b) Burned or cracked insulation which exposes electrical conductors.
  - (c) Overheating and damage at cable connections.
- (2) Secure the "welding return" and "welding ground" cables to the work with a bolt for strip conductor. For stranded conductors use a cable lug or a grounding clamp. Cable strands are unlikely to hold firm for long periods under the head of a bolt.

- (3) Ensure welding lead and return are sized for maximum welding amperage.

### 3. **CONFINED SPACE**

#### 3.1 **Entry Into Confined Space**

- (1) A space which is enclosed or partially enclosed and is not intended for human occupancy. An area with restricted entry or exit and may be hazardous because of design, construction, location, atmosphere or the materials or substances in it or other conditions.
- (2) All employees permitted to work in confined spaces shall be trained on the requirements of entry. Retraining programs will be offered to ensure personnel remain versed in procedures with confined spaces.
- (3) All operation carried out within confined spaces: shall be under the supervision of a person in charge, shall be attended by and in communication with another worker stationed outside at or near the entrance.
- (4) Atmosphere inside a confined space shall be remotely monitored for hazards prior to each entry and throughout the operation.

#### 3.2 **Hazardous Assessment**

- (1) Hazardous Atmosphere:
  - (a) An atmosphere that may expose employees to risk or death.
  - (b) Concentrations of chemicals.
  - (c) Airborne combustibles, flammable gas or mist.
  - (d) An atmosphere which will incapacitate, impair ability to self rescue, will injure or harm.
- (2) Hazardous atmosphere will be force ventilated to reduce to acceptable levels or eliminate the hazard. If ventilation is ineffective, the appropriate level of personal protective equipment required to perform the task shall be provided.
- (3) Approved self-contained breathing apparatus or airline respirators equipped with a five (5) minute emergency air supply shall be used in hazardous atmosphere or dangerous conditions.
- (4) Hazard Isolation:

Actions to isolate confined space hazards shall be performed prior to entry. These include but are not limited to blanking or gliding, double block and bleed or log out and tag.

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- (5) If a confined space requires respiratory protective equipment or where rescue may be difficult, body harnesses and life lines shall be used. The attendant shall be provided with the same equipment as those working within the confined space.
- (6) All equipment provided for permit space entry shall be adequately maintained and calibrated in accordance with manufacturers specifications. All employees using equipment shall be trained in their use.
- (7) All sources of ignition must be removed prior to entry, hand tools will be in good condition, explosion proof and spark proof, hand held lights and other illumination equipped with guards and be explosion proof.
- (8) Compressed gas cylinders shall not be taken into confined spaces, except cylinders used for self-contained breathing apparatus.
- (9) Contractors shall be provided with all available information, regulations and safety procedures for entry into confined space. Procedures for each employer shall be implemented when one or more employer has employees in a permit space.
- (10) Rescue teams trained in confined space responses will be available to assist the confined space attendant in emergency situations. Rescue teams shall be informed of the hazards associated with the confined space prior to commencement. Retrieval system allowing attendant to extricate entrant without entering confined space may be used, tripods or other properly secured retrieval system.

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1. Description of Work to be Undertaken:		
2. Names of Workers and Positions:		
3. List of Tools/Equipment and Product For This Project (Example: Lifting Devices, Lighting, Wrenches, Solvent, Gaskets):		
4. Lock Out Procedure In Place:  Name of Electrician and/or Plumber:  Name of Employee(s) Entering Space:		
	Check (✓)	Not Applicable
Electrical Source Locked Out		
Mechanical Source Locked out		
Lines Blanked or Isolated		
Others (Please Specify)		
5. Cleaning or Purging Method.  How Long?  By Whom?		
<b>ENTRY INTO CONFINED SPACE HAZARD ASSESSMENT</b>		
6. Ventilation Set Up and Operational	Yes	No
Force Air		
Extraction		
7. Safety Equipment	Yes	No
Tripod		
Fall Arrest System		
Hard Hat		
Protective Footwear		
Safety Glasses		
Respirator (Type):		

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Coveralls		
8. Testing Results	Yes	No
Carbon Monoxide Level More Than 35 ppm		
Methane Level More Than 10 ppm		
Explosive Limits Level More Than 10%		
Oxygen Less Than or More Than 19.5%-23%		
9. Emergency Plan	Yes	No
Communication Devices in Place and Tested		
Emergency Plan Posted		
Rescue Preparedness		
10. Entry Permit in Place	Yes	No
Hazard Assessment and Work Procedure Reviewed With Workers		
Date	Signature of Person in Charge	



## 4. **DEMOLITION/DISMANTLING**

### 4.1 **General**

- (1) Hazard assessment to be done before demolition.
- (2) Warning signs to be installed.
- (3) Seal off as much as possible, to contain dust, etc.
- (4) All electrical water and gas to be locked out before demolition.
- (5) Masonry walls shall be removed in reasonably level courses in any one storey. It shall not be permitted to fall in such a mass as to damage the structural stability of floor or supports.
- (6) Proper storage bins or trucks to be on job site for debris.
- (7) Anything over 3 meters a proper shoot to be used from work site to container, or carried out by hand
- (8) Do not leave anything hanging or something that could fall.
- (9) All debris shall be disposed of as soon as possible.
- (10) No stacking or piling materials or debris on project to endanger workers.
- (11) No workman shall enter or be permitted in any area where his safety might be endangered by material or debris falling from demolition.

### 4.2 **Barricades and Guardrails**

- (1) Hazardous areas should be cordoned-off with barricades and danger tape.
- (2) Guardrails consisting of a top rail, mid-rail and toeboard must be provided at all floor edges or roof openings where an employee may fall more than 2.5 meters (8 feet), unless protected by adequate coverings.
- (3) Barricades may only be removed for work to proceed with permission of the supervisor. They must be replaced immediately after work is completed.

**5. FIRE PROTECTION SPRINKLERS**

- (1) All sprinkler work shall be carried out by qualified personnel.
- (2) Notify personnel 24 hours before disconnection.
- (3) Prior to sprinkler shut down, the building contact person shall be notified. The type and duration of work will be disclosed.
- (4) Notices will be posted by building contact person prior to commencement of work, using attached form. Form will be posted on all affected pull stations. Electrician to notify monitoring company.
- (5) Electrician to disconnect fire alarm zones and AC & DC Power if needed.
- (6) End of day electrician will notify proper authority if system or only part of the system can be re-energized.
- (7) Upon completion of work:
  - (a) Ensure system is charged.
  - (b) Main water supply is fully open.
  - (c) Alarm panel is connected and checked for operation by electrician.
  - (d) Monitoring service is notified system is back to normal.
  - (e) Notify building contact person that work is complete and system is charged and back on line.
  - (f) Signs are removed.

**IN CASE OF FIRE, CALL 9 - 911**

## 6. GAS WELDING AND CUTTING - CYLINDER STORAGE

### 6.1 General

- (1) Store oxygen and fuel gas cylinders at least 6 m (20 ft.) apart, or separate by a 1.5 (5ft.) high wall with a half-hour fire resistance rating. Place outside on fire-proof surface. When inside storage is necessary, ensure that the room is well ventilated.
- (2) Keep cylinders away from open flames (including welding or cutting torches), electric arcs, molten slag, sparks and radiators. Exposure to the sun for long periods can cause a dangerous rise in pressure within a cylinder. Cylinders are not designed for temperatures above 54 degrees C (130 degrees F).
- (3) Keep cylinders at least 6 m (20 ft.) from flammable materials such as paint, oil or solvents.

### **Checklist**

- (1) Identify storage areas. Clearly post “no smoking” signs within those areas.
- (2) Keep all cylinders and fittings where they cannot be contaminated by oil or grease.
- (3) Secure acetylene cylinders upright, whether full or empty, so they will not fall.
- (4) Ensure all cylinders are marked clearly. If not, refuse delivery.
- (5) Keep full and empty cylinders apart to prevent accidental part-filling of an empty cylinder by back-feeding.
- (6) Close valves of empty cylinders. Fit protection caps. Mark cylinders empty or “MT”. Return cylinders promptly to the supplier.
- (7) Protect cylinders from extremes of weather, ice, snow and direct sunlight.
- (8) Avoid placing cylinders where they could become part of an electrical circuit and, through arcing, cause a fire.
- (9) Store cylinders away from elevators, stairs, doorways and aisles.

## 6.2 Handling Cylinders

- (1) Handle cylinders with hands and clothing which are free of grit, grease and oil. This prevents slipping and also prevents grit or grease getting onto the nozzle of valve.
- (2) Keep cylinders in trolleys built for them. When not using such a trolley to move cylinder, detach cylinder regulators and fit with valve protection cap.
- (3) Dragging or sliding cylinders can cause damage. Roll cylinders on their bottom edge.
- (4) If moved by crane, place cylinders in a proper cradle or trolley. Fit with a valve protection cap.
- (5) Chain or wire rope slings allow cylinders to slip. Even rubber covered slings can slip.
- (6) If an acetylene cylinder has been accidentally left on its side, set it upright for at least one hour before using it.
- (7) When cylinders are frozen to the ground, do not pry them loose. Use warm but not boiling water to loosen and pull out by hand.

### **Checklist**

#### **DO**

- (1) Handle all cylinders as if they were full.
- (2) Protect cylinders from damage.
- (3) Secure cylinders to a firm support.
- (4) Tighten valve protection caps by hand.
- (5) Move cylinders with caps on.
- (6) Transport cylinders in an upright position, secured on a vehicle or trolley designed for that purpose.

## **DO NOT**

- (1) Do not strike an electric arc on a cylinder.
- (2) Do not transfer gas from one cylinder to another.
- (3) Do not use a sling or an electromagnet to move cylinders.
- (4) Do not refer to acetylene as “gas”, or oxygen as “air”. Always use the proper name.
- (5) Do not hoist a cylinder by the protection cap.
- (6) Do not use cylinders as rollers or supports.
- (7) Do not drop cylinders. They could burst or the valves could break off or become damaged.
- (8) Do not place an acetylene cylinder on its side.
- (9) Do not rely on cylinder’s colour. Check cylinder stencil and tag.

### **6.3 Welding, Cutting, Burning**

- (1) Work involving welding, cutting and burning can increase the fire and breathing hazard on any job.
- (2) Always ensure that adequate ventilation is supplied during welding, cutting and burning.
- (3) Where workers and others are exposed to the hazards created by welding, cutting and burning they must be alerted to these and/or protected from them by the use of “screens”.
- (4) Never start work without proper authorization.
- (5) Always have fire fighting or prevention equipment on hand before starting work.
- (6) Check work area and surrounding for combustible material and possible flammable vapours before starting work.
- (7) Check cables and hoses to protect them from slag or sparks.

Cape Breton University  
Maintenance Safe Work Manual

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- (8) Hoses should be equipped with flame arrestors.
- (9) When working overhead creates a hazard, use fire resistant materials to control or contain slag and sparks.
- (10) Eye protection shall be worn at all times during work operations, shields and glasses tinted to specifications required.

## 7. ELECTRIC WELDING - EQUIPMENT USE CHECKLIST

### DO

- (1) Have solid footing and support yourself against stable objects. Your sense of balance may be affected with your welding shield covering your face.
- (2) Hold the weight of the welding lead in one hand while welding with the other hand.
- (3) Store electrode holders where they cannot contact workers, fuels or compressed gas leaks.
- (4) Remove all electrodes from holders and disconnect the machine from power source when welding is stopped for any period of time. Retract or cut off wire electrodes in semi-automatic holders to prevent contact.
- (5) Burn electrodes to no less than 39 to 50 mm (1 1/2 to 2 in.) in length. Burning them shorter damages the electrode holder insulators, and may result in accidental shorting out.
- (6) Keep electrode holders and electrodes dry. If exposed to water or steam, dry thoroughly before further use.
- (7) Place electrode stubs in a container to prevent welders from slipping or falling on them.
- (8) Position yourself where welding fumes do not rise directly into your face.
- (9) Shield other workers from your welding arch.
- (10) Wear protective clothing, including eye and foot protection.
- (11) Use chalk to mark completed work "Hot".
- (12) Chip slag so that the pieces fly away from you. Remove combustible materials from slag path before chipping.

### DO NOT

- (1) Do not change electrodes with bare hands, wet gloves or when standing on wet floors or grounded surfaces.
- (2) Do not weld near degreasing operations. This causes the formation of

hazardous gases.

- (3) Do not cut or weld on containers, tanks, or drums until they have been thoroughly cleaned and properly ventilated. Follow practices outlined in safety regulations and standards.
- (4) Do not cool electrode holders by dipping in water.
- (5) Do not switch the polarity switch with an electric welder in operation. Turn off equipment to change polarity.



## 8. **GAS WELDING AND CUTTING - LEAKING & OVERHEATING CYLINDERS**

### 8.1 **Leaking**

- (1) Check regularly and every time equipment is set up for gas leaks at cylinder valves, regulators and torch connections.
- (2) Return cylinder to supplier with protection cap in place when empty. Do not ship a leaking cylinder.
- (3) Close the valve on a cylinder if a leak is found around the valve stem.
- (4) Stop temporarily a leak through the cylinder valve by attaching a regulator.
- (5) Take a leaking cylinder out-of-doors well away from any source of ignition, if the leak cannot be stopped. Clearly tag it. Call and follow instructions of supplier.
- (6) Post a sign on cylinders warning not to approach within 6 m (20 ft.) with a cigarette or other source of ignition.
- (7) Open the cylinder valve slightly and allow gas to escape slowly.

