



**NORTH
FORGE**

FABRICATION LAB

2020

SAFETY MANUAL



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1. Message from the CEO

Our Fabrication Lab is continuously changing and the addition of new equipment or the relocation of existing equipment, introduces new hazards and risks to everyone.

At North Forge, we recognize that the creation of a safe culture in which we are all committed to ensuring that everyone goes home at the end of their day just as healthy as when they arrived is very important.

A *Safe Fabrication Lab* embodies this approach and reflects our belief that member safety and an efficient and effective Fabrication Lab are complementary rather than competing means to achieving and sustaining a positive environment and successful business outcomes from which we all benefit.

A Safe Fabrication Lab is made easier however, when we work together as a team, thinking about not only ourselves, but other members, our families, friends, and everyone else that would be impacted by a serious workplace injury, as well as the impact on your work or projects.

I am incredibly proud of the commitment and effort I see towards improvements in safety at the North Forge Fabrication Lab. It is reflected positively in the startup, educational and industry communities.

A handwritten signature in blue ink, appearing to read "Joelle Foster", with a long horizontal flourish extending to the right.

Joelle Foster
CEO , North Forge Technology Exchange



2. Emergency Preparedness

Updated Sep 18.18

Introduction

Emergency situations may arise from incidents involving personal injury or equipment damage. It is imperative that North Forge Fabrication Lab have in place a plan to provide assistance to and / or ensure that safety of members and the general public, and to control the incident.

Emergency Preparedness Policy

It is the policy of North Forge Fabrication Lab that an emergency preparedness plan be in place. Emergency preparedness drills will be conducted annually.

At a minimum, North Forge shall provide first aid as required. All members at the Fabrication Lab must be oriented to the emergency procedures and muster points, the first aid trained members, and emergency phone numbers posted.

Emergency Response Plan

The Fabrication Lab shall have in place an Emergency Response Plan. **The Emergency Response Plan will be reviewed on an annual basis (January of each year).** At a minimum the plan shall include:

- Communications procedures in the event of an emergency including air horn signals.
 - Air horns are located in the lobby on top of the black community mailbox and in the Tool Room.
 - Due to the fact that our shop is relatively small a quick yelling or running through the shop (if safe) communicating an emergency may suffice.
- Listing of emergency phone numbers including Ambulance, Fire, and any other.
 - Emergency Phone numbers are visible by each telephone in the co-working space and in the shop. Also refer to the Safety Manual: 2. A. Emergency Phone Numbers - Fabrication Lab.
- Designation of personnel with first aid responsibilities.
 - Refer to the Safety Manual: 2. A. Emergency Phone Numbers - Fabrication Lab.
 - Posted in our Bulletin Board.
- Safety plan locating important safety features such as fire extinguishers, flammable storage, garbage disposal, first aid kits and phones. (partially complete).

Emergency Procedures

An emergency procedure is essentially a checklist of steps to be followed in the event of an emergency. The procedure should be customized but may include the following steps:

1. If necessary, evacuate the scene onsite.
2. Secure the scene of the incident.
3. Have a responsible person call emergency services (911) and direct to scene.
4. Notify the Safety lead or any onsite North Forge Fabrication Lab employees (Vice President or Maintenance Manager).
5. Go to our Muster Point. Across the street in the Canadian Footwear Parking Lot, the South West Corner where the Muster Sign is located.



6. If a North Forge employee (Maintenance Manager or Vice President) is also at the Muster Point, all members back into the Fabrication Lab only after an “all clear” is given by an employee. If no North Forge employee is present, entering back into the Fabrication Lab only after and “all clear” is given by authorized personnel such as the Fire Department. In the scenario of winter months and in the middle of the night, the member should leave and go home.

Emergency Preparedness Drills

Emergency preparedness drills will be conducted once every three months (before every Safety Committee Meeting) as our **building code occupancy is F2**. All members on-site should be notified in advance of the drill. An incident should be simulated and observations made of the

response. A post-drill meeting should be conducted to review the response and address any deficiencies.

Following an actual incident, the response should be reviewed at the next Safety Committee meeting to evaluate effectiveness and correct deficiencies.

Fire Related Incidents

When a fire is discovered, the following steps are to be taken:

- Raise the alarm. Let other workers in the immediate area know that there is a fire.
- Contact emergency services and arrange for someone to meet them at a designated area.
- If the fire is small enough to be handled with portable fire extinguishers, a competent worker may attempt to put out the fire if it is safe to do so.
- If the fire is too large to extinguish safely, then an evacuation of the area is to be ordered.

