

DEPARTMENT OF MECHANICAL ENGINEERING

Name of SOP	HH Roberts Milling Machine (usage in JHE rm.207)
Effective Date	April 13, 2009
Author	Jim McLaren
Reason for SOP	Potential for injury due to rotating machinery Injury from metal cuttings or objects/work piece ejected from machine.
Approved by (supervisor)	Ron Lodewyks
Date reviewed by (JHSC)	

Definitions

Terms	None
acronyms	RMM – Risk Management Manual JHSC - Joint Health and Safety Committee EOHSS – Environmental & Occupational Health Support Service

Requirements

Applicable OSHA regulations and / or codes of practice.
<ol style="list-style-type: none"> 1. OSHA code. 2. McMaster University Risk Management Programs
Training and competency.
<ol style="list-style-type: none"> 1. Training provided by Mechanical Engineering technicians . 2. Lab supervised by Mechanical Engineering technicians 3. Competency is shown by the individual after training. Those persons using the facilities must attend a “shop safety course” and pass a written test in order to use the shop facilities

Description of the Task

Location and time of work	JHE 207C during normal working hours
Individuals and skills required	Undergraduate students, graduate students, faculty members, workers etc. who have attended the mandatory “Machine shop safety” training course. Those who have demonstrated competency or have received instruction in the required process procedure.
Equipment and supplies required	Vertical milling machines, standard and special work holding devices as required eg. Vises ,vee blocks, angle plates ,cutter holding collets dividing head etc. Standard and special cutting tools and their holders , cutting inserts, drills, reamers etc

Personal protective equipment required	Safety glasses. As required hearing protection or foot protection
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General safety instructions

- 1) **Develop and use common sense** when using the equipment (think before you act).
- 2) Be sure to discuss the operation of the mill in detail with the Technician before operating the machine
- 3) Do not operate the machine until you have had proper training.
- 4) Make sure the work piece is adequately clamped for the job being performed. The clamping force must be high enough to resist movement under these conditions. If there is any doubt make sure the Technician checks the part clamping before starting the machine
- 5) Make sure the tool holder and cutting insert are adequately clamped for the job being performed.
- 6) **Always wear safety glasses** when in the machine shop.
- 7) Long hair should be tied back to avoid being caught in the revolving parts of the machine (**Keep loose items away from rotating objects**).
- 8) Loose clothing, rings or watches must not be worn when operating machine tools to avoid being getting caught in the rotating part of the machine.
- 9) Wear long pants (preferably cotton) as metal cuttings removed from the work piece during the machining process can reach temperatures in excess of 300°C and will burn.
- 10) **No sandals or open toed shoes are permitted in the lab.**
- 11) Watch out for sharp edges on the part, tool and on the chips. When ever possible remove sharp edges prior to handling.
- 12) Do not use rags near the machines when the spindle is running. Rags can be caught in the rotating spindle and the result can be serious injury. Rags may be used for material handling and for cleaning purposes provided there are no rotating hazards nearby.
- 13) Use extreme caution with the chips produced during machining. Chips are sharp and some chips are long stringers which can easily be caught up in the spindle and thrown with great force. Do not clear chips away from the work area when the machine is in operation. If it is necessary ask the Technician how this can be best done.
- 14) It is mandatory to report all cases of injury to the Technician
- 15) Anyone using the lab equipment is expected to work safely at all times. If you do not work safely you will be asked to leave.. Re-admittance to the lab requires the approval of the department chair. You are responsible for your safety and the safety of others working around you. If you do not know how to safely operate the equipment it is your responsibility to obtain the proper instruction from the Technician

Sequential steps to complete the work safely.

1. Safety glasses must be worn.
2. If competency level has been achieved continue setting up the machine.
If not review safety rules with Mech. Eng. Technician.
3. Make sure work piece is properly secured before turning on power.