### 8.2 **Acetylene Cylinder Overheating**

Acetylene cylinders may become hot from severe backfire or accidental heating. To prevent an accident:

- (1) Remove source of heat.
- (2) Shut cylinder valve, detach regulator.
- (3) Clear all other workers away.
- (4) Call supplier.
- (5) Cool cylinder with a large supply of water, from behind a protective barrier.
- (6) So gas does not ignite, remove all sources of ignition from the area if this can be done safely.
- (7) If the cylinder valve safety device opens and gas ignites, cool with water. Do not try to extinguish the flames.
- (8) Periodically stop cooling.
- (9) Check if water dries off the cylinder or if it remains wet.
- (10) When the cylinder remains wet on removal of the water, remove cylinder to an open space.
- (11) Open valve and continue to cool cylinder with water until cylinder is empty.

## 9. GAS WELDING AND CUTTING - LIGHTING UP

### 9.1 General

Use torch as described in manufacturers' instructions. A procedure for one torch is not always safe for another.

### 9.2 Pressure Setting

- (1) Open the oxygen cylinder valve slowly and fully.
- (2) Open the fuel gas cylinder valve about 3/4 of a turn but not more than 1 1/2 turns.
- (3) For welding, open the oxygen torch valve, turn the pressure-adjusting screw on oxygen regulator to desired pressure and close torch oxygen valve.
- (4) Open the fuel torch valve 1/4 turn. Adjust fuel gas to working pressure. (Refer to manufacturers' recommendations for pressure settings.) Set gas pressures as low as possible.

### 9.3 Purge

- (1) Purging removes mixed gases in hoses which can cause a flashback when lighting up.
- (2) Do not purge equipment in confined spaces or in the presence of any ignition source.
- (3) To purge, in turn open and close each torch valve for 1 second for every 3 m (10 ft.) of hose.
- (4) Purge hoses before using and after each shut down or more than 1/2 hour.

### 9.4 Lighting Up

- (1) Open the torch fuel gas valve about 1/4 turn. Do not open fuel and oxygen valves at the same time. Make sure that the torch is not pointed at any person, cylinder, or combustible material.
- (2) Immediately light the gas at the tip/nozzle with a spark lighter or a pilot flame. Do not use matches, hot metal or welding arc.
- (3) Increase the fuel gas flow until the flame stops smoking.

- (4) Open the torch oxygen valve and adjust the flame to that required for the process.
- (5) Check the regulator, set pressures and adjust if necessary.
- (6) When the flame is adjusted to manufacturers' recommendations but is too large (hot) or small (cold) do the job, change the tip size.

## 10. GAS WELDING AND CUTTING - SHUT DOWN

### 10.1 Shutting Off Torch

- (1) Close torch fuel gas valve then close oxygen valve. This is satisfactory for temporary stops not involving leaving the equipment. (Check manufacturers' recommendations. Some recommend closing oxygen valve first.)
- (2) In case of backfire or flashback, close torch oxygen valve first. This cuts off the oxygen supply to the internal flame.

### 10.2 Closing Down

- (1) Shut off torch as described above.
- (2) Close fuel gas cylinder valve and then close oxygen cylinder valve.
- (3) Drain fuel gas line by opening torch fuel gas. When both gauge needles have fallen to "0" close the fuel gas torch valve.
- (4) Drain oxygen line by opening torch oxygen valve. Allow both gauge needles to fall to "0". Close the torch oxygen valve.
- (5) Back off regulatory pressure-adjusting screw until no spring tension is felt.
- (6) Regulators and torches can not be disconnected or, if shut down temporarily, hang up the torch and hoses to prevent damage.

### Checklist

#### **DO**

- (1) Shut off the gas at the regulators to change torches, do not crimp the hose.
- (2) Close cylinder valves when work is finished. Put valve protection caps in place and release pressure in regulators and hose lines before cylinders are moved or placed in storage.
- (3) Mark completed pieces "Hot" with chalk.

#### **DO NOT**

- (1) Do not put down a torch until the valves have been completely shut off.

- (2) Do not hang torches from a regulator or other equipment so that they come in contact with the sides of gas cylinders. If the flame is not out or if a leaking torch ignites, it may heat the cylinder.
- (3) Do not leave the hoses pressurized. Always turn off the supply from the cylinder, bleed the lines, and with lines open, back off the regulator. Lines should then be coiled without kinks.
- (4) Do not re-light torches from hot work. If gases do not light instantly, ignition may be violent.

## 11. GAS WELDING AND CUTTING - OPERATING FAULTS

### 11.1 General

Minor “explosions” known as backfires and flashbacks may occur during welding and cutting. Common causes are:

- (a) Torch nozzle obstructed or held too close to work.
- (b) Pressures exceed the capacity of the cutting nozzle or welding tip. Gas at the higher pressure flows into the lower pressure line.
- (c) A leak from regulator, hose, or connection causes a drop of pressure in a line. Gas from the higher pressure line back feeds into it.
- (d) Leaking valves allow gas to seep through and mix when the equipment is not in use.
- (e) Lighting up with both torch control valves open, but one cylinder closed.
- (f) The fuel gas may backfeed into the oxygen line regulatory and cylinder when an oxygen cylinder becomes empty. If the regulatory is then placed on a new oxygen cylinder, and the cylinder valve is opened too rapidly, the pressure can increase the temperature of the mixed gas enough to ignite it.

### 11.2 Backfire

Return of the flame into the torch with a popping sound. The flame is either extinguished or re-ignited at the nozzle.

What to do:

- (1) Close oxygen torch valve.
- (2) Close fuel gas torch valve.
- (3) Check cylinder pressures.
- (4) Check and adjust regulatory settings.
- (5) Cool torch and clean nozzle or tip.
- (6) Re-light when gas flow is properly set.

### 11.3 Flashbacks

Return the flame through the torch into the hoses and the regulators. They are caused by oxygen and fuel gas in the same supply line. Flashbacks will damage equipment. A serious flashback or several minor ones makes equipment unsafe.

What to Do:

- (1) Close oxygen torch valve.
- (2) Close fuel gas torch valve.
- (3) Close fuel and oxygen gas cylinder valves.
- (4) Extinguish fire.

- (5) Inspect torch, hose, regulators and cylinders. If cylinder is hot, cool.

#### 11.4 **Non-Return Valve**

A device designated to prevent the back flow of gases. When fitted to the torch end of the hose it reduces the chance of oxygen and fuel gas mixing, but may not stop a flashback reaching the hose, regulator, and cylinder. For this reason, a flashback arrestor is preferred.

#### 11.5 **Flashback Arrestor**

- (1) A device designed to prevent the back flow of gas, and stop the flashback flame front. Prevents the flashback reaching the regulator and cylinder.
- (2) Fit small flashback arrestors between the torch and hose. Install larger units at the regulator outlets. Maintain regularly to ensure satisfactory performance.
- (3) Use of flashback arrestors does not reduce the need to follow safe operating procedures.

## 12. GRINDING WHEELS

To avoid injuring yourself or damaging equipment, follow these safety instructions.

### 12.1 Wheel Marking

Use only wheels marked with the type of wheel and maximum speed in revolutions per minute (rpm).

### 12.2 Inspection

- (1) Upon receipt of all wheels examine for any signs of damage. Use “Ring Test” to check wheels.
- (2) Ring tests do not apply to small wheels 10 cm (4 in) diameter and smaller.  

Support heavy wheels on a clean hard floor.	Suspend light wheels from hole by small pin or finger.
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- (3) Tap wheels gently with a non-metallic tools such as a plastic screwdriver handle or wooden mallet.
- (4) A sound wheel will emit a ring. Reject any wheel that sounds dead or cracked.

### 12.3 Selection of Wheels

Selecting the right wheel for the job is of critical importance for safety. A wheel is dangerous when used for work it was not designed for. Booklets from wheel and machine manufacturers provide technical information on wheel use.

### 12.4 Handling

- (1) All abrasive wheels are fragile.
- (2) Handle wheels carefully. Avoid dropping or bumping.
- (3) Provide a soft surface to roll wheels on if they cannot be carried.
- (4) Transport wheels in containers designed to provide support for the wheels.
- (5) Do not pile other items such as tools on top of wheels.



## 12.5 Storage

- (1) Store wheels in racks or bins with dividers for different types of wheels.
- (2) Place straight or tapered wheels on end in a cradle or chocked position to prevent rolling.
- (3) Store thin wheels on a flat surface.
- (4) Stack cylinder and straight cup wheels on the flat side with cushioning material, such as cardboard.
- (5) Never store wheels near excessive heat, in contact with oil or moisture, or in drawers with loose tools.

## 12.6 Bench and Pedestal Wheel Mounting

Grinding machine wheel use and maintenance should conform to manufacturer's recommendations.

- (a) Ensure you have the correct type and size wheel for the machine by checking the markings on both. The machine spindle speed must not be greater than the speed marked on the wheel.
- (b) Examine the wheel for cracks or chips. Replace a faulty wheel.
- (c) Do not force a wheel onto the machine spindle or change the size of the mounting hole.
- (d) Maintain even pressure from both flanges against the sides of the wheel. Check flanges with a straight edge. Worn or warped flanges must not be used.
- (e) Maintain a clearance (undercut relief) of at least 3 mm (1/8 in) to prevent pressure on the wheel near the hole.
- (f) Check the surface of the abrasive wheel and flanges to ensure that no particles are present.
- (g) Use paper blotters between wheel and flanges to take up slight wheel surface roughness.
- (h) Ensure mounting pilot(s) is rounded with length about 2/3 width of the wheel.
- (i) Extend the threaded section well inside of the loose flange.
- (j) Tighten grinding wheels just enough to prevent them from slipping. Over tightening the spindle nuts or clamping screws can damage the wheel and grinder parts. With multiple screw mounting flanges tighten the bolts uniformly. Start by barely tightening a screw, "snug-up" opposite screw and in a crisscross manner, continue until all mounting screws are uniformly tight. Use a torque wrench to apply not more than 20 to 27 joules (15 to 20 foot-pounds).

- (k) Place the thread of the central spindle in a direction that allows the nut to tighten because of the force of the work being done.
- (l) Replace all guards.
- (m) Warn all persons in the area of the wheel to stand clear.
- (n) Stand to one side and test the wheel. Start up and run the wheel for at least one minute. If any undue vibration occurs, switch off immediately and make adjustments.

### 12.7 Straight Wheels

- (1) Inspect and conduct “ring test” before mounting a wheel.
- (2) Check flanges for distortion or abrasion. When flanges are distorted or warped contact area is reduced.
- (3) Flanges must not be reversed.
- (4) Do not use flat washers, or other filler materials in place of flanges.
- (5) The fixed and loose flanges should have the same diameter and have undercut relief. The minimum flange size is 1/3 the wheel diameter.

### 12.8 Cup Wheels

Use a flat unrelieved flange with a threaded hole mounting. This prevents strain on the bond that anchors the bushing to the wheel cup.

### 12.9 Cone and Plug Wheels

The common cause of breakage is that the spindle threads are either too short or too long for the tapped hole in the wheel.

### 12.10 Depressed Centre Wheels

- (1) Replace worn or bent reusable adapters. A damaged adapter will not mount properly.
- (2) Do not reuse “throw-away” adapters.
- (3) Ensure grinder spindle shoulder runs true. The adapter must tighten against this shoulder. Use spacers provided with adapters if the spindle is too long.
- (4) The wheel will wobble if the shoulder is not square with the spindle, or if the adapter does not tighten against the shoulder. This can result in wheel

breakage.

## 13. GROUNDS MAINTENANCE

### 13.1 General Precautions

- Ensure personnel are properly trained with the proper tools and understand job hazards.
- Identify and destroy poisonous plants.
- Protect against insects with insect repellent when required.
- Do not touch stray or dead animals. Contact the Animal Control Agency.
- Pace yourself in hot weather.
- Make sure emergency numbers are posted.
- Locate first aid kit and know the use of the contents.

### 13.2 Personal Protective Equipment

- Wear high-cut safety footwear with top caps and reinforced soles.
- Use approved head protection when working under low objects that may fall.
- Wear a brimmed hat and comfortable clothing that provide sun protection.
- Wear sturdy gloves with grips.
- Wear rubber gloves when handling hazardous materials.
- Wear proper sun glasses when in direct sunlight for extended periods.
- Use eye protection at all times.
- Do not wear loose or torn clothing.

### 13.3 Tools

Select the suitable tools:

- For the task.
- To your body size, shape, strength.
- Ensure that tools are in good repair.
- Fasten handles securely.
- Finish handle surfaces so that they are smooth.
- Repair or replace worn or damaged handles.
- Keep cutting tools sharp.
- Put tools away when job is finished.
- Store tools where they do not create a hazard.
- Protect cutting edges.

### 13.4 Refueling Equipment

- Fill the fuel tank before starting job.
- Shut off engine and allow to cool.
- Position yourself comfortably so that you can refuel without slipping.
- Remove the fuel cap slowly, holding it at the semi-locked position until

- pressure is released.
- Allow the nozzle to empty by keeping it in the filler opening for a few moments after shutting off fuel flow.
- Replace the fuel cap after checking to see that its venting is not clogged.
- Store fuel in sturdy, approved containers identified according to WHMIS requirements.
- Have fire extinguisher or other fire-fighting equipment nearby.
- Do not smoke or have open flame while refueling. Gas fumes are heavier than air and will drift downward from the container. The vapour, not the liquid, burns.
- Do not spill any fuel on equipment. If you do, wipe up and allow any residue to dry before starting engine.
- Do not run if your clothing catches fire. Stop, drop and roll. Quickly remove the burning garment, or drop to the ground and roll slowly, or wrap yourself in a blanket.