Evacuation Incidents

When it is determined that an evacuation is required, the following steps are to be taken:

- Sound the fire alarm.
- All members and staff are to proceed to the designated muster station.

Training

Those responsible for development, delivery and ongoing review of the Emergency Response Plan should be trained in the following areas:

- First aid training;
- Communication equipment.

Vulnerable Members

In the event that North Forge had any vulnerable workers identified, they would be assisted during evacuation by the Vice President, the Maintenance Manager or the Entrepreneur in Residence. All new members of the Fabrication Lab have been trained on our emergency procedures.

List of Forms

- 2. A. Emergency Phone Numbers
- 2. B. Emergency Response Drill / Evaluation
- 2. C. Drill Participants

2. A. Emergency Phone Numbers

Updated: June 9, 2020

This document is to be posted in a conspicuous location.

Post on the bulletin board and in close proximity to telephones.

Manitoba Regulation 217/2006 Workplace Safety and Health Regulation, Section 5.5(1)

Ambulance: 911

Police Emergency: 911

Fire Department Emergency: 911

If no fire or smoke is noticeable and the alarm is going off, leave the premises until the Fire Alarm is turned-off.

The Fire Alarm is located from the William Street door entrance.

North Forge does not have keys to open the Fire Alarm.

The nearest hospital is located 1.2 km away at:

Health Sciences Centre, 820 Sherbrook St.

[\(204\) 787-3661](tel:2047873661)

North Forge - Fabrication Lab - 3rd Floor, 125 Adelaide Street

	Name	Contact Number
North Forge	Marney Stapley	204-799-2033
Safety Lead	Lawrence Rosdobutko	(204) 230-4622
Building Related	Remco, Property Management	204-284-1300

First Aid Trained Personnel		
Marney Stapley	204-799-2033 mstapley@northforge.ca	St John's Ambulance First Aider Level II - Current
Jordynn Friesen	(204) 941-9919 jordynnfriesen204@gmail.com	St John's Ambulance First Aider Level II - Current
Jeff Stobbe	(204) 260-1290 jstobbe@northforge.ca	St John's Ambulance First Aider Level II - Current
Morgan Fiks	204-955-9655 morganfiks@gmail.com	St John's Ambulance First Aider Level II - Current



Jordynn Friesen



Marney Stapley



Jeff Stobbe



Morgan Fiks

**2. B. Emergency Response
Drill / Evacuation**

Occupancy Class: F2 Medium Hazard Industrial Occupancy
THE FIRES PREVENTION AND EMERGENCY RESPONSE ACT. Manitoba Fire Code:
Regulation 155/2011

The purpose of fire drills is to ensure that the occupants and staff are totally familiar with emergency evacuation procedures, resulting in orderly evacuation with efficient use of exit facilities. The Voice Communication System should be used where available. Following each drill, all persons of delegated responsibility should attend a debriefing to report on their actions and the reactions of the occupants. Fire drills shall be held at intervals not greater than 12 months.

The decision as to whether all occupants should leave the building during a fire drill will depend on the nature of the occupancy. It may be necessary to hold additional fire drills outside normal working hours for the benefit of employees on afternoon or night shifts who should be as familiar with fire drill procedures as those who work during the day.

Emergency Drill Coordinator:
Date of Practice Drill:

Type of Response Tested (check all that apply):

- Evacuation Fire
 First Aid Medical Aid
 Other

Start Time: (hours)
Completed: (hours)

Evaluation:
What went well:

Improvements Opportunities:

Review and Sign-off
Vice President:

Date:

Safety Lead:

Date:

Comments:

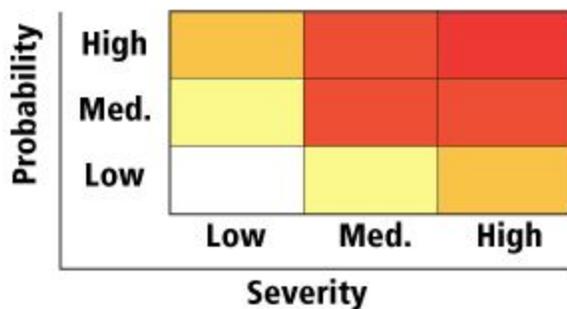
2. D. Emergency Risk Assessment

Updated: January 2, 2020

Manitoba Workplace Safety and Health Act and Regulation. Workplace Safety and Health Program. Content of Program. Act Sect 7.4(5)

It is important for the Company to perform an emergency risk assessment activity with the safety committee, beginning with identifying all of the possible emergencies that may arise.