Power-Up sequence

- 1) Turn "Power on /off Switch " to ON position (Fig 1)
- 2) Make sure emergency stop button is released Turn and then pull stop toward you . (Fig.5)

Machine operation

1. Turn spindle lock knob to 12' o' clock position (Fig. 2)
2. Mount tool in spindle and tighten (Fig.3)
3. Turn spindle lock knob to 3 'o'clock position. (Fig.2)
4. Calculate the RPM
5. Press Spindle Enable button. (Fig.5)
6. Turn Spindle Rate Pot to ZERO (Fig 5)
7. Start spindle (Fig.4)
8. Select proper RPM using Spindle Rate Pot and Digital readout screen (Fig 5)
9. *Calculate correct feed rate for the operation being performed*
10. Turn Feed Rate Pots to ZERO.(Fig.5)
Select proper feed rate using Feed Rate Pot and digital read out screen (Fig.5)
Setting feed rate

Step (1) Press soft key F
Feed rate window should display (Fig.5)
SPECIAL
< UTILIT > PARAM COMM

Step (2) Press ENTER
Feed rate window should display (Fig .5)
OPERATING ASSISTANCE
< SPEED > ALIGN

Step (3) Press ENTER
Axes X, Y, & Z should be flashing (Main Digital Read Out (DRO) screen) (Fig 5)

Step (4) Select X axis by pressing X axis key

Step (5) Engage feed, using appropriate joystick lever (CAUTION make sure tool is clear and Feed pots are set to ZERO)

Step (6) Rotate Feed pots until proper feed is displayed.

Step (7) Disengage feed.

Step (8) Repeat steps 1 through 3

Step (9) Select Y axis.

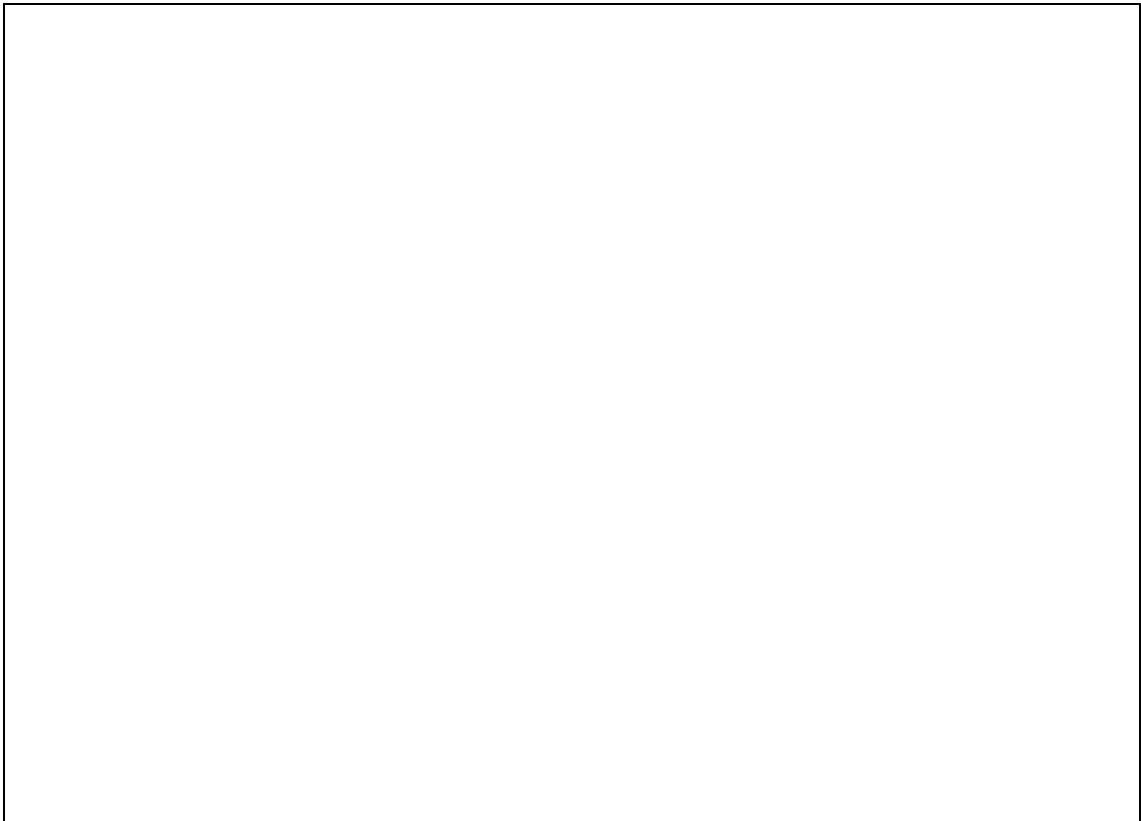
Step (10) Repeat steps 5 through 7

Complete these setup sequences in a position where the cutter will not engage work piece.