## 14. **HAND TOOLS**

### 14.1 **General Safe Hand Tool Operation**

#### **DO**

- (1) Wear safety glasses or goggles.
- (2) Ensure that workers are properly trained in the safe use of hand tools.
- (3) Use good quality tools.
- (4) Select the right tool for the job. Substitutes increase the chance of having an accident.
- (5) Avoid using hand tools with your wrist bent, use tools designed to allow your wrist to stay straight.
- (6) When possible pull on a wrench or pliers. Never push unless you hold the tool with your palm open.
- (7) Maintain tools carefully. Keep them clean and dry, and store them properly after each use.
- (8) Inspect tools for defects before use.
- (9) Keep cutting tools sharp.
- (10) Keep tools in good condition at all times. Replace or repair defective tools.
- (11) Replace cracked and broken handles on files, hammers, screwdrivers, or sledges.
- (12) Redress burred or mushroomed heads of striking tools.
- (13) Carry tools in a sturdy tool box to and from the worksite.
- (14) Keep the work environment clean and tidy to avoid clutter which may cause accidents.
- (15) Whenever possible, use a heavy belt or apron and hang tools at your sides, not behind your back.

**DO NOT**

- (1) Do not use tools for jobs they are not intended to do.
- (2) Do not apply excessive force or pressure on tools.
- (3) Do not cut towards yourself when using cutting tools.
- (4) Do not hold the stock in the palm of your hand when using a cutting tool or a screwdriver.
- (5) Do not wear bulky gloves to operate hand tools.
- (6) Do not throw tools. Hand them directly to workers.
- (7) Do not carry tools in a way that interferes with using both hands on a ladder, while climbing on a structure, or when doing any hazardous work.
- (8) Do not carry a sharp tool in your pocket.

**14.2 Wrenches**

Wrenches are made in various shapes and sizes and for many uses. Use the correct wrench for the job.

**DO**

- (1) Wear safety glasses or a face shield.
- (2) Grip the wrench so that you will not endanger yourself in case it slips.
- (3) Use the correct jaw to avoid slippage.
- (4) Face an adjustable wrench forward. Turn wrench so pressure is against the permanent jaw.
- (5) Whenever possible, pull on a wrench; do not push.
- (6) Adjust your stance and pull when applying excess force.
- (7) Stand aside when work is done with wrenches overhead.
- (8) Maintain all leverage tools and keep at the correct adjustment during use.

- (9) Clean and place tools and wrenches in a tool box, rack or tool belt after use.

**DO NOT**

- (1) Do not use pipe wrenches on nuts or bolts.
- (2) Do not use a wrench on moving machinery.
- (3) Do not interchange tools. Never use pliers instead of a wrench, or a wrench as a hammer.
- (4) Do not use a make-shift wrench.
- (5) Do not use worn adjustable wrenches. Inspect the knurl, jaw and pin for wear.
- (6) Do not insert a shim in a wrench for better fit.
- (7) Do not strike a wrench with a hammer, or similar object to gain more force.

**14.3 Hand Saws**

- (1) Saws are made in various shapes and sizes and form many uses. Use the correct saw for the job.
- (2) Wear safety glasses.
- (3) Select a saw of proper shape and size for stock being used.
- (4) Whenever possible, choose a saw handle that keeps your wrist in a natural position in the horizontal plane.
- (5) Check the stock being cut for nails, knots, and other objects that may damage or buckle saw.
- (6) Start cut by placing your hand beside the cut mark with your thumb upright and pressing against blade. Start cut carefully and slowly to prevent blade for jumping. Pull upward until blade bites. Start with partial cut, then set saw at proper angle.
- (7) Apply pressure on the downstroke only.
- (8) Hold stock being cut firmly in place.



- (9) Use a helper, a supporting bench or a vise to support long stock if required.
- (10) Keep teeth and blades properly set.
- (11) Protect teeth of saw when not in use.
- (12) Keep saw blades clean.

#### 14.4 Hacksaws

- (1) Select correct blade for material being cut.
- (2) Secure blade with the teeth pointing forward.
- (3) Keep blade rigid, and frame properly aligned.
- (4) Use strong, steady strokes, directed away from yourself.
- (5) Whenever possible, use entire length of blade in each cutting stroke.
- (6) Clamp thin, flat pieces requiring edge cutting.
- (7) Keep saw blades clean and lightly oiled.

#### 14.5 Hammers

Hammers and other striking tools are widely used and often abused. Hammers are made for specific purposes in various types and sizes, with striking surfaces of varying hardness.

##### **DO**

- (1) Wear safety glasses or a face shield.
- (2) Select hammers according to their intended use. Misuse can cause the striking face to chip, possibly causing a serious injury.
- (3) Choose a hammer with a striking face diameter approximately 2.54 cm (1 in.) Larger than the face of the tool being struck.
- (4) Strike a hammer blow squarely with the striking a face parallel to the surface being struck. Always avoid glancing blows and over and under strikes.
- (5) Look behind and above before swinging hammer.

- (6) Watch the object you are hitting.
- (7) Hold the hammer with your wrist straight and your hand tightly wrapped around the handle.

**DO NOT**

- (1) Do not use a hammer with a loose or damaged handle.
- (2) Do not use rough handles that are cracked, broken, splintered, sharp-edged or loosely attached to head.
- (3) Do not use any hammer head with dents, cracks, chips, mushrooming or excessive wear.
- (4) Do not redress, grind, weld or reheat-treat a hammer head.
- (5) Do not strike with the side or cheek of the hammer.
- (6) Do not use one hammer to strike another hammer.

**14.6 Wood Chisels**

Wood chisels are made in various shapes and sizes and for many uses. Use the correct chisel for the job.

**DO**

- (1) Wear safety glasses or face shield.
- (2) Use the right size of chisel for the job.
- (3) Choose smooth, rectangular handles that have no sharp edges and are attached firmly to the chisel.
- (4) Ensure that the cutting edge is sharp.
- (5) Check stock thoroughly for knots, staples, nails, screws or other foreign objects before chiseling.
- (6) Chip or cut away from yourself.
- (7) Keep your hands and body behind the cutting edge.

- (8) Use a wooden or plastic mallet with a large striking face on all chisels; never hit chisels with a steel hammer or your hand.
- (9) Place chisels safely with plastic protective caps on the cutting edges.
- (10) Replace any chisel that is bent or shows dents, cracks, chips, or excessive wear.
- (11) Store chisels in a “storage roll”, a cloth or plastic bag with slots for each chisel and keep them in a drawer or tray.
- (12) Replace broken or splintered handles.
- (13) Sharpen cutting edges as often as necessary.
- (14) Hold the chisel firmly.

**DO NOT**

- (1) Do not use a wood chisel as a pry or a wedge.
- (2) Do not use a wood chisel on metal.
- (3) Do not use a grinder to redress heat-treated tools. Use a whetstone.
- (4) Do not use a dull chisel.

**14.7 Pliers**

Pliers are made in various shapes and sizes for many uses. Use the correct pliers for the job.

**DO**

- (1) Choose tools with sufficient space between the handles to prevent your palm or fingers from being pinched.
- (2) Whenever possible, pull on the pliers; do not push.

**DO NOT**

- (1) Do not cut hardened wire unless pliers are specifically manufactured for this purpose.

- (2) Do not expose pliers to excessive heat.
- (3) Do not bend stiff wire with light pliers. Needle nose pliers can be damaged by using the tips to bend large wire. Use a sturdier tool.
- (4) Do not use pliers as a hammer.
- (5) Do not extend the length of handles to gain greater leverage. Use a larger pair of pliers or a bolt cutter.
- (6) Do not use cushion grip handles for jobs requiring insulated handles. Cushion grips are primarily for comfort and do not protect against electric shock.
- (7) Do not use pliers on nuts and bolts; use a wrench.

#### 14.8 **Cutting Tools**

Many types and sizes of cutters are used for selected ferrous and non-ferrous metal such as steel wire, cable rod wire rope, fencing, bolts and strapping.

##### **DO**

- (1) Wear safety glasses or a face shield and protective gloves when using cutters.
- (2) Choose the proper cutter for the job. Cutters are designed for a specific type and size of material.
- (3) Warn those in the area to take precautionary measures to avoid possible injury from flying metal pieces.
- (4) Keep cutting tools in good repair.
- (5) Adjust and lubricate cutter and moving parts daily if heavily used.
- (6) Sharpen jaws according to manufacturers' instructions.

##### **DO NOT**

- (1) Do not use a cutting tool until you are trained in its proper and safe use.
- (2) Do not use cushion grip handles for jobs requiring insulated handles.

Cushion grips are for comfort primarily and do not protect against electric shock.

- (3) Do not use cutters which are cracked, broken or loose.
- (4) Do not exceed the recommended capacity of a tool.
- (5) Do not rock cutters from side to side when cutting wire.
- (6) Do not pry or twist with tool when cutting. Keep material being cut at right angles to the cutting edges of jaws.
- (7) Do not hammer on cutting tools to achieve greater cutting power.
- (8) Do not expose cutters to excessive heat.

#### 14.9 Clamps

Clamps are versatile tools that serve to temporarily hold work securely in place. They are used for many applications including carpentry, woodworking, furniture making, welding, construction and metal working.

Clamp styles include C-clamps, bar clamps, pipe clamps, and hand screws.

#### **DO**

- (1) Select the proper clamp style and size by matching the work-holding requirements of the job with the following clamp features:
  - (a) Strength and Weight
  - (b) Opening (Length of Reach)
  - (c) Throat Depth (Depth of Reach)
  - (d) Ease of Adjustment
  - (e) Clamping Surface (Material Used and Size)
- (2) Ensure that the swivel at the end of the screw turns freely before using.
- (3) Remove clamps as soon as the job is finished. Clamps serve only as temporary devices for holding work securely in place.
- (4) Use padding with C-clamps to avoid marring the work.
- (5) Keep all moving parts of clamps lightly oiled and clean. Make sure there is no dirt or oil on any part that will come in contact with the work.

## **DO NOT**

- (1) Do not use any clamp that has a bent frame or a bent spindle.
- (2) Do not use wrenches, pipes, hammers, or pliers to tighten clamps. Use wrenches only on clamps especially designed for wrenches.
- (3) Do not hoist with C-clamps. Use special lifting clamps.
- (4) Do not use C-clamps to construct scaffolds or platforms for workers.

### 14.10 **Snips**

Snips are made in various shapes and sizes and for many uses. Use the correct snips for the job.

## **DO**

- (1) Wear safety glasses or a face shield when working with snips.
- (2) Select the right size and type of snips for the job.
- (3) Use the proper tool for the job.
  - (a) Left cut snips are for making cuts to the left as well as straight cuts.
  - (b) Right cut snips are making straight cuts as well as cuts to the right.
  - (c) Offset snips permit you to keep your hands above the cut while cutting directly through the centre of a large sheet.
- (4) Use snips for cutting soft metal only. Hard or hardened metal should be cut with cutting tools.
- (5) Use hand pressure for cutting. Never hammer, or use your foot to exert extra pressure on the cutting edges. If extra pressure is needed, use a larger tool.
- (6) Avoid springing the blades. This results from trying to cut metal that is too thick or heavy for the snips you are using.
- (7) Keep the nut and the pivot bolt properly adjusted at all times.
- (8) Oil the pivot bolt on the snips occasionally.

### **DO NOT**

- (1) Do not try to cut sharp curves with straight cut snips.
- (2) Do not extend the length of handles to secure greater leverage.
- (3) Do not attempt to resharpen snips in a sharpening device designed for scissors, garden tools or cutlery.
- (4) Do not use cushion grip handles for jobs requiring insulated handles. They are for comfort primarily and not for protection against electric shock.

#### **14.11 Pipe Tools**

Pipe tools are made in various shapes and sizes and for many uses. Use the correct tool for the job.

#### **14.12 Pipe Wrenches**

### **DO**

- (1) Wear safety glasses or a face shield.
- (2) Select a pipe wrench with sufficient capacity and leverage to do the job.
- (3) Use a pipe wrench to turn or hold a pipe. Never use a pipe wrench to bend, raise or lift a pipe.
- (4) Take the bite of a pipe wrench near the middle of the jaws.
- (5) Adjust the pipe wrench grip to maintain a gap between the back of the hook jaw and the pipe. This concentrates the pressure at the jaw teeth, producing the maximum gripping force. It also aids ratcheting action.
- (6) Inspect pipe wrenches periodically for worn or unsafe parts and replace them.
- (7) Keep pipe wrench teeth clean and sharp.
- (8) Face a pipe wrench forward. Turn wrench so pressure is against heel jaw.
- (9) Whenever possible, pull, rather than push on the pipe wrench handle. Maintain a proper stance with feet firmly placed to hold your balance.

**DO NOT**

- (1) Do not use a pipe wrench as a hammer, or strike a pipe wrench with a hammer.
- (2) Do not use pipe wrenches on nuts and bolts.
- (3) Do not use a pipe extender for extra leverage. Get a larger pipe wrench.



### 14.13 Pipe Cutter, Reamers, Threaders

#### **DO**

- (1) Wear glasses or a face shield
- (2) Replace pipe cutter wheels which are nicked or otherwise damaged.
- (3) Use a three or four-wheeled cutter, if there is not enough space to swing the single wheel pipe cutter completely around the pipe.
- (4) Choose a cutting wheel suitable for cutting the type of pipe material required:
  - (a) Thin wheel for cutting ordinary steel pipe.
  - (b) Stout wheel for cutting cast iron.
  - (c) Other wheels for cutting stainless steel, plastic and other materials.
- (5) Select the proper hole diameter and correct tap size to tap a hole. The hole should be sized so that the thread cut by the tap will be about 75% as deep as the thread on the tap.
- (6) Use lubricant with metals other than cast iron.