Table 1: Risk matrix



Hazard	How is the Risk Controlled	What further action is required to control the risk	Risk Rating
Water Leaking from roof	If possible, move equipment away from water dripping. Place a bucket under the water. Phone or DM on Slack to the Maintenance Manager or VP.	Contact the Property Manager to patch the roof from further leaks.	Low probability and low severity
Fire from Laser Cutters	Members to be in the room watching laser cutting during jobs. Stop job immediately before a fire becomes serious. Use the fire extinguisher to put out the fire.	Development of Safe Work Procedures and members signing off that they read and understood.	Low Probability and medium severity
Fire in Wood room or	Policy for members not to	Development of Safe Work	Low

<p>CNC Room</p>	<p>store wood in the wood room or CNC room. Wood room champion to inspect the room on a daily or weekly bases and give it a thorough cleaning.</p> <p>Understand that a spinning tool generates friction and heat, creating the risk of fire.If you see any burning on the wood and sparks, stop the cut immediately. Sparks are sent down the dust collector hose into the dust collector bin where fires can start.</p> <p>Know how to use the fire extinguisher.</p>	<p>Procedures and members signing off that they read and understood.</p> <p>Use correct sharp bits and always double check files before cutting. Be prepared to pause or stop the cut if something seems incorrect or unsafe.</p> <p>Understand and have completed the dust collection training.</p>	<p>Probability and medium severity</p>
<p>Power failure shutting down equipment</p>	<p>Contacting the Vice President or Maintenance Manager who contacts Hydro.</p>	<p>Backup generator for lights. Notification via SLACK to all members.Back up contacts at North Forge if VP is unavailable.</p>	<p>Low probability and low severity</p>
<p>No Water</p>	<p>Contact Vice President who contacts Property Manager.</p>	<p>Back up contacts at North Forge if VP is unavailable. If necessary, purchase jugs of bottled water.</p>	<p>Low probability and low severity</p>
<p>Chemical Spill - Example: Resin from 3D Print Room or a member bringing in an unidentifiable chemical</p>	<p>Safe Handling Procedures (Training). Proper storage in the bins. See SDS for clean up and disposal. Follow WHMIS for proper temporary labeling.</p>	<p>Investigate absorbent spill kit.</p>	<p>Low Probability and medium severity</p>



3. First Aid Plan / Medical Emergency Procedures

Revised: June 9, 2020

Part 5 First Aid, Manitoba Workplace Safety and Health Act and Regulation

All North Forge Locations in Winnipeg follow this First Aid Plan / Medical Emergency Procedures.

First Aid - In the event of a minor medical incident, report the incident to a North Forge Employee and seek first aid from qualified First Aid Attendant.

In the event of a serious medical aid incident:

- Secure the scene of the incident
- If able, transport injured / ill worker to nearest hospital or;
- Call emergency 911

Fire Response Procedures:

- Raise the alarm. Let other members in the immediate area know there is a fire.
- Call 911 and arrange for them to be met at designated area.
- If fire is small enough to be handled with portable extinguishing equipment, a competent member may attempt to put out the fire with the fire extinguisher if it is safe to do so.
- If too large to extinguish safely, initiate the following evacuation procedures.

Evacuation Procedures:

- Upon hearing fire alarm, turn off equipment and any gases being used.
- Move quickly and directly to the designated Muster Point.
- North Forge employee, Vice President or Maintenance Manager: Take a headcount to ensure all known members from the Fabrication Lab are present.
- Remain at Muster Point until "All Clear" notification.

Part 5, First Aid, Manitoba Workplace Safety and Health Act and Regulation

5.5(1) Close Workplace

1 - 10 workers per shift. Other Work.

First Aiders at North Forge Fabrication Lab

Marney Stapley

Morgan Fiks

Jordynn Friesen

Jeff Stobbe

Throughout the shop there are 6 First Aid Kits and 1 in the lobby.

1-10 workers per shift, low hazard work.

