THUNDER BAY REGIONAL RESEARCH INSTITUTE STANDARD OPERATING PROCEDURE			
Manual:	Operations	SOP No.	**OP 1.05**
Section:	Machine Shop	Issued:	Sept 2011
Subject:	**MACHINE SHOP – Training & Guidelines**	Effective:	Sept 2011
Issue to:	All Manual Holders	Page:	1 of 10
		Replaces:	**New**
Issued by:	Shop Supervisor	Dated:	Sept 1, 2011

PURPOSE

The purpose of this Policy & Procedure is to outline access, general training, and guidelines for safe operation of tools and equipment within the Machine Shop.

For access rights to the Machine Shop, please contact the Shop Supervisor.

TRAINING

All applying individuals must receive basic Machine Shop training from the Shop Supervisor before entering the Machine Shop. The Machine Shop is off-limits to unauthorized people.

Basic training will include proper shop and equipment usage and safety procedures. Applying individuals will be required to complete a small project under the supervision of the Shop Supervisor to prove competency.

Applying individuals are only allowed to use equipment that they have been specifically trained on. The Training Sign-off Sheets, at the end of this policy, are to be filled out accordingly and forwarded to HR for recording.

SAFETY

Only trained individuals may use the Machine shop and its equipment. Never try to repair equipment yourself, instead report any issues to the Shop Supervisor. The Shop Supervisor will ensure that broken or equipment in need of repair is appropriately taken out of service and addressed.

Appropriate PPE must be worn at all times while working in the Shop. As well, if additional specialized PPE is required for specific pieces of equipment, it must be worn in addition to, or in replacement or, the base PPE.

As there are points of entanglement in the machine shop and while using the machines, therefore, long hair, loose clothing, jewellery, neck straps for key-badges, and other possible sources of entanglement should not be worn. Always contain loose hair, and do not wear gloves or other sources of entanglement around rotating equipment.

Note there is a safety board and first aid kit in the machine shop. Be aware of the first-aid location.

HOUSEKEEPING

Proper housekeeping of the machine shop is required by the user after each use. Ensure all materials and tools which have been used are clean and returned to their appropriate location. All debris and liquids must be cleaned up before exiting the machine shop, and immediately if they pose a risk to others. All machines which require manual lubrication must be monitored before and after use e.g. milling machine and lathe.

MACHINE BASICS

Hand Tools:

1. Clean grease and oil from hands before using tools to prevent slipping.
2. To prevent injury or damage to your project use only tools in good condition.
3. Use tools only for the job that they were designed for.
4. Cut away from your hands and body when using a knife or sharp object.
5. Check the hammer or mallet handle before using to be sure the handle fits tightly in the head of the hammer.
6. Use a wrench on nuts and bolts – not pliers.
7. Use open-end or adjustable wrenches that fit the nut snugly to prevent slipping and injuring fingers or damaging parts.
8. Use the correct size tool for the job.
9. All power tools must be turned off and have come to a complete stop before they can be set down by the operator.

Drill Press:

1. Wear the face protection provided.
2. Check the drill press head and table for security and condition before starting.
3. Select the correct speed for the material and size drill being used.
4. Shut off power before removing bit.
5. Make sure the drill bit or cutting tool is locked securely in the chuck. Remove the chuck key immediately after tightening or removing a bit. Leaving it in the chuck can injure someone if the machine is turned on.
6. All work pieces must be held securely for drilling by using either a drill vise or C-clamps.

7. Hands are to be kept clear of the revolving spindle, chuck, drill and chips.
8. Always ease up on the feed or drill pressure as the drill begins to break through the work piece. Heavy feed pressure will cause the drill to dig in, and could damage the material being drilled, break the drill, or cause the work piece to spin.
9. Be sure the drill press is stopped before removing the work piece, chips or cuttings.

Electric Drill (hand held):

1. Centre punch the hole to be drilled.
2. Tighten the drill using the chuck key and remove the chuck key immediately.
3. Hold the drill motor firmly, and keep hands away from the revolving spindle and drill.
4. Apply straight and steady pressure on the drill, and ease up on the pressure as the drill begins to break through the material.
5. With the motor still running, back out the drill as soon as the hole is drilled.
6. Turn off the drill and hold firmly until it comes to a complete stop before laying it on the work bench.