#### **DO NOT**

- (1) Do not permit chips to clog flutes. The chips prevent the tap from turning.
- (2) Do not attempt to thread hardened steel. This can chip or damage the die.
- (3) Do not thread any rod or other cylindrical object that is larger in diameter than the major diameter of the die thread.
- (4) Do not use a spiral reamer on a rotating pipe. The reamer may snag and cause serious injury.

### 14.14 Gear Pullers

Gear pullers are made in various shapes and sizes and form many uses. Use the correct tool for the job.

#### **DO**

- (1) Wear safety glasses or a face shield.

- (2) Select the proper gear puller for each pulling job. Always use a gear puller of the required size or larger.
- (3) Ensure that the gear puller is aligned with the shaft. This assures a straight pull.
- (4) Take care to remove a stubborn gear or bearing by striking the head of the centre screw squarely. If after two sharp blows, the gear or bearing remains stuck, select a larger puller and proceed to remove the gear or bearing.
- (5) Cover work with a cloth to stop flying parts.
- (6) Lubricate the centre screw with machine oil before use.
- (7) Clean the gear puller after use and store it in a dry place.

**DO NOT**

- (1) Do not use air powered tools on gear pullers.
- (2) Do not use any puller with functioning parts that show excessive wear, dents, or cracks. Inspect the centre screw for signs of galling or seizing.
- (3) Do not heat any gear puller. It will lose its strength and break under pressure if heated.
- (4) Do not cut or grind any part of a gear puller.

## 15. HOUSEKEEPING & STORAGE

### 15.1 General

- (1) It is imperative to keep the work site as tidy as practical. Waste materials and debris must be removed from work and access areas on a regular basis. Waste material must not be thrown from one level to another, but must be carried, lowered, or deposited in a proper disposal chute and container.
- (2) Materials must be stacked, piled, or otherwise stored to prevent tipping and collapsing. If in boxes or packages, materials should be labeled to identify their contents.
- (3) Each person within an area will be responsible for the clean up of their own material.

### 15.2 Tools and Maintenance

- (1) All power tools shall be C.S.A. approved, and workers must be trained in their proper use.
- (2) It is the responsibility of the University to supply and maintain shop tools and other power equipment in good repair. It is the employees responsibility to use such tools properly, and to report any defects to their immediate supervisor.
- (3) Large tools should be set up out of the way, so as not to create a hazard.

### 15.3 Fire Extinguishers

- (1) Portable extinguishers are classified according to their ability to handle specific types of fire.
- (2) Fire extinguishers must be readily accessible, properly maintained, regularly inspected, and promptly refilled after use.

#### **Class "A" Extinguishers**

Ordinary - For fires in ordinary combustible.

## 16. LOCKOUT/TAGOUT

### 16.1 General

- (1) With modern technology we find more sophisticated equipment and work practices. This increases the possibility of harm or injury in the work place. To minimize harm to people and equipment it is essential that all University employees utilize proper work procedures when working in any type of energy system.
- (2) This section details the procedures to be followed for securing the locking out of equipment undergoing repairs, maintenance or set up operations where injury could result from unexpected motion, and start up or contact with energized systems.

### 16.2 When to Lockout

- (1) Any authorized employee who will be performing the work is required to lockout.
- (2) If more than one employee is working on the same equipment, each employee shall install his or her own lock.
- (3) All lockout personnel must be trained on how to do lock out.

### 16.3 Lockout Equipment

- (1) Padlock shall be master # 1 or equivalent.
- (2) Lockout hasps shall be used for this procedure.
- (3) Lockout tags shall be approximately 3" x 5" and suitable for all environmental applications.
- (4) All lockout equipment shall be kept in good working order, and be available to all authorized employees.

### 16.4 Lockout/Tagout Test Procedure

- (1) All personnel affected by the lockout shall be notified.
- (2) Stored energy must be neutralized by releasing hydraulic or pneumatic pressure; blocking or releasing spring or gravity mechanisms; disconnecting electrical power supplies from their source.

- (3) All energy sources must be checked to ensure they are de-energized.

### 16.5 Lockout/Tagout

- (1) All switches and valves shall be locked and tagged with an approved lockout device.
- (2) The key to each employees lock shall stay with that employee until work is completed.
- (3) If more than one shift is involved to complete the work, the relief person should place his/her lock on the energy isolating device prior to the removal of the original lock and tag.

### 16.6 Return to Service

- (1) Only the person who installed the lock shall remove it.
- (2) If emergency start up of equipment is required every effort must be made to locate the employee whose lock is on the equipment. If they cannot be located, and after positive assurance is made that no one is working on the locked out equipment, the Supervisor, may personally remove the lock, but must make every effort to inform the person whose lock he removed.
- (3) Clear away all tools and materials before removing the lock and tag.
- (4) Notify all affected employees that the work is completed.

**Note:** When working on hydraulic systems of a hydraulic elevator, in addition to lockout and tag, the elevator must be “landed” on pipe stands or similar supports to prevent accidental motion resulting from the loss of hydraulic pressure.

### 16.7 Lockouts for Confined Spaces

Where work is to be done in confined spaces, such as tanks, bins, or silos, the supply lines must be blanked off wherever possible. Valves must be locked out when depended upon. Agitators, fans, pump, and other rotating equipment must be locked out and tagged, and the employee in the confined space should keep the key.

### 16.8 Summary

Cape Breton University  
Maintenance Safe Work Manual

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No job is too small to merit locking and tagging out. Yielding to the temptation to bypass this procedure, could cost a life.

## 17. **MANUAL MATERIALS HANDLING**

Lifting boxes/or other materials:

- Store boxes at waist height.
- Do not bend over and try to lift box all at once.
- Raise box upright.
- Put one knee against box.
- Pull box up the leg.
- Rest box on edge of knee of other leg.
- Stand upright.
- Walk with your back upright while carrying the box.

### 17.1 **Transferring Weight**

Reduce the load on your back by transferring weight. Shift body weight from one leg to the other. Avoid twisting your back. Momentum helps move the load.

- Pull material toward you.
- Transfer your weight to the lift side.
- Lift only to the level required.
- Shift weight to your other leg.
- Push material into position.
- Use the above sequence of motions for moving heavy or bulky materials such as:
  - Salt Bags
  - Patio Stones
  - Side Walk Slabs
  - Cement Blocks

## 18. MATERIAL HANDLING

- (1) Heavy loads should be lifted with mechanical lifting devices.
- (2) Workers will take precautions not to lift loads beyond personal limitations.
- (3) Use gloves as required when handling hot, abrasive or heavy materials.
- (4) Always keep clear vision when carrying or moving loads.

### 18.1 Compressed Gases

- (1) Compressed air should never be used to dust off, clean or in any way to remove particles from workers.
- (2) Never use oxygen as compressed air.
- (3) Cylinders shall not be stored near heat sources, direct sunlight, flammable materials, electrical circuits, in areas where they may be struck or near building fresh air intake.
- (4) Where toxic, flammable or corrosive gases exist, minimize the hazard by ventilating the area.
- (5) All cylinders must be stored or transported in the upright position with valves closed, protective caps in place and cylinders held by non flammable straps.
- (6) When lifting by crane, appropriate cage, basket or cradle shall be used.

### 18.2 WHMIS

- (1) WHMIS stands for Workplace Hazardous Materials Information System. It is a Canada-wide system to provide information about hazardous materials used by employees on the job. There are three essential elements to WHMIS:

Labels  
MSDS - Material Safety Data Sheets  
Education and Training

- (2) WHMIS is for every employee's protection. WHMIS describes the danger of materials employees use on the job and tells how to protect yourself from their hazards. Employees must know if material has hazardous labels and safety data sheets.



CLASS

Class A: Compressed Gas (Oxygen)

Class B: Flammable and Combustible Material (Acetylene)

Class C: Oxidizing Material (Chromic Acid)

Class D: Poisonous and Infectious Material

1. Material causing immediate and serious toxic effects (Ammonia)
2. Materials causing other toxic effects (Asbestos)
3. Biohazardous Infectious Material (Contaminated Blood Products)

Class E: Corrosive Material (Hydrochloric Acid Sodium Hydroxide)

Class F: Dangerously Reactive Material (Metal Azides)

### 18.3 Labels

All controlled products must have a label that identifies the product by:

- (a) Name
- (b) WHMIS Hazard Symbol
- (c) Risk Factor
- (d) Precautions
- (e) First Aid Instructions
- (f) MSDS Referral
- (g) The Supplier

### 18.4 Material Safety Data Sheets

- (1) Give detailed information of a product and its hazards:
  - (a) Product Information
  - (b) Hazardous Ingredients
  - (c) Physical Data
  - (d) First Aid Measures
  - (e) Fire and Explosion Data
  - (f) Toxicological Properties
  - (g) Reactivity Data

Cape Breton University  
Maintenance Safe Work Manual

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- (h) Preventative Measures
  - (i) Preparation Date and Group
- (2) Every employee can and must protect himself/herself by:
- (a) Practicing safe work habits
  - (b) Be informed
  - (c) Use personal protective equipment
  - (d) Known emergency procedures
  - (e) Follow first aid practices.
- (3) WHMIS is for safety in the workplace - if an employee is not sure ASK SUPERVISOR.

## 19. METALWORKING MACHINES

### 19.1 General

Metalworking machines can be dangerous if used improperly. Read the owner's manuals carefully. Make sure you receive complete instructions and are properly trained before using any tool or machine.

#### **DO**

- (1) Use the appropriate safety equipment for the job. Wear CSA certified safety glasses or goggles, eye glasses have impact resistant lenses only; they are not safety glasses.
- (2) Wear dust masks when required.
- (3) Wear hearing protection when required. If you have trouble hearing someone speak from one metre (three feet) away, the noise level from the machine is too high. Damage to hearing may occur.
- (4) Wear CSA certified footwear with an appropriate sole.
- (5) Ensure that the guards are in position and in good working condition. Adequately guard the machine before operating.
- (6) Ensure that all stationary equipment is anchored to the floor.
- (7) Check and adjust all safety devices before each job.
- (8) Ensure all machines have a start/stop button within easy reach.
- (9) Ensure that keys and adjusting wrenches have been removed from the machine before turning on the power.
- (10) Ensure that all cutting tools and blades are lean and sharp so that they cut freely without being forced.
- (11) Stop the machine before measuring, cleaning or making any adjustments. Any maintenance on machines will initiate lockout procedures.
- (12) Know how to stop the machine in an emergency.
- (13) Use a brush or rake to remove cuttings. Do not handle them by hand because they are very sharp.

- (14) Keep hands away from the cutting head and all moving parts.
- (15) Avoid awkward operations and hand positions. A sudden slip could cause the hand to move into the cutting tool or blade.
- (16) Return all portable tooling to the proper storage place after use.
- (17) Clean all tools after use.
- (18) Keep work area clean, well swept, and well lit. Floors should be level and non slip.
- (19) Ensure there is enough room around equipment to do the job safely.
- (20) Obtain first aid immediately for all injuries.
- (21) Dispose of oily rags in proper containers.

**DO NOT**

- (1) Do not remove cuttings by hand from the machine while it is running.
- (2) Do not leave machines running unattended. Turn power off.
- (3) Do not free a stalled cutter without first turning off the power.
- (4) Do not distract an operator. Horseplay can lead to injuries and should be strictly prohibited.
- (5) Do not wear loose clothing that can become entangled in moving parts. Confine long hair.
- (6) Do not clean hands with cutting fluids.
- (7) Do not use rags near moving parts of machines.
- (8) Do not use compressed air to blow debris or to clean dirt from clothes.

**19.2 Metal Saw (Cold)**

- (1) Metal saws can be dangerous if used improperly. Read the owner's manual carefully. Make sure you understand instructions and are properly trained before operating a metal saw.



- (2) Cold cutting saws include hand and powered hacksaws, band saws, and horizontal and vertical circular saws.
- (3) Hot cutting saws use an abrasive disc or large toothless (friction) circular saw.

**DO**

- (1) Wear safety glasses.
- (2) Ensure that saw has a start/stop button within easy reach.
- (3) Ensure that guards are in place.
- (4) Guard long material at both ends to prevent anyone from coming in contact with it.
- (5) Ensure that blade is completely stopped before removing stock.
- (6) Use cutting or lubricating fluid when cutting metals.
- (7) Check blades regularly for wear or damage.
- (8) Keep saw blades clean and sharp.
- (9) Select the correct blade and saw speed for the material being cut. Follow the manufacturer's instructions.
- (10) Use the stop gauge supplied with most cut-off saws when several pieces of the same length are required.
- (11) Secure all work in a vise. Extend the length to be cut beyond the cutting blade.
- (12) Support long stock with a floor stand.
- (13) Keep working surface clean of scraps, tools and materials.
- (14) Keep floor around saw free of oil and grease.

**DO NOT**

- (1) Do not mount, measure or remove work unless the saw is stopped.

- (2) Do not apply extra force to the saw blade.
- (3) Do not leave saw running unattended.

### 19.3 Metal Saws (Hot)

- (1) Hot metal saws can be dangerous if used improperly. Read the owner's manual carefully. Make sure you understand instructions and are properly trained before operating a hot metal saw.
- (2) Hot metal saws, often referred to as cut-off saws or chop saws, use an abrasive cut-off wheel. The machine may be dry or wet, low or high speed, and either hand operated or automatic.

#### **DO**

- (1) Wear safety glasses.
- (2) Wear hearing protection.
- (3) Handle and store wheels as directed by manufacturer.
- (4) Inspect all wheels for possible damage before mounting.
- (5) Check machine speed against the established, maximum safe operating speed marked on the wheel.
- (6) Ensure that mounting flanges are equal and the correct diameter (at least 1/4 of the wheel diameter).
- (7) Use mounting blotters when they are supplied with wheels.
- (8) Clamp work firmly in place when using non-reinforced cut-off wheels.
- (9) Use a properly designed safety guard covering at least one half of the grinding wheel.
- (10) Allow mounted wheels to run at operating speed, with guards in place, for one minute before cutting.
- (11) Bring wheel into contact with the work without bumping on impact.
- (12) Turn off coolant before stopping the wheel to avoid an out of balance condition.