First Aider at North Forge Smart Park Location

*To be confirmed

1 First Aid Kit

FIRST AID TREATMENT TRACKING

Date	Member	First Aid Treatment Administered	Follow-up Date
October 16.19	Matt Marakowitz	Burned finger, antiseptic and bandaid	



3. A. First Aid Drill

Part 5 First Aid, Manitoba Workplace Safety and Health Act and Regulation

Date:

August 29, 2019

Participants:

Injured Worker / Member: Morgan Fiks

First Aider: Marney Stapley, Management

Describe Injury:

Severe external bleeding from carving a spoon alone.

Treatment:

Did a scene survey.

Called 911.

Did a primary survey. Checked for other injuries. Checked Airways, Breathing and Circulation.

Applied direct pressure to the wound.

Made sure Morgan was lying flat on his back.

Bandaged wound and stayed with Morgan and gave ongoing care until emergency personnel arrived.

What we could have done better:

Assist to freight elevator and bring down to the main floor.

ACTION: Add the First Aid Reference Guide to the lobby kiosks.

5. Program Reporting

Revised: October 25, 2018

Introduction

To effectively manage and continuously improve our safety performance we need to continuously monitor, measure, document and assess what we are doing and how well we are doing it. While we recognize that documentation is typically one of the more tedious aspects of any job, doing it well is critical to ensuring consistency across the organization and contributing to our goal and expectation that every member of the Fabrication Lab leaves as healthy and safe as they arrived.

This section sets out the policy and responsibilities necessary to ensure that the reporting of incidents, near misses, and safety meetings provides the information required to effectively track, measure and improve our safety performances.

Policy

Ongoing tracking and reporting of near misses, incidents and events outlined in this section are to be undertaken in accordance with the reporting requirements and responsibilities set-out.

All incidents at the North Forge Fabrication Lab are required to be reported on the digital form found on northforge.ca/safety or on paper found in the front of the Safety Manual.

Also see 24. Measuring Success of the Safety Program.

Measuring the effectiveness of the North Forge Safety and Health Performance -

Leading Indicators - can be a useful tool to help us track, measure and adjust our Safety Program so we can effectively direct our health and safety performance and avoid incidents/harm. Leading indicators reflect positive opportunities for changing health and safety performance.

Leading Indicators can help provide assurance and build confidence where corrective actions are shown to be in place. Leading indicators measure the inputs that people are making to the safety management process. They measure the presence of safety as opposed to the absence of injury. They acknowledge individual efforts and, in so doing, can inspire a positive culture towards improving health and safety performance.

1. Near Miss Reports Increasing
2. Adopting a Safety Culture

3. Safety and Orientation Training

In development is a VR Safety Training Experience, with Bit Space Development. A proposal for funding has been submitted to the Workers Compensation Board, Workplace Innovation Application, Research and Workplace Innovation Program. Neal Curry, Executive Director of Made Safe has written a letter of support. The VR Safety Training Experience will provide a dashboard for tracking leading indicators and will be an asset to effective Safety Program Reporting.

Safety Meetings are held in accordance of **Part 3 of the Workplace Safety and Health Regulations and Section 40(1) - 41.3 of The Workplace Safety and Health Act**. Also refer to 9. Workplace Safety and Health Committee.

As per WSH Act Part 3.3.2, the Safety Committee will conduct an inspection prior to every meeting. Findings from the inspection will become part of the meeting minutes and discussed and corrective actions will be recommended and assigned. Follow-up of corrective actions will be reviewed at each meeting.

List of Forms

Monthly Near Miss / Incident Report

Online digital copy: northforge.ca/safety



**NORTH
FORGE**

FABRICATION LAB

SAFETY INCIDENT AND NEAR MISS REPORTING

QUESTIONS FOR INCIDENT AND NEAR MISS FORM

- Name of Member reporting: _____
- Name of member who had the near miss or incident: _____
- Date and time of near miss or incident: _____
- Location of near miss or incident: _____
- Description of near miss or incident: _____
- Description of injury (if applicable): _____
- Name of Witnesses : _____
- Injured worker signature and date: _____
- Property damage: Yes or No
If Yes, give description: _____
- Severity of incident or near miss. Check off 1 – 5 that apply.
 - 1 Near Miss
 - 2 Minor Incident – Example: First aid only injury.
 - 3 Minor Incident – Example: Injury requiring medical treatment.
 - 4 Serious Incident – Examples: electrical contact, unconscious as a result of a concussion, fractured bone(s), third degree burns, permanent or temporary loss of sight, cut or laceration requiring treatment at a hospital, asphyxiation or poisoning.
 - 5 Serious Incident that resulted in a fatality.