Bench Grinder:

1. Wear the face protection provided.
2. Adjust the work rest to within 1/16 inch of the wheel face.
3. Ensure all the guards are in place and secure.
4. Stand to the side of the grinder, not in line with the wheels, while turning on the grinder and while the wheels are accelerating; this is the most common time for a damaged wheel to fly apart.
5. Do not allow hands to come in contact with the grinding wheel while it is in motion.
6. Dress the grinding wheel when it is worn, uneven or out or round.
7. Hold the work firmly, and make grinding contact without bumping or impacting the grinder.
8. Use only enough pressure to assure grinding, but not heavy pressure as this will only cause overheating and grinder damage. If the work piece begins to get warm, quench with water.
9. Grind only on the face of the wheel. Grinding on the side can cause the grinder wheel to explode due to heat stress build-up.
10. Keep the work piece in motion across the face of the wheel.
11. Stone type grinding wheels are not for grinding aluminium, brass or copper because the soft metal becomes imbedded in the stone, overheats, and can explode.

Band Saw (vertical):

1. Always wear safety glasses or goggles with side shields.
2. Use only the correct blade for the material being cut – fine blade for steel, coarser one for aluminium.
3. Stand to one side while doing power-on-testing of blade tracking. Should the blade come off the wheels or break, it could cause serious injury.
4. Adjust the blade guides and rollers properly, and adjust the speed. The upper saw guide should be ¼ inch or less above the work piece.
5. Check the work piece to be sure it is free of defects – broken off tool bits, etc.
6. Plan the cut so as to prevent backing out of a cut, as this will pull the blade off the wheels. Make relief cuts as needed.
7. Holding the work piece firmly, feed the work piece at a moderate rate.
8. Use a push stick when sawing small pieces.
9. When feeding a work piece into the band saw blade, your fingers should not be in line with the blade in case the work piece cuts faster than you expected.

Shear:

1. Always wear goggles or safety glasses with side shields.
2. Inspect shear for any mechanical or electrical malfunctions and report to the machine shop supervisor immediately. Do not repair equipment on your own.
3. Operating air and foot shears presents three areas of hazard:
    a. Bodily contact with the blades or material hold downs at the point of operation.
    b. At pinch points where part of the body comes in contact with a moving part of the machine or feeding mechanism.
    c. Materials handing:
        i. Where a part of the body may be pinched between the material being worked and parts of the machine.
        ii. Handling sheets and scraps.
        iii. Contact with sharp edges.
4. Only operate this machine from the front.
5. The area around the shear should be free of oil or coolant spills as well as all other obstructions including employees.
6. Do not place any material or your body under the backstop when shearing.
7. Keep hands clear from pressure stock pads.
8. Do not remove the safety barrier during operation.
9. Never place feet near foot pedal or shear treadle until hands and feet are clear and you are ready to cut stock (never use as foot rest).
10. Do not exceed the capacity of the shear. The shear is not meant to cut stacked material.

11. When shearing large pieces use proper support.
12. The shear may only be used by one person at a time. However some jobs will require a helper, if so s/he must also abide by all safety guidelines. They must not support material being cut from rear position.

Bender (Brake):

1. Always wear goggles or safety glasses with side shields.
2. Check for broken or damaged parts before using the brake. Do not attempt to fix or replace, report issues to your Shop Supervisor.
3. Operating the bender presents three areas of hazard:
    a. Bodily contact with the blades or material hold downs at the point of operation
    b. At pinch points where part of the body comes in contact with a moving part of the machine or feeding mechanism.
    c. Materials handing:
        i. Where a part of the body may be pinched between the material being worked and parts of the machine.
        ii. Handling sheets and scraps.
        iii. Contact with sharp edges.
4. Only operate this machine from the front.
5. The area around the shear should be free of oil or coolant spills as well as all other obstructions including employees.
6. Do not exceed capacity of brake. The bender is meant to bend one piece of material only.
7. Always check your Counterweight Rods and Counterweights to make sure they are secure before you use the break.
8. Never bend rods, wires, multiple thicknesses, or across seams.