- (13) Keep working surface clean of scraps, tools and materials.
- (14) Keep floor around saw clean and free of oil and grease.
- (15) Ensure that saw has a start/stop button within easy reach.

**DO NOT**

- (1) Do not use a cracked wheel or one that has been dropped or damaged.
- (2) Do not force a wheel onto the machine or alter the size of the mounting hole. If the wheel does not fit the machine, get one that will.
- (3) Do not exceed the maximum operating speed marked on the wheel.
- (4) Do not use mounting flanges whose bearing surfaces are not equal, clean, flat and free of burrs.
- (5) Do not tighten the mounting nut excessively.
- (6) Do not grind on the side of the wheel.
- (7) Do not start the machine until the wheel guard is in place.
- (8) Do not stand directly in front of the cut-off wheel when starting a machine.
- (9) Do not jam, bend or pinch the wheel.
- (10) Do not force cutting so that the motor slows.
- (11) Do not cut without proper ventilation.



## 20. PORTABLE EXTENSION CORDS

### 20.1 General

- (1) All portable extension cords must be of the proper rated size and have an insulated grounding conductor.
- (2) Defective cords must not be used.
- (3) C.S.A. approved male and female cord caps shall be on all extension cords.
- (4) All extension cords should be protected by approved ground fault protection.
- (5) Portable extension cords are just that “Portable” and shall not be used for permanent use.
- (6) Never break off the third prong on a plug, this will make the cord ungrounded.
- (7) Do not allow vehicles to pass over unprotected power cords. Cords should be put in conduit or protected by placing planks along side of them
- (8) Unplug the cord by pulling the cord cap not the cord.
- (9) All extension cords must be repaired by qualified persons.
- (10) Do not tie power cords in knots. Knots can cause short circuits and shocks. Loop the cords or use a twist lock plug.

## 21. PORTABLE GRINDERS

### 21.1 General

- (1) An abrasive wheel brake can cause a serious injury.
- (2) Guards must be provided and adjusted to protect you. Replace damaged guards.
- (3) Clean and service grinders according to manufacturers' recommendations. Record all maintenance for grinders.
- (4) Ensure that a machine will not operate when unattended by checking dead-man (constant pressure) switch.
- (5) Wear safety glasses, goggles, and face protection to protect against flying particles. Gloves, aprons, safety boots, and respiratory protection are advisable, depending on the work.

### **Speeds**

- (1) Maximum speed in revolutions per minute (RPM) is marked on every wheel. Never exceed this speed.
- (2) Check that the wheel speed marked on the wheel is equal to or greater than the maximum speed of the grinder.
- (3) Measure speed of governor controlled air driven grinders after 20 hours of use or every week, whichever comes first. Measure speed after any repairs.

### **Check-List**

#### **DO**

- (1) Check that grinders do not vibrate or operate roughly.
- (2) Use racks or hooks to store portable grinders.
- (3) Stand away from the wheel when starting grinders.
- (4) Inspect all wheels for cracks and defects before mounting.
- (5) Ensure mounting flange surfaces are clean and flat.

- (6) Use mounting blotters supplied.
- (7) Run newly mounted wheels at operating speed for 1 minute before grinding.
- (8) Wear eye, ear and face protection.

**DO NOT**

- (1) Do not use grinders near flammable materials.
- (2) Do not clamp portable grinders in a vise for grinding hand-held work.
- (3) Do not use liquid coolant with portable grinders.
- (4) Do not force wheels onto a grinder or change mounting hole sizes.

**21.2 Bench and Pedestal Grinders**

- (1) Fasten pedestal and bench grinders securely.
- (2) Ensure all the guards are in place and secure before using a grinder.
- (3) Adjust tool rests to within 3 mm (1/8 in) of wheels. Never adjust rests while wheels are moving. Work rest height should be on horizontal centre line of the machine spindle.
- (4) Maintain 6 mm (1/4 in) wheel exposure with a tongue guard or a movable guard.
- (5) Stand to one side of the grinder until the operating speed is reached.
- (6) Bring work in contact with the grinding wheel slowly and smoothly, without bumping.
- (7) Apply gradual pressure to allow the wheel to warm up evenly. Use only the pressure required to complete a job.
- (8) Move the work back and forth across the face of the wheel. This prevents grooves forming.
- (9) Wheels are made only for grinding certain items. Do not grind rough forgings on a small precision grinding wheel.
- (10) Dress wheels regularly. Do frequent light dressings rather than heavy

dressings.

- (11) Support dressing tool to apply leverage without undue effort. With revolving cutter dressing tools use the lugs as anchors.
- (12) Replace worn wheels if they cannot be dressed.

### **Check-List**

#### **DO**

- (1) Ensure the grinder speed does not exceed the operating speed marked on the wheel.
- (2) Visually inspect wheels for possible damage before mounting.
- (3) Wear eye, ear and face protection. Safety boots and respiratory protection are advisable depending on the work. Wear gloves only where necessary.

#### **DO NOT**

- (1) Do not use a wheel that has been dropped.
- (2) Do not grind wood, plastics and non-iron metals on ordinary wheels.
- (3) Do not leave grinding wheels standing in liquids. This causes balance problems.
- (4) Do not grind on the side of a regular wheel.
- (5) Do not tighten the mounting nut excessively.

## 22. PORTABLE LADDERS

### 22.1 General

Falls from portable ladders are a major source of serious injury. Be aware of possible hazards and take proper precautions to prevent falling.

#### **DO**

- (1) Inspect ladder before and after each use.
- (2) Reject and tag ladder that has defects. Have ladder repaired or throw out.
- (3) Use ladder designed for your task. Consider strength, type and CSA approval.
- (4) Get help when handling a heavy or long ladder.
- (5) Keep ladder away from electrical wires.
- (6) Tie off ladder at the top and secure bottom to prevent its slipping.
- (7) Set up barricades and warning signs when using ladder in a door way or passageway.
- (8) Clean muddy or slippery boot soles before mounting ladder. Avoid climbing with wet soles. Ensure that footwear is in good condition.
- (9) Face the ladder when going up or down and when working from it.
- (10) Keep the centre of your body within the side rails.
- (11) Place ladder feet 1/4 of ladder's working length away from the base of the structure.
- (12) Extend ladder at least 1 m (3 ft.) above the landing platform.
- (13) Locate ladder on a firm footing using slip-resistant feet or secure blocking, or have someone hold the ladder.
- (14) Rest both side rails on top support, and secure ladder to prevent slipping.

#### **DO NOT**

- (1) Do not use ladder in a horizontal position as a scaffold plank or runway.
- (2) Do not carry objects in your hands while on ladder. Hoist materials or attach tools to a belt.
- (3) Do not work from top three rungs. The higher a person goes on a ladder, the greater the possibility that the ladder will slip out at the base.
- (4) Do not use makeshift items such as a chair, barrel or box, as a substitute for a ladder.
- (5) Do not use a portable ladder when other equipment is available. Replace ladder with a fixed stairway or scaffold.

## 22.2 Extension Ladders

Where a ladder cannot be tied off at the top, station a person at the foot to prevent slipping. This is only effective for ladders up to 5 m (16 ft.) long. The person at the foot of the ladder should face the ladder with each hand on a side rail and with one foot resting on the bottom rung.

### **DO**

- (1) Place ladder feet 1/4 of ladder's working length away from the base of the structure.
- (2) Erect ladder so that a minimum of 1 m (3 ft.) extends above landing platform. Tie top at support points.
- (3) Raise and lower ladder from the ground. Ensure that locking ladder hooks are secure before climbing.
- (4) Erect extension ladder so that the upper section rests on the bottom section.
- (5) Place ladder on firm, level surface and ensure a secure footing.
- (6) Maintain the minimum overlap of sections as shown on ladder label. Refer to safety regulations.

### **DO NOT**

- (1) Do not use ladder near electrical wires.
- (2) Do not overextend. Maintain minimum overlap of sections.

- (3) Do not climb higher than the third rung from the top of ladder.
- (4) Do not use ladder on ice, snow or slippery surface without securing ladder's feet.
- (5) Do not extend top section of ladder from above or be "bouncing" on ladder.

### 22.3 Stepladders

#### **DO**

- (1) Face stepladder when climbing up or down. Keep body centered between side rails.
- (2) Maintain a firm grip. Use both hands in climbing.
- (3) Keep stepladder close to work.
- (4) Open stepladder spreaders and shelf fully.
- (5) Check stability. Ensure that all four ladder feet are on firm, level and dry ground.
- (6) Place stepladder at right angles to the work, with either the front or back of the steps facing the work.

#### **DO NOT**

- (1) Do not overreach. Move stepladder when needed.
- (2) Do not "shift" or "walk" stepladder when standing on it.
- (3) Do not stand, climb, or sit on stepladder top or pail shelf.
- (4) Do not overload. Stepladders are meant for one person.
- (5) Do not use stepladder to brace or support a work platform or plank.
- (6) Do not use stepladder on slippery surface.
- (7) Do not use stepladder on boxes, unstable bases or scaffolds to gain additional height.

- (8) Do not climb the back of a stepladder.
- (9) Do not push or pull stepladder sideways. It is less stable in those directions.
- (10) Do not use ladder in passageways, doorways, driveways or other locations where a person or vehicle can hit it. Erect suitable barriers or lock doors shut.

#### 22.4 Inspection

- (1) Inspect ladders for:
  - (a) Missing or loose steps or rungs (they are loose if they can be moved by hand).
  - (b) Loose nails, screws, bolts or other metal parts.
  - (c) Cracked, split, worn or broken rails, braces, steps or rungs.
  - (d) Rough or splintered surfaces.
  - (e) Damaged or worn non-slip feet.
  - (f) Twisted or distorted rails.
  - (g) Corrosion, rust, oxidization and excessive wear, especially on treads.
  - (h) Sharp edges on rails and rungs.
- (2) Inspect stepladders for:
  - (a) Wobble.
  - (b) Loose or bent hinge spreaders.
  - (c) Loose hinges.
- (3) Inspection extension ladders for:
  - (a) Loose, broken or missing extension locks.
  - (b) Defective locks that do not seat properly when ladder is extended.
  - (c) Sufficient lubrication of working parts.
  - (d) Defective cords, chains and ropes.
  - (e) Missing or defective pads or sleeves.

#### **DO**

- (1) Inspect ladders before each use.
- (2) Tag defective ladders and take out of service.
- (3) Check fibreglass ladders regularly for cracks and exposed fibreglass.



- (4) Check all nuts, bolts, spreaders and locks for tightness and good repair.
- (5) Check all ladders for distortion by sighting along the rails. A ladder that is twisted or distorted is hazardous.
- (6) Replace worn or frayed ropes on extension ladders.
- (7) Lubricate pulleys on extension ladders regularly.
- (8) Check the condition of ladders that have been dropped or have fallen before using them again.

**DO NOT**

- (1) Do not make temporary or makeshift repairs.
- (2) Do not try to straighten or attempt to use bent or bowed ladders.

**22.5 Fixed Access Ladders**

Offset the hazards of falling by installing and properly using safety climbing devices according to safety regulations.

**DO**

- (1) Maintain three-point contact by keeping two hands and one foot, or two feet and one hand on ladder at all times.
- (2) Face ladder and use both hands to grip the rungs firmly.
- (3) Place feet firmly on each rung.
- (4) Wear footwear with heels. Ensure that footwear is in good condition.
- (5) Clean muddy or slippery boot soles before mounting ladder. Avoid climbing with wet soles.
- (6) Inspect fixed ladders for:
  - (a) Loose, worn and damaged rungs or side rails.
  - (b) Damaged or corroded cage guard, bolts and rivet heads.
  - (c) Damaged or corroded handrails and brackets on platforms.
  - (d) Broken or loose anchorages.
  - (e) Defects in climbing devices, including loose or damaged carrier rails

- or ropes.
  - (f) Defects in climbing devices, including loose or damaged carrier rails or ropes.
  - (g) Slippery surfaces from oil and ice.
  - (h) Cutter obstructing the base of ladder or platform.
- (7) Report any defects promptly.
  - (8) Wait until the other person has exited before ascending or descending.
  - (9) Raise or lower tools and materials using a handline.

**DO NOT**

- (1) Do not carry tools or materials in your hand while climbing. Carry small tools in a tool pouch.
- (2) Do not jump from ladder. Check footing before descending ladder.
- (3) Do not hurry up or slide down ladder.

## 23. USE OF PORTABLE LADDERS

### **DO**

- (1) Check for overhead electrical wires before setting up ladder.
- (2) Clear area around base and top of ladder of debris, tools and other objects.
- (3) Tie yourself off with a safety harness when working 3 m (10 ft.) or more off the ground or when working with both hands.
- (4) Ensure that only one person is on a ladder. Only one person is allowed on each side of a double-sided ladder.
- (5) Maintain three point contact by keeping two hands and one foot, while climbing up to 3 m (10 ft.).
- (6) Grab rungs when climbing ladder, not side rails. If your foot slips on ladder, it is easier to hold onto rungs than to side rails.
- (7) Ensure that all electrical equipment used during ladder work is in good condition and properly grounded.
- (8) Drape your arms over a rung and rest your head against another rung or side rail if you become dizzy or panicky. Climb down slowly.