INVESTIGATIONS (TO BE COMPLETED BY NORTH FORGE)

Identify indirect or direct cause (check all that apply)

- Operating equipment without training
- Failure to use PPE
- Failure to follow procedures
- Housekeeping
- Using equipment improperly
- Using defective tools / equipment
- Horseplay
- Failure to secure
- Other: _____

IDENTIFY ROOT CAUSES

- Design of workspace
- Not enough electrical outlets
- Physical stress
- Improper motivation
- Lack of skill
- Inadequate orientation
- Inadequate training
- Inadequate tools
- Other (explain) _____
- _____
- _____

LIST OF ATTACHMENTS (CHECK ALL THAT APPLY)

- Photos
- Training records
- Video
- Diagrams / sketches
- Other

CORRECTIVE ACTION:

Corrective Actions

Assigned to

Date Assigned

Sign off Signature by VP

Date



6. Respectful Workplace Policy

Updated: February 17, 2020

North Forge Fabrication Lab values the health and safety of its employees and expects that its workplaces will be free of harassment and violence.

North Forge Fabrication Lab believes people have the right to be treated with respect and dignity and strives to provide a work environment free from harassment and physical violence. North Forge Fabrication Lab is committed to providing a work environment that is built on mutual respect and teamwork, providing opportunities for all employees to participate in its success. Abuse in any form erodes the mutual trust and confidence that are essential to operational effectiveness.

North Forge strictly prohibits harassment or violence against any individual at the Fabrication Lab and prohibits discrimination on the basis of religious beliefs, gender, sexual orientation, marital or family status, physical or mental disability, place of origin, age or any other protected group identified in the applicable legislation.

North Forge will not tolerate incidents of harassment and violence perpetrated against or by any member or visitor of the North Forge Fabrication Lab. Failure to comply with this policy will result in disciplinary action up to and including deactivation of a key fob and cancellation of membership.

Joelle Foster
CEO, North Forge Technology Exchange



7. Harassment Policy

Part 10, 10.1 - 10.2 Workplace Safety and Health Regulation

This policy was developed in consultation with the North Forge Safety Committee.

Company Commitment

At North Forge, we are committed to providing a safe and respectful work environment for all staff and members. No one may be harassed and no one has the right to harass anyone else, at any situation related to this organization. This policy is a step toward ensuring that North Forge is a respectful and safe place for all of us, free from harassment.

What is Harassment?

There are two main types of harassment. One type includes inappropriate conduct in any form about a person's:

- age, race
- creed, religion
- sex, sexual orientation
- marital status, family status, economic status
- political belief, association or activity
- disability, size, weight, physical appearance
- nationality, ancestry or place of origin

A second main type relates to what is sometimes referred to as "bullying" behaviour that may involve:

- repeated humiliation or intimidation that adversely affects a worker's psychological or physical well-being
- a single instance so serious that it has a lasting, harmful effect on a worker

Harassment may be written, verbal, physical, a gesture or display, or any combination of these. It may happen only once, but often happens repeatedly.

What is not Harassment?

Reasonable, actions by North Forge staff to help manage, guide or direct members or the workplace are not harassment. Appropriate employee performance reviews, counselling or discipline by a supervisor or manager is not harassment.

Employee Rights and Responsibilities

Employees are entitled to work free of harassment at North Forge.

Employees have the responsibility to treat each other with respect. We ask that any employee who experiences harassment or sees another person harassed reports it to the appropriate person at North Forge.

Employees are responsible to co-operate in the investigation of a harassment complaint. Anyone who investigates or gives evidence in a complaint investigation is asked to keep details confidential until the investigation is complete.

All employees or members have the right to file a complaint with the Manitoba Human Rights Commission.

Employer Responsibilities

Management at North Forge must ensure, as much as possible, that no employee or member is harassed at North Forge.