11. Position tool using cross feed and table traverse hand wheels. **Ensure retractable handle is folded in after setting location.**(Fig. 7)
12. Start spindle (Fig 4)
13. Set depth of cut using vertical handle (Fig 6)
14. Engage feed using feed joy stick (Fig. 5)
15. After cut has finished STOP FEED .(Fig 5)
16. Stop spindle (Fig 4)
17. If unsure of any of above sequences consult technician or consult reference manual "Technology of Machine Tools" (sixth edition) kept in JHE room 205

Power down sequence

1. Press red emergency stop button.
2. Switch off "Power on/off Switch" (Fig 1)
3. Remove tool from spindle (Fig. 3)
4. Clean and remove all cuttings from machine
5. Use gloves if necessary
6. Clean floor area around machine



Contingency Plan and Reporting

Accident / injury response

1. Notify Mechanical Engineering Technical staff. Apply first aid as required immediately .
2. For all injuries complete an “Injury/Incident Report” and provide a copy to the Chair and EOHSS
3. In case of critical injury call security (DIAL 88).
4. In case of critical injury notify EOHSS immediately, ext 24352

Spill response

If **coolant** is spilled contact a technician who will determine which of the following is appropriate.

In small quantities use available absorbent to minimize slipping hazard.

In larger quantities use a wet/dry vacuum to remove coolant from floor, replace into the machine if suitable. If coolant is not useable due to contamination the technician will package and follow established hazardous waste practices for disposal.

If **oil** is spilled contact a technician who will determine which of the following is appropriate.

In small quantities use available absorbent to minimize slipping hazard.

In larger quantities use a wet/dry vacuum to remove oil from floor, the technician will package and follow established hazardous waste practices for

disposal.

Equipment shutdowns.

In cases where the machine malfunctions or seems to behave in an erratic manner eg. fails to start, stop or displays excessive vibration etc. **use the emergency stop button if necessary** & contact a technician immediately. When repairs are made the lock out tag out procedures of [306 Lockout / Tag-out Program](#) will be followed.

Environmental Responsibility

Waste disposal procedures

As indicated in the “Spill Response” area above when oil or coolant is spilled or replaced for maintenance purposes these activities are to be performed or directed by the technical staff who will follow [502 Hazardous Waste Management Program](#)

Building air quality

In some operations cutting oils will generate smoke. In these cases use the local exhaust fans to clear the air.

References (OHSA/ regulations, EPA and Municipal environmental regulations, McMaster University Program/ Policy, Material Data Sheets (MSDS)).

1. RMM Program #300 Safety Orientation and Training Program
2. RMM Program #301 Standard Operating Procedure
3. RMM [306 Lockout / Tag-out Program](#)
4. RMM Program #309 Laboratory Safety Manual
5. RMM Program #310 Eye Protection.
6. RMM [317 Machine Shop Safety Program](#)
7. RMM Program #403 Noise Control and Hearing Preservation
8. RMM Program #1000 Reporting and Investigating Injury, Incidents and Occupational Disease

Distribution

1. Supervisor
2. Technical Staff of Mechanical Engineering
3. Faculty of Engineering JHSC

Risk Management Manual (RMM)

<http://www.workingatmcmaster.ca/link.php?link=Job+Matters%3APolicy-Manual>

Environmental and Occupational Health Support Services

<http://www.workingatmcmaster.ca/link.php?link=Job%20Matters:EOHSS>

Figure 1.



Power on/off
Switch

Figure 2.



Spindle -lock
knob

Figure 3.