### **DO NOT**

- (1) Do not splice together short ladders to make a long ladder. Side rails are not strong enough to support the extra load.
- (2) Do not use ladder in passageways, doorways, driveways or other locations where a person or vehicle can hit it. Erect suitable barricades or lock doors shut.
- (3) Do not place ladder against flexible or moveable surfaces.
- (4) Do not straddle the space between ladder and another object.
- (5) Do not erect ladder on boxes, carts, tables or other unstable surfaces.
- (6) Ladder must rest on both side rails.
- (7) Do not allow anyone to stand under ladder.

- (8) Do not use ladder on ice.
- (9) Do not overreach from ladder; move as required.
- (10) Do not use ladder near electrical wires.

### 23.1 **Storage and Handling**

#### **DO**

- (1) Store ladders where they are not exposed to the weather.
- (2) Keep ladders clean and free of foreign materials.
- (3) Ensure that storage areas are easy to access.
- (4) Return ladders to storage area after use.
- (5) Avoid long overhangs beyond support points when transporting ladders on vehicles.
- (6) Tie ladders to each support point to minimize damage. Load other equipment so that ladders are not damaged in transit.
- (7) Mark ladders which overhang vehicles with a red or orange flag.
- (8) Grasp ladders near the centre when carrying them.
- (9) Use caution when carrying ladders through passageways, doorways or any place where your view is obstructed.
- (10) Use a partner to help carry long or heavy ladders.
- (11) Ensure that you and your partner are on the same side when carrying a ladder. Stay in step. Work out in advance any hand or voice signals to coordinate stopping or changing direction.

#### **DO NOT**

- (1) Do not store materials on ladders.
- (2) Do not expose fibreglass ladders to excessive temperatures (above 93 degrees C/200 degrees F).

- (3) Do not hold the front of ladders at head level when carrying.

## 23.2 Securing Portable Ladders

- (1) Rest top of ladder against a solid surface that can with stand the load.
- (2) Attach a ladder stay across the back of ladder where a surface cannot stand the load. Extend the stay across a window for firm support against the building walls or window frame.
- (3) Guard or fence off area around ladder that has been erected in an area where persons have access.
- (4) Station a person at the foot of ladder when it is not possible to tie it at the top or at the foot.
- (5) Ensure that the person at the foot of the ladder faces the ladder with a hand on each side rail and one foot resting on the bottom rung.
- (6) Attach hooks on top of ladder rails where ladder is to be used at a constant height.
- (7) Do not rest ladder on any rung. Only the side rails are designed for this purpose.
- (8) Secure base of ladder against accidental movement.
- (9) Use ladder equipped with non-slip feet. Otherwise nail a cleat to the floor or anchor the feet or bottom of the side rails.

## 23.3 Extension Set-Up

- (1) When setting up an extension ladder, use the following method to avoid straining muscles or losing control of ladder. With ladders more than 24 ft. in length or where conditions complicate the task, have two persons set up ladder, step by step as follows:
  - (a) Lay ladder on the ground close to intended location.
  - (b) Brace the ladder base using helper's feet.
  - (c) Grasp the top rung with both hands, raise the top end over your head and walk towards the base of ladder. Grasp the centre of the rungs to maintain stability.
  - (d) Move the erect ladder to the desired location. Lean it forward against the resting point.



- (2) One person can erect short ladder step by step as follows:
  - (a) Place the bottom of ladder firmly against the base of a building or stationary object.
  - (b) Lift the top of the ladder, and pull upwards to raise ladder to a vertical position.
  - (c) Transfer ladder to its required position when it is erect.
  - (d) Keep ladder upright and close to the body with a firm grip.
- (3) The method for lowering any ladder is the reverse procedure of erecting it.
- (4) Leave all tie-off devices in place until they must be removed.
- (5) Do not raise or lower ladder when extended.

## 24. POWERED HAND TOOLS

### 24.1 Basic Electrical Safety

- (1) Inspect tools, power cords, and electrical fittings for damage prior to each use. Repair or replace damaged equipment.
- (2) Do not wear gloves or loose clothing while using revolving power tools.

### 24.2 Tools

- (1) Switch tools OFF before connecting them to a power supply.
- (2) Disconnect power supply before making adjustments.
- (3) Ensure tools are properly grounded or double-insulated. The grounded tool must have an approved 3-wire cord with a 3-prong plug. This plug should be plugged in a properly grounded 3-pole outlet.
- (4) Do not bypass the switch and operate the tools by connecting and disconnecting the power cord.
- (5) Do not use electric tools in wet conditions or damp locations unless tool is connected to a ground fault circuit interrupter (GFCI).
- (6) Do not clean tools with flammable or toxic solvents.
- (7) Do not operate tools in an area containing explosive vapors or gases.

### 24.3 Power Cords

- (1) Keep power cords clear of tools during use.
- (2) Suspend power cords over aisles or work areas to eliminate stumbling or tripping hazards.
- (3) Replace open front plugs with dead front plugs. Dead front plugs are sealed and present less danger of shock or short circuit.
- (4) Do not carry electrical tools by the power cord.
- (5) Do not tie power cords in knots. Knots can cause short circuits and shocks. Loop the cords or use a twist lock plug.



### **Checklist**

- (1) Inspect Cords & Plugs
  - (a) Check power cords and plugs daily. Discard if worn or damaged. Have any cord that feels more than comfortably warm checked by an electrician.
- (2) Eliminate Octopus Connections
  - (a) Do not plug several power cords into one outlet.
- (3) Pull the Plug, Not the Cord
  - (a) Do not disconnect power supply by pulling or jerking cord from the outlet. Pulling the cord causes wear and may cause a shock.
- (4) Never Break Off the Third Prong on a Plug
  - (a) Replace broken three-prong plugs and make sure the third prong is properly grounded.
- (5) Never Use Extension Cords as Permanent Wiring
  - (a) Use extension cords only to temporarily supply power to an area that does not have a power outlet.
  - (b) Keep power cords away from heat, water and oil. They can damage the insulation and cause a shock.
  - (c) Do not allow vehicles to pass over unprotected power cords. Cords should be put in conduit or protected by placing planks alongside them.

#### **24.4 Drills**

##### **DO**

- (1) Wear safety glasses or a face shield.
- (2) Keep drill vents clear to maintain adequate ventilation.
- (3) Keep drill bits sharp at all times.
- (4) Keep all cords clear of the cutting area during use.

- (5) Disconnect power supply before changing or adjusting bit or attachments.
- (6) Tighten the chuck securely. Remove chuck key before starting drill.
- (7) Secure workpiece being drilled to prevent movement.
- (8) Slow the rate of feed just before breaking through the surface.
- (9) Drill a small pilot hole before drilling of large holes.

**DO NOT**

- (1) Do not use a bent drill bit.
- (2) Do not exceed the manufacturer's recommended maximum drilling capacities.
- (3) Do not use a hole saw cutter without the pilot drill.
- (4) Do not use high speed steel (HSS) bits without cooling or lubrication.
- (5) Do not reach under or around stock being drilled.
- (6) Do not overreach. Keep proper footing and balance at all times.

**24.4.1 Working with Small Pieces**

- (1) Clamp stock so work will not twist or spin.
- (2) Do not drill with one hand while holding the material with the other.

**24.4.2 Choosing the Proper Bit or Attachment**

- (1) Select the bit or attachment suitable to the size of the drill and the work being done.
- (2) Use only bits and attachments that turn true.
- (3) Ensure that the bit or attachments are properly seated and tightened in the chuck.
- (4) Follow manufacturer's instructions when selecting and using a bit or attachment, especially with unfamiliar drills or work.

- (5) Use auxiliary (second) handle for larger work or continuous operation.

## 24.5 Belt Sanders

### **DO**

- (1) Wear safety glasses or a face shield
- (2) Wear a dust respirator for dusty operations.
- (3) Disconnect power supply before changing sanding belt, making adjustments, or emptying dust collector.
- (4) Install sanding belts that are the same width as the pulley drum.
- (5) Adjust sanding belt tension to keep the belt running true and at same speed as pulley drum.
- (6) Secure the sanding belt in the direction indicated on the belt and the machine.
- (7) Inspect sanding belts before using them. Replace those belts that are worn or frayed.
- (8) Keep hands away from sanding belt.
- (9) Use two hands to operate sanders; one on trigger switch, the other on front knob handle.
- (10) Keep all cords clear of sanding area during use.
- (11) Clean dust from motor and vents at regular intervals.

### **DO NOT**

- (1) Do not exert excessive pressure upon the moving sander.
- (2) Do not use sander with exhaust system or dust collector when over 1/4 full.
- (3) Do not work on unfixed stock, unless it is heavy enough to stay in place. Secure the stock or use a “stop block” to prevent movement.
- (4) Do not overreach. Keep proper footing and balance at all times.

- (5) Do not cover the air vents.

## 24.6 Sabre Saws, Jig Saws & Reciprocating Saws

- (1) Wear safety glasses or a face shield.
- (2) Disconnect power supply before changing or adjusting blades.
- (3) Use lubricants when cutting metals.
- (4) Position the saw before cutting, and avoid re-entry with a moving blade.
- (5) Do not insert a blade into, or withdraw a blade from a cut or lead hole while the blade is moving.
- (6) Do not put down a saw until the motor has stopped.

### 24.6.1 Cutting

- (1) Secure and support stock as close as possible to the cutting line to avoid vibration.
- (2) Keep the base or shoe of the saw in firm contact with the stock being cut.
- (3) Select the correct blade for stock being cut and allow it to cut steadily, do not force it.
- (4) Use blades designed for various materials as recommended by manufacturer. Blades are available ranging from 2-12 teeth/cm (7-32/in.). For rough cutting of softwood and composition board, use a blade with 2 teeth/cm (7/in.). For all-round work with most types of wood, a blade with 4 teeth/cm (10/in.) is satisfactory.
- (5) Do not start cutting until the saw reaches its full power.
- (6) Do not force saw along or around a curve. Allow the machine to turn with ease.
- (7) Do not reach under or around the stock being cut.

### 24.6.2 Starting an External Cut

- (1) Place the front of the shoe on the stock.
- (2) Make sure that the blade is not in contact with the stock or the saw will stall when the motor starts.

- (3) Hold the saw firmly down against stock and switch it on.
- (4) Feed the blade slowly into the stock maintaining an even forward pressure.

### 24.6.3 Starting an Inside Cut

- (1) Drill a lead hole slightly larger than the saw blade. With the saw switched off, insert the blade in the hole until the shoe rests firmly on the stock.
- (2) Do not let the blade touch the stock until the saw has been switched on.

## 24.7 Chain Saws

### 24.7.1 General

Chain saws are used for many jobs in construction. Since this tool was primarily meant for use in the logging industry, it can be an unfamiliar tool to some workers.

Workers must be trained in its safe use before using a chain saw.

This training must include a minimum of the following elements:

- (1) The proper personal protective equipment to be worn is as follows. Steel toed boots, ballistic pants or leggings, hard hat with shield, and hearing protection.
- (2) Fueling of the saw must be done in a well ventilated area and not while the saw is running or hot.
- (3) An approved safety container must be used to contain the fuel used along with a proper spout or funnel for pouring.
- (4) The correct methods of starting:
  - (a) Hot Start - Saw on ground, secured with one foot while pulling on cord.
  - (b) Cold Start - Saw on ground, secured with one foot while pulling on cord.
- (5) Ensure that the chain brake is functioning properly and adequately stops the chain.
- (6) The chain must be sharp, have the correct tension and be adequately lubricated.



- (7) When carrying/transporting a chain saw the bar guard must be in place, the chain bar must be toward the back and the motor must be shut off.
- (8) The chain saw must not be used for cutting above shoulder height.

Chain saws will comply with CSA Standards.

## 24.8 Circular Saws

Circular saws are designed for right-hand operation; left-handed operation will demand more care to operate safely.

### Checklist

#### DO

- (1) Wear safety glasses or a face shield.
- (2) Wear approved respirators when exposed to harmful or nuisance dusts.
- (3) Use a sharp blade that is designed for your work.
- (4) Check the retracting lower blade guard frequently to make certain it works freely. It should enclose the teeth as completely as possible, and cover the unused portion of the blade when cutting.
- (5) Allow the saw to attain full power before cutting.
- (6) Ensure the retracting lower blade guard is fully returned before laying the saw down.
- (7) Disconnect power supply before adjusting or changing the blade.
- (8) Keep all cords clear of cutting area.
- (9) Keep upper and retracting lower blade guard clean and free of sawdust.
- (10) Keep motor free from accumulation of dust and chips.
- (11) Select the correct blade for stock being cut and allow it to cut steadily, do not force it.
- (12) Check saw for proper blade rotation.
- (13) Secure material being cut to avoid movement.



- (14) Adjust blade height to suit material being cut.

**DO NOT**

- (1) Do not hold or fix the retracting lower guard in the open position.
- (2) Do not place hand under the shoe or guard of the saw.
- (3) Do not over tighten the blade locking nut.
- (4) Do not twist the saw to change, cut or check alignment.
- (5) Do not use a saw that vibrates or appears unsafe in any way.
- (6) Do not force the saw at any time during cutting.
- (7) Do not cut materials without first checking for obstructions or foreign objects, such as nails and screws.
- (8) Do not carry saw with finger on the trigger switch.
- (9) Do not overreach. Keep proper footing and balance at all times.

**24.9 Planers**

- (1) Wear safety glasses or a face shield.
- (2) Use blades of the same weight, and set at exactly the same height.
- (3) Ensure blade locking screws are tight.
- (4) Remove adjusting keys and wrenches before turning power on.
- (5) Disconnect the planer from the power supply before making any adjustments to the cutter head or blades.

**24.9.1 Secure Work**

- (1) Support stock in a comfortable position for doing the job safely and accurately.
- (2) Disconnect power supply to dump out chips.