NOTE: SPECIAL AUTHOIZATION REQUIRED FOR MILL AND LATHE:

Milling Machine:

1. Always wear safety glasses or goggles with side shields. If it is necessary to wear a face shield, safety glasses or goggles must be worn underneath. NOTE: It may also be necessary for others in the area to wear safety glasses. Be sure to inform others in the area of work to be undertaken.
2. Persons using the milling machine must have instruction and understand the safe operation of the equipment. Students must be supervised at all times.
3. Always lock-out the machine before making any adjustments.
4. Draw the job back to a safe distance prior to making any adjustments.
5. Do not use a vise or jig that prevents close adjustment of the guard. Never leave the cutter exposed after the job has been removed.
6. Do not leave hand tools on the worktable.
7. Always securely clamp the work prior to milling.
8. Never reach around the cutter to remove debris when the machine is in motion.
9. Follow job specifications for the speed, feed and depth of cut for materials fabricated. Ensure that at least 60% of the piece being cut is secured in the vise.
10. Always use a brush to remove cuttings, never sweep them away with your hand.
11. Work should only be measured or callipered when the machine is not running.
12. Machine must be at a full stop before cleaning any part.
13. Ensure that cutters being used are sharp and after use are correctly dressed and stored.
14. Never remove a nut from the machine's arbor by applying power to the machine.
15. Take care not to strike the cutter with a hand or arm while setting up or adjusting a stopped machine.
16. Be conscious of the distances between the arbor and other parts.
17. Never clean the machine while it is in motion.
18. Do not leave milling machine while it is running

Lathe:

1. Always wear safety glasses with side shields or goggles. If it is necessary to wear a face shield, safety glasses or goggles must be worn underneath. It may be necessary for others in the area to wear safety glasses as well.
2. The area around the shear should be free of oil or coolant spills as well as all other obstructions including employees.
3. Follow job specifications for the speed, feed and depth of cut for materials being turned. Make sure all work runs true and centered.
4. Centre-drill work deeply enough to provide support for the piece while it is turning.
5. Secure and clamp the piece being worked.
6. Adjust tool and tool rest so that they are slightly above the centre of the work.
7. Use a lifting device to handle heavy chucks or work. Refer to Materials Handling for additional information.
8. Inspect chucks for wear or damage. Flying pieces can be very dangerous.
9. Remove chuck wrench immediately after adjusting chuck.
10. Use a barrier guard when operating the lathe in semi-automatic or automatic mode.
11. Guard all power transmission parts.
12. Remove all tools, measuring instruments and other objects from saddle or lathe bed before starting machine.
13. Keep all lathe cutting tools sharp.
14. Ensure that the chip and coolant shields are in place.
15. Shut off the power supply to the motor before mounting or removing accessories.
16. Stop lathe before taking measurements of any kind.
17. Use a brush or rake to remove cuttings only after the lathe has stopped moving.
18. Keep working surface clean of scraps, tools and materials.
19. Do not leave lathe unattended while running.

GENERAL TRAINING SIGN OFF SHEET

I, _____ (please print), the undersigned, have read and understood the JH&SC Policy 2.08 and the general principles which govern access to and proper conduct in the Machine Shop. I also acknowledge that I have undergone general safety training and orientation with the Shop Supervisor. I agree to abide by all the rules and operational direction given.

Further, I have been trained to use the following equipment, located within the Machine Shop at ICR Discoveries (please check all that apply):

- ○ Hand Tools
- ○ Bandsaw KB-36
- ○ Drill Press King KC-122-FC
- ○ Stm Digital Height Gauge 300mm
- ○ Baldor Model 623E bench grinder
- ○ Shear National N5216
- ○ Bender National U4816

X _____

Signature
Date:

Signature of Trainer:_____
Date:

Signature of Supervisor:_____
Date:

Signature of Shop Supervisor:_____
Date:

Access Granted ☐
Copy to file HR

MILL TRAINING SIGN OFF SHEET

Granting of Special Authorized Access for Use

I, _____ (please print), have been trained to use the following equipment, located within the Machine Shop at ICR Discoveries:

- ACRA Milling Machine model AM4
- Powerfeed on x-axis
- Newall 3 axis Digital Readout

X _____

Signature
Date:

Signature of Trainer:_____
Date:

Signature of Supervisor:_____
Date:

Signature of Shop Supervisor:_____
Date:

Access Granted ☐
Copy to file HR

LATHE TRAINING SIGN OFF SHEET

Granting of Special Authorized Access for Use

I, _____ (please print), have been trained to use the following equipment, located within the Machine Shop at ICR Discoveries:

- EMCO Lathe

X _____

Signature
Date:

Signature of Trainer:_____
Date:

Signature of Supervisor:_____
Date:

Signature of Shop Supervisor:_____
Date:

Access Granted ☐
Copy to file HR