Figure 4

Direction and
Spindle on /off
control



Figure 5.

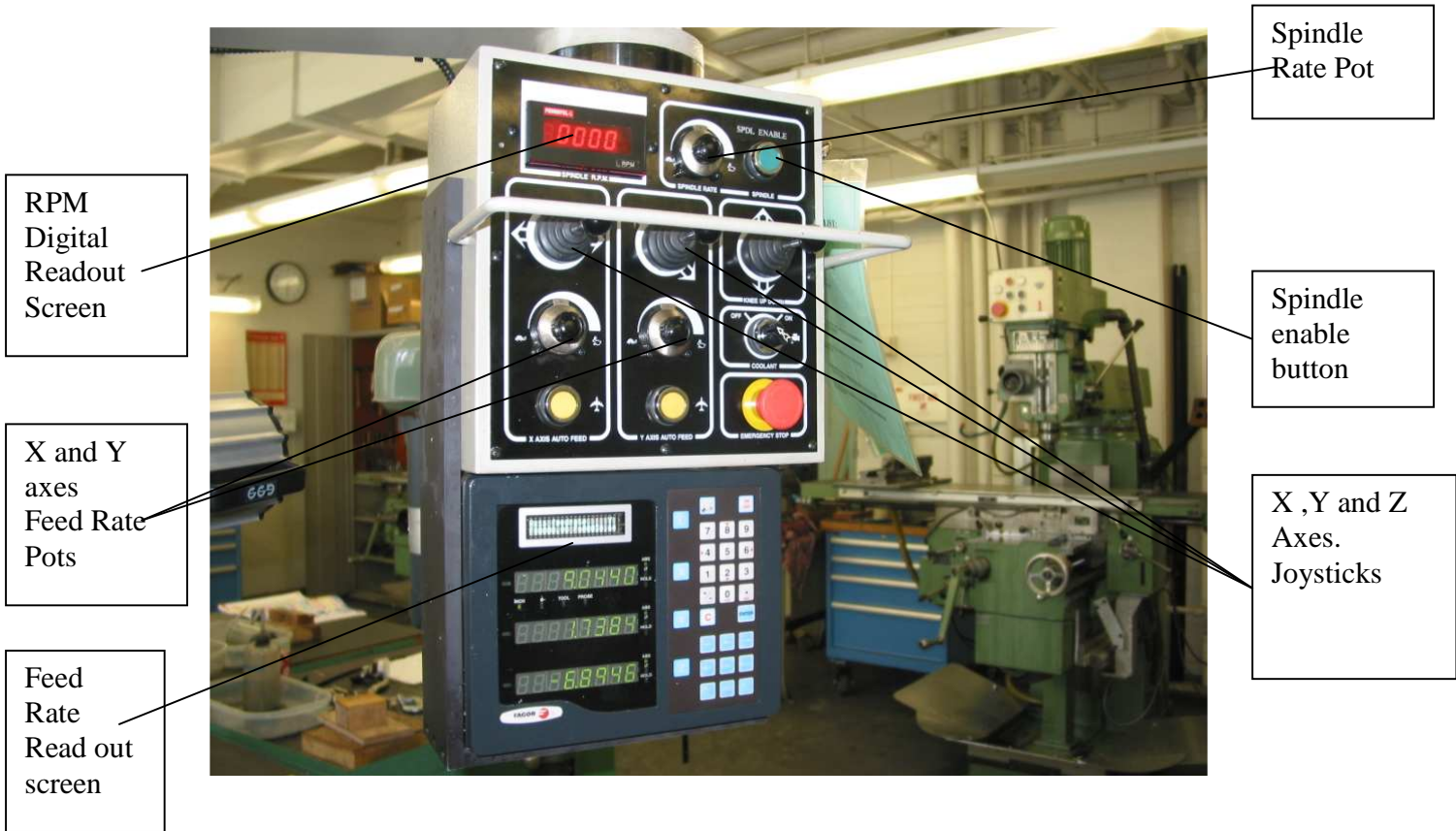


Figure 6.



X and Z axes hand feed handles

Figure 7.



Retractable
Handle
folded
in