- (3) Do not put finger or any object in deflector to clean out chips while planer is running.

#### 24.9.2 Cutting

- (1) Check stock thoroughly for staples, nails, screws or other foreign objects before using planer.
- (2) Start a cut with the infeed table (front shoe) resting firmly on the stock, and cutter head slightly behind the edge of the stock.
- (3) Use two hands to operate planer; one on the trigger switch, the other on front handle.
- (4) Keep all cords clear of cutting area.
- (5) Do not overreach. Keep proper footing and balance at all times.
- (6) Do not set planer down until blades have stopped turning.

#### 24.10 Routers

- (1) Router motors operate at extremely high speeds (up to 25,000 rpm) and turn in a clockwise direction.
- (2) Wear eye protection or a face shield.
- (3) Disconnect power supply before making adjustments or changing bits.
- (4) Ensure that the bit is securely mounted in the chuck and the base is tight.
- (5) Before switching on the motor put the base of the router on the work, template or guide, ensuring that the bit can rotate freely.
- (6) Secure stock, never rely on yourself or a second person to support or hold the material. Sudden torque or kickback from the router can cause damage or injury.
- (7) Check stock thoroughly for staples, nails, screws or other foreign objects before using router.
- (8) Hold both hands on router handles at all times until motor has stopped.
- (9) Keep all cords clear of cutting area.

- (10) Do not overreach. Keep proper footing and balance at all times.

#### 24.10.1 **Cutting**

- (1) When inside routing start motor with bit above stock, and when full power is reached, lower bit to required depth.
- (2) When routing bevels, moldings and other edge work, the router bit must contact to stock to the left of starting point in correct cutting direction.
- (3) Feed the router bit into the material at a firm controlled speed.
  - (a) With softwood, the router can sometimes be moved as fast as it can go.
  - (b) With hardwood, knotty and twisted wood, or with larger bits, cutting may be very slow.
- (4) The sound of the motor indicates safe cutting speed. When the router is fed in the material too slowly, the motor makes a high-pitched whine. When the router is paused too hard, the motor makes a low growling noise.
- (5) When the type of wood or side of the bit necessitates going slow, make two or more passes to prevent the router from burning out or kicking back.
- (6) To determine the depth of cut and how many passes to make, test the router on a scrap of lumber similar to the work.
- (7) Do not set router down until exposed router bit has stopped turning.

#### 24.11 **Explosive Actuated Fastening Tools**

- (1) Permit only trained, competent and authorized persons who are familiar with the regulations governing the use of the tool to operate explosive actuated fastening tools.
- (2) Use CSA Standard Z166 "Safety Code for Explosive Actuated Tools" as a guide for safe operation and maintenance of tool.
- (3) Wear safety glasses, or a face shield, and a hard hat.
- (4) Wear hearing protection.
- (5) Brace yourself at all times when working on ladders or scaffolds to maintain good balance.
- (6) Keep tool pointed in a safe direction.

- (7) Do not carry loaded tools from job to job.
- (8) Do not permit bystanders in the immediate vicinity of the work. It may be necessary for the working area to be shielded to protect against possible ricochet.

#### **24.12 Care and Servicing of Tools**

- (1) Clean and maintain tools in accordance with the manufacturer's instructions.
- (2) Check tools prior to use to ensure they are in good working order.
- (3) Remove defective tools from service until repaired.
- (4) Store tools and cartridges in a locked container when not in use.

#### **24.13 Use of Tools**

- (1) Use the tool at right angles to the work surface.
- (2) Check the chamber before using to see that the barrel is clean and free from any obstruction.
- (3) Do not use the tool where flammable or explosive vapors, dusts or other such substances are present.
- (4) Do not place your hand over the front (muzzle) end of a loaded tool.

#### **24.14 Use of Projectile**

- (1) Use only projectiles (nails, studs, etc.) Recommended by the tool manufacturer.
- (2) Ensure that the base material has no holes or openings and is of sufficient consistency that a projectile would not pass right through.
- (3) Do not load tool until immediately before use.
- (4) Do not leave loaded tool unattended.
- (5) Do not force a projectile into a working surface which is harder than the projectile being used. If the base material is unknown, use a hand hammer to drive the projectile, using it as a centre punch.



#### 24.15 Use of Charge Cartridges

- (1) Use only cartridges recommended by the tool manufacturer.
- (2) Check that the colour of the cartridge is appropriate for work being done. Charge cartridges are colour-coded for strength.
- (3) Make the first trial fixing with the weakest or lowest strength charge cartridge.
- (4) Provide adequate ventilation in confined spaces where explosive actuated tools are used.
- (5) Hold the tool in fixing position for no less than 15 seconds when a tool misfires. Keep the tool pointed in a direction which will not cause injuries. Unload cartridge with the utmost caution.
- (6) Exercise caution when using tools near live electrical circuits. Ensure fastenings do not penetrate live circuits that are buried or hidden in the base material.
- (7) Keep cartridges locked up when not in use.
- (8) Do not attempt to force a cartridge into a tool.
- (9) Do not discard unfired cartridges carelessly.
- (10) Do not carry cartridges loose or in a pocket. Carry them in the manufacturer's package.

#### 24.16 Air Powered

Air-powered tools include nailing and stapling guns, grinders, drills, jack hammers, chipping hammers, riveting hammers and wrenches.

#### 24.17 Air Hoses

- (1) Avoid tripping hazards created by hoses laid across walkways or curled underfoot.
- (2) Install quick disconnects of a pressure release type. Attach the male end of connector to the tool not the hose.
- (3) Turn off air pressure to hose when not in use or when changing power tools.

- (4) Check hoses regularly for cuts, bulges and abrasions. Replace if defective.
- (5) Blow out air line before connecting tool, hold hose firmly and blow away from yourself and others.
- (6) Choose air-supply hoses that have a minimum working pressure rating of 1035 kPa (150 psig) or 150% of the maximum pressure produced in the system, whichever is higher.
- (7) Do not use compressed air to blow debris or to clean dirt from your clothes, or those of others.
- (8) Do not operate at pressure above manufacturer's rating.

#### 24.17.1 **Operation**

- (1) Wear safety glasses or face shield and, where necessary, safety shoes and hearing protection.
- (2) Post warning signs and shields in areas where tools are used and others may be exposed to flying chips, dust, and excessive noise.
- (3) Exercise care to prevent hands, feet, or body from injury in case the machine slips or the tools break.
- (4) Reduce operator fatigue. Support heavy tools by means of counter balance wherever possible.

#### 24.17.2 **Air Cleaning**

- (1) Cleaning with compressed air is dangerous.
- (2) Compressed air may be used if no alternate method of cleaning is available. Nozzle pressure **MUST** remain at below 207 kPa (30 psi). Personal protective equipment and effective chip guarding techniques must be used.



**25. ROLLING SCAFFOLDS**

- (1) All rolling scaffolds will be equipped with braking and locking devices.
- (2) Locking devices shall be set in place when work is being done on the scaffold.
- (3) All areas shall be cleaned prior to moving scaffold around areas. Secure or remove material on scaffold.
- (4) A rolling scaffold shall not be moved on an inclined surface unless adequate precautions are taken to prevent tipping, sliding, acceleration or any dangerous or sudden movement.
- (5) Do not ride scaffolds.
- (6) Do not attempt to move rolling scaffold without sufficient help. Watch for holes in floor and overhead obstructions.
- (7) The working platform height of a rolling scaffold must not exceed three times the smallest base dimension unless guyed or otherwise stabilized.
- (8) All rolling scaffolds must be horizontally braced.

## 26. SCAFFOLDS - METAL

### 26.1 General

- (1) There are various types of metal scaffolds and they all have a right and wrong way to be erected.
- (2) The misuse of scaffolding is the cause of numerous serious injuries. Every worker who designs or constructs a scaffold should be competent and know what the manufacturer's specifications are for that type of scaffold and inspect the scaffold each day prior to use.
- (3) The scaffold type which will be best suited for the job and capable of withstanding the 4 times the loads to be imposed on it must be determined before the job begins. Ensure that:
  - (a) The location in which the scaffold is to be constructed is level or is capable of presenting secure footing by use of a mudsill or some other device.
  - (b) Scaffolds must be erected with all braces, pins, screw tacks, base plates and other fittings installed as required by the manufacturer.
  - (c) Workers erecting or dismantling a scaffold more than 3 meters (10 feet) high must be tied off with a safety harness and a lanyard.
  - (d) Scaffolds must be equipped with guardrails, plus toe boards where required.
  - (e) Scaffold platforms must be at least 46 centimeters (18 inches) wide and if over 10 ft. high must be fully decked to a guard rail or full width.
  - (f) Scaffolds must be stable and secured either by guylines or to the building every third lift.
  - (g) Scaffold planks must be secured by cleats.
  - (h) Before erecting staging make a hazard assessment before hand. (Example: power lines, transformer, inclines, etc.)
  - (i) Scaffold planks and platforms must be of good quality and clean of all foreign objects.
  - (j) Erected scaffolds should be plumb.
  - (k) Scaffolds must be equipped for proper access.
  - (l) Scaffolds over 15 meters (50 feet) must be designed by a professional engineer.
  - (m) Wheels or caster on rolling scaffold must be equipped with braking devices and secured to the frame.

Horizontal Rail - 0.92 meters to 1.07 meters above the platform.

Intermediate Rail - horizontal rail midway between scaffold platform and top rail.

Toe Board - horizontal member at platform level no less than 140mm in height above the platform level.

## 27. VEHICLE SAFETY

### 27.1 General

- (1) Follow the common sense rules of good driving:
  - (a) Don't tailgate.
  - (b) Observe the speed limit.
  - (c) Stay alert, expect the unexpected.
  - (d) Use vehicle mirrors.
  - (e) Drive defensively.
- (2) Before driving, check the load:
  - (a) For even distribution of weight.
  - (b) To ensure that it is secured in place.
- (3) Before towing equipment, check to ensure that:
  - (a) The hitch and ball are properly connected.
  - (b) The safety chain is secured in place.
  - (c) Material is at a level where it will not spill during cornering or stopping.
  - (d) All brake and running lights are working.
- (4) Other vehicle checks include:
  - (a) Horn, front lights, and windshield wipers.
  - (b) Oil and water levels.
  - (c) Tire pressure (including equipment in tow).
- (5) Allow for safe stopping distances. A heavily loaded vehicle will not stop quickly.
- (6) Vehicles should be equipped with a first aid kit and dry chemical extinguisher.

### 27.2 Vehicle Parking

#### 27.2.1 General

- (1) Parking and movement of vehicles in the confinement of parking lots, yards and job sites poses a hazard. Employees and the public at large are often pedestrians in parking areas, and quite often workers are moving in and out of the premises.

Cape Breton University  
Maintenance Safe Work Manual

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**27.2.2 Practice**

- (1) Where possible, all vehicles parked in University lots will be parked so they can be driven forward when leaving the parking area.
- (2) All vehicles parked in other than University parking lots or areas should be parked so they can be driven forward when leaving the parking area.
- (3) Vehicles should not be parked in front of large equipment doors, or within 3 metres of any building entry/exit door or fresh air intake/fire hydrant.
- (4) When backing into confined areas, or when backing a vehicle with limited rear visibility, a person to guide the backing operation should be used.

**27.3 Vehicle Report**

Vehicle Model: \_\_\_\_\_

Period From: \_\_\_\_\_ to \_\_\_\_\_  
Date Date

Vehicle Number: \_\_\_\_\_

Mileage at Beginning of Week: \_\_\_\_\_

Mileage at End of Week: \_\_\_\_\_

A. Vehicle is operating Satisfactorily: \_\_\_\_\_ (If NO Complete B.)

B Driver's Comments:

Vehicle Check at End of Week: (Check each area ✓)

Oil	<input type="checkbox"/>	Battery	<input type="checkbox"/>	Cooling System	<input type="checkbox"/>
Tires	<input type="checkbox"/>	Lights	<input type="checkbox"/>	Brake Fluid	<input type="checkbox"/>

\_\_\_\_\_  
Driver's Signature

\_\_\_\_\_  
Manager's Signature

## 28. WELDING - EYE AND FACE PROTECTION

### 28.1 General

- (1) The arc welding lens assembly consists of 3 parts. The outside lens is clear plastic or tempered glass. It protects the shade lens from damage. The centre lens is a shade lens which filters out the harmful light. The inner lens is clear and must be plastic.
- (2) Use gaskets provided with helmets or goggles.
- (3) Wear arc welding helmets for all arc welding or cutting operations.
- (4) Do not use gas welding goggles for arc welding.
- (5) Wear safety glasses with side shields at all times in a welding shop, even under welding helmets.
- (6) Replace pitted or cracked lenses.
- (7) Protect eyes from flying pieces of slag when chipping the weld.
- (8) Do not substitute modified glasses, sunglasses, smoked plastic or other materials for proper welding lenses.
- (9) Replace loose or damaged helmets. Invisible and dangerous light rays (ultraviolet) can get in undetected.
- (10) Contact lens users should prevent dust and particles from getting in their eyes. Foreign particles can collect behind the lens and cause severe discomfort and possibly eye damage.

### 28.2 Screens

- (1) Prevent the welding arch from affecting other workers by screening electric welding operations.
- (2) Ensure all screens are constructed of sturdy opaque or translucent materials. Permit at least 50 cm (20 in) bottom clearance for ventilation. Post warning notices to alert other workers.

## 29. WELDING - PROTECTIVE CLOTHING

### 29.1 General

- (1) Wear 100% wool or flame-retardant cotton clothing. Wear long-sleeved shirts with buttoned cuff and a collar to protect the neck. Dark colours prevent light reflection. Remove shirt pockets or have flaps with buttons.
- (2) Pant legs without cuffs should cover the tops of the boots. Cuffs can collect sparks.
- (3) Repair all frayed edges, tears or holes in clothing.
- (4) Wear high top boots to prevent sparks from going into the boots. The top of the toe of the boot should be smooth so that sparks will not get caught in the seams.
- (5) Boot protectors or spats can be strapped around the pant legs and boot tops to prevent sparks from bounding in the top of the boots.
- (6) Remove matches and lighters from pockets. The hot welding sparks may light the matches or burn a hole through a plastic lighter, causing a serious burn.
- (7) Leather is a good insulator. Wear gauntlet-type cuff leather gloves or protective sleeves of similar material, which protect wrists and forearms. Arrange seams inside to prevent burning of stitches and trapping of hot metal particles. Unseamed gloves with reinforcement between thumb and forefinger are preferred.
- (8) Wear leather aprons to protect your chest and lap when standing or sitting. Leather jackets with full sleeves, back and high neck are good for out-of-position work.
- (9) Wear a flame-resistant skull cap under your helmet to prevent head burns.
- (10) Keep clothing free of oil or grease to avoid fire or slipping. Keep dry to reduce electrical risk.

## 30. **WELDING - VENTILATION**

### 30.1 **General**

- (1) Fumes and gases are released from welding rods and torches and coating on the metal. They rise in a cloud or plume from the welding site.
- (2) Fumes and gases are toxic and can be harmful. Check regulations and standards for recommended personal protection. Mechanical ventilation is necessary unless the work being done is in the open air.
- (3) Take advantage of any general ventilation such as open windows so that the fumes are blown away from your face. Keep your head out of the welding plume.
- (4) Local exhaust ventilation is better than general ventilation. It captures the fumes and gases at the source.
- (5) Locate exhaust openings as close as possible to the welding site.
- (6) Discharge exhaust air where it cannot contaminate fresh air being drawn into the workroom.

## 31. WOODWORKING MACHINES

### 31.1 Band Saw

Band saw machines can be dangerous if not used properly. Read the owner's manual carefully. Make sure you understand instructions before use.

#### **DO**

- (1) Wear safety glasses or a face shield.
- (2) Ensure all safeguards are in place.
- (3) Ensure the blade runs freely in and against the upper and lower guide rollers.
- (4) Ensure the machine has been properly oiled.
- (5) Ensure the blade is under proper tension.
- (6) Ensure the band saw is securely anchored to the floor to reduce vibration, unless a portable unit.
- (7) Ensure all band wheels are enclosed.
- (8) Ensure that the band saw is equipped with automatic tension control, unless manufactured without it.
- (9) Keep the floor around a band saw free of obstructions.
- (10) Adjust guard height with minimum clearance of material.
- (11) Feed with hands and arms to side of stock.
- (12) Use band saw blades which are sharp, properly set and otherwise suitable for the job.
- (13) Hold stock firmly and flat on the table. This prevents the stock from turning and drawing your fingers against the blade.
- (14) Release cuts before long curves when doing intricate scroll-type work.
- (15) Provide adequate lighting at the machine table. A light fixture with a flexible connection can provide essential lighting.





### **DO NOT**

- (1) Do not attempt to back the stock away from the blade while the saw is in motion if work binds or pinches on the blade.
- (2) Do not stop the band saw by thrusting stock against the cutting edge or side of blade immediately after the power has been shut off.
- (3) Do not remove sawdust or cuttings from the table by hand. Use a stick or brush.
- (4) Do not leave the saw running, unattended. Turn off the power and make sure the machine has stopped running.

### **31.2 Wood Turning Lathes**

Wood turning lathes can be dangerous if not used properly. Learn the machine's applications and limitations.

### **DO**

- (1) Only permit experienced and trained lathe operators to operate lathe.
- (2) Wear safety goggles or face shields at all times.
- (3) Use stock free of defects.
- (4) Hold tools firmly with both hands against the tool rest.
- (5) Hold the stock securely on the faceplate.
- (6) Use only those tools that have been furnished or approved.
- (7) Use sharp, well-maintained chisels and gouges.
- (8) Operate lathe at low speed with moderate depth of cut to prevent flying splinters during roughing operations. Speed of the lathe depends on type of wood, diameter of stock, nature of work being done and type of tool used.
- (9) Adjust tool rests parallel and as close as possible to the stock and high enough so that tools will cut into the wood slightly above the centre of the work being turned.
- (10) Remove tool rest when sanding or polishing.

- (11) Hold sandpaper in the fingers and pressed lightly against a small area at the top of the rotating shaft when hard sanding. This will keep the sandpaper from catching and pulling your hand around the stock.

**DO NOT**

- (1) Do not wear gloves, loose clothing. Clothing should be worn snugly, Shirts Tucked In.
- (2) Do not use makeshift tools.
- (3) Do not use stock containing checks, slits, cracks, or knots.

To make a faceplate turning, the tip of the chisel is steadied by the one hand, which holds the edge against the tool rest while the other hand guides the tool. Note that the tip of the chisel is held higher than the handle.

### 31.3 **Jointer/Planers**

Jointer/planers can be dangerous if not used properly. Make sure you understand instructions before operating a jointer/planer.

**DO**

- (1) Wear safety glasses or goggles.
- (2) Permit only experienced and trained personnel to operate jointers.
- (3) Use only sharp, balanced and joined knives.
- (4) Replace old square cutting heads with round heads as they are much safer.
- (5) Ensure start and stop buttons are within easy and convenient reach of the operator.
- (6) Before starting machine the operator should check:
  - (a) Knives for proper clearance, depth of cut, sharpness and balance, secure fastening.
  - (b) Fence anchored in the proper position.
  - (c) Guard (sing or overhead) for freedom of movement and return over the cutting head.
  - (d) Jointer for proper lubrication.
  - (e) Parts or accessories for proper working condition.



- (7) Ensure swing guard pushes beside the stock as it passes over the cutting heads and returns against the fence after the stock is removed.
- (8) Remove all wrenches and tools used in the set up from the table.
- (9) Provide a minimum clearance of at least 3 feet greater than the length of the longest stock being worked.
- (10) Construct hold-down push blocks to perform bevelling as well as surface operations.
- (11) Use hold-down (double handled) push blocks. These keep hands well away from the cutting head.
- (12) Maintain an adequate amount of downward and forward force with push blocks as the knife blades on a revolving cutting head can take the stock from an operator's hands.

**DO NOT**

- (1) Do not leave machine running unattended. Shut off the power and make sure that the cutting head has stopped revolving.
- (2) Do not make cuts of deeper than 1/16" in one pass.
- (3) Do not joint (edge) stock of pieces less than 12" long, 3/4" wide and less than 1/4" thick.
- (4) Do not surface stock less than 12" long, 3/4" wide and more than 6" wide or less than 5/8" thick.
- (5) Do not pass hands over cutters.
- (6) Do not remove dust or particles of wood from table by hand. Use a stick or brush.

**31.4 Shaper**

Shapers can be dangerous if not used properly. Make sure you understand instructions before use.

**DO**

- (1) Wear safety glasses or face shield.

- (2) Permit only experienced and trained personnel to operate wood shapers.
- (3) Remove all wrenches and tools used in the set up from the table.
- (4) Ensure all guards are in proper position.
- (5) Check, before operating, to see that the spindle top and knives are correctly adjusted and securely fastened and that the spindle is free before turning on the power.
- (6) Bring spindle up to operating speed slowly during start-up by applying power in a short series of starts and stops.
- (7) Use jig fixtures and hold down push blocks. Fasten the work securely in a jig. When a table guide pin is used ensure it is adjusted and will not slip.
- (8) Remove all other blades when one blade is removed from the shaper spindle. This will prevent the other blades from being hurled from the spindle if the machine is started.
- (9) Turn off power, lock out machine when performing set-ups or any other operation on or about the spindle.
- (10) Shape only one piece of stock at a time.
- (11) Use extra care in machining stock that contains cross grains or knots. These may pull the operator's hands into the knives, or may cause kick-backs.
- (12) Shape stock only longer than 10".

**DO NOT**

- (1) Do not leave machine running on. Make sure that the power is shut off and that the cutter head has stopped revolving.
- (2) Do not rest your hands near the edge of the stock being cut.
- (3) Do not tamper with guards or make them inoperative in any way.
- (4) Do not back up the stock (check to see that the direction of rotation is as expected). Always feed against rotation of the cutter.
- (5) Do not take deep cuts or feed the stock too rapidly.

- (6) Do not remove sawdust or cuttings around knives by hand. Use a stick or brush.
- (7) Do not clear the table when the cutter is rotating.
- (8) Do not allow stock or finished work to accumulate on the table.
- (9) Do not stand in line with the stock being fed.

### 31.5 Sanders

Sanders can be dangerous if not used properly. Make sure that you understand instructions before use.

#### **DO**

- (1) Wear goggles and dust respirators when operating sanders.
- (2) Keep hands away from the abrasive surface.
- (3) Inspect abrasive belts before using them. Replace those belts that are worn, frayed, or excessively worn in spots.
- (4) Sand on the downward side of the disc.
- (5) Adjust work rest on all manually fed sanders to provide minimum clearance between the belt and the rest. It should be secured to support the work.
- (6) Hold small pieces of stock in a jig or holding device.
- (7) Install abrasive belts that are the same width as the pulley drum.
- (8) Adjust abrasive belt tension to keep the belt running the same speed as the pulley-drum.
- (9) Guard feed rollers to allow boards to pass, but keep operator's fingers/arms out.
- (10) Locate guards on a belt sanding machine at all:
  - (a) In-running nip point.
  - (b) Power transmission and feed roll parts.
  - (c) The unused portion of the abrasion belt on the operator's side of the machine to prevent human contact.





### **DO NOT**

- (1) Do not operate sander without exhaust system operating on stationary machine.
- (2) Do not operate sander unless adequately guarded.
- (3) Do not operate sander unless work rest is properly adjusted.

### **31.6 Push Sticks**

- (1) Push sticks or push blocks should be used when operating standard woodworking machinery, including table saws, band saws, radial arm saws, jointer/planers and shapers.
- (2) These sticks protect the hand while allowing good hand control of the stock as it is pushed through the cutting head or blade.
- (3) Push blocks for Jointer/Planers should be constructed for two-handed positioning.
- (4) Hold-down push blocks should be designed to:
  - (a) Be rigid.
  - (b) Protect both hands.
  - (c) Allow two-handed, firm, steady pressure to be applied.

### **31.7 Mitre Saws**

Mitre saws can be dangerous if not used properly. Make sure you understand the instructions before use.

### **DO**

- (1) Wear safety glasses or a face shield. If work is dusty, use a respirator or dust mask.
- (2) Keep one hand on the trigger switch and handle and use the other hand to hold the stock against the fence.
- (3) Keep hands out of the path of the blade.
- (4) Keep guards in place and in working order.
- (5) Remove adjusting keys and wrenches.

- (6) Use a crosscut or combination blade.
- (7) Ensure that the blade rotates in the correct direction.
- (8) Ensure that the blade and arbor collars are secure and clean. Recessed sides of collars should be against blade.
- (9) Keep blade tight, clean, sharp and properly set so that it cuts freely and easily.
- (10) Allow motor to reach full speed before cutting.
- (11) Follow instructions for lubricating and changing accessories.
- (12) Keep work area clean. Cluttered areas and benches invite accidents.
- (13) Keep work area well lit.
- (14) Unplug tools before servicing and when not in use.
- (15) Check for damage. Repair or replace damaged parts.
- (16) Keep motor air slots clean and free of chips.
- (17) Use only accessories designed for the specific saw and job.

**DO NOT**

- (1) Do not cut stock of pieces smaller than 20 cm (8 inches) in length.
- (2) Do not cut "free hand". The stock should lie solidly on the table against the fence.
- (3) Do not reach around or behind saw blade while it is running.
- (4) Do not remove your hand from the trigger switch and handle until the blade is fully covered by the lower blade guard.
- (5) Do not overreach. Keep proper footing and balance at all times.
- (6) Do not force saw. The saw cuts better and safer at the rate for which it was designed.

- (7) Do not operate electric tools near flammable liquids or in gaseous or explosive atmospheres. Sparks may ignite fumes.

### 31.8 Table Saws

Table saws can be dangerous if not used properly. Read the owner's manual carefully. Learn the applications and limitations use. Refer to general safeguards.

#### **DO**

- (1) Wear safety glasses or face shield.
- (2) Pay particular attention to the manufacturer's instructions on reducing the risk of kickback.
- (3) Use a guard high enough to cover the part of the blade rising above the stock.
- (4) Choose proper blades for the type of work being performed.
- (5) Keep blades clean, sharp, and properly set so that they will cut freely without being forced.
- (6) Keep guards in place and in working order.
- (7) Keep area clean. Only operate machines in a non-congested, well lighted area.
- (8) Keep hands out of the line of a saw blade.
- (10) Use guard with a spreader and anti kickback fingers for all ripping or cross cutting operations.
- (11) Keep the body and face to one side of the saw blade out of the line of a possible kickback.
- (12) Use a push stick when ripping narrow stock. Refer to ripping applications in the instruction manual.
- (13) Move the rip fence out of the way when cross cutting. Never use it as a cut-off gauge.
- (14) Provide adequate support to the rear and sides of a saw table for wide or long stock.

- (15) Exercise extreme care when waxing or cleaning the table. Shut off or lock out saw before waxing the table.

**DO NOT**

- (1) Do not perform free-hand sawing operations. Hold stock firmly against the mitre gauge or rip fence to position and guide the cut.
- (2) Do not reach around or over moving blades.
- (3) Do not leave saw running attended.