Management will take corrective action with anyone under their direction who harasses another person. Management will not disclose the name of a complainant or an alleged harasser or the circumstances of the complaint to anyone except where disclosure is:

- necessary to investigate the complaint
- a part of taking corrective action
- required by law

The harassment prevention policy at North Forge does not discourage or prevent anyone from exercising their legal rights. North Forge, its managers and supervisors are responsible for keeping a safe work environment, free of harassment. If you are a manager and you become aware of harassment you must do everything in your power to stop it, whether or not a complaint is made.

Courts presume that employers and managers are responsible for being aware of harassment in their organization and may penalize them accordingly. Managers who ignore harassment leave themselves and their employer open to legal consequences, and will be disciplined at North Forge.

Procedures Applying to Complaints of Harassment

If you are harassed, the first thing to do is tell the person harassing you to stop, if you feel comfortable doing that. You can do this in person or in writing. If you feel unable to deal with him or her directly, you can speak to the Vice President of North Forge (Marney Stapley).

There may be informal ways to handle your complaint. Marney may speak to the alleged harasser. Marney may also arrange for mediation, in which a neutral third party helps the people involved reach an acceptable solution. If the informal route does not succeed or is not appropriate, North Forge supports its employees or members in filing a formal complaint. The complaint will be investigated thoroughly and promptly by an independent party (either within the organization or outside of it) trained to investigate such matters. The investigator will interview the complainant, the alleged harasser and any witnesses. When the investigation is complete, the investigator will provide a written report for management.

Marney Stapley will inform the person who filed the complaint and the alleged harasser of the results of the investigation in a timely manner.

Corrective Action for Harassers

Employees or members who harass another person will be subject to corrective action by North Forge.

If the investigation does not find evidence to support the complaint, no record will be kept. When the investigation finds harassment occurred, the incident and the corrective action will be recorded in the harasser's membership or employee file.

Confidentiality

The company and its managers will not identify a complainant, an alleged harasser or any circumstances about a complaint, to anyone, except:

- when it is necessary in investigating the complaint
- if it is part of disciplinary action
- where required by law

Retaliation

Anyone who retaliates in any way against a person who has complained of harassment, given evidence in a harassment investigation or been found guilty of harassment, will be considered to have committed harassment and will be subject to corrective actions described previously.

Education

North Forge commits to making sure all of its employees and managers learn about harassment and the company's harassment policy.

Monitoring

North Forge will monitor this policy and make adjustments whenever necessary. If you have any concerns with this policy, please bring them to the attention of Marney Stapley.

Note: No record of the complaint, investigation or decision will go in the employee's or membership's account if the complaint was made in good faith. Any unfavourable work review

or comments that were placed in the complainant's personnel or membership file because of the harassment will be removed from the file.



7. A. Harassment Complaint Form

Part 10, Workplace Safety and Health Regulation

This form should be used to report formal complaints of disrespectful behaviour under North Forge's Harassment Prevention Policy. Please return the completed form to Marney Stapley, Vice President, North Forge.

COMPLAINT INFORMATION (person making the complaint)

Name:

Email:

Contact Number:

RESPONDENT INFORMATION (alleged offender)

Name:

INFORMATION REGARDING THE INCIDENT(S)

Describe the incident(s) in detail include:

1. Time and place of the incident(s)

2. Frequency

3. Were there any witnesses to the behaviour? If yes, who and when were they present?

4. Is the conduct ongoing? If no, when and why did it stop?

5. What was your reaction to the behaviour?

6. How did you feel?

7. Have you approached the respondent about the incident(s) and your concern? If so, when? And what, if any, was their response?

8. Did you do anything or talk to anyone else after the incident(s)? Provide details.

Any Additional Information:

I understand that my complaint, as described, will be investigated and that a copy of this form and any attachments will be given to the respondent.

Signature:

Date:



8. Roles and Responsibilities

The Workplace Safety And Health Act. Duties of Employers. Duties of Workers.

Introduction

To achieve and sustain our goal to be a true Safety Leader within the Fabrication Lab and Manufacturing Industry, North Forge requires the participation and commitment of all members.

All employees and North Forge staff share responsibility for fostering and promoting a safe and healthy environment for themselves, their fellow members, contractors, visitors, and the general public.

The following is a brief summary of duties and responsibilities organized by position to clarify the expectations for individuals to work safely and to support a safe work environment and culture at North Forge.

The summaries are not exhaustive and every North Forge Fabrication Lab member - at the lab or in an office (coworking space) - is expected to reflect the North Forge company value that safety is a moral obligation that we each share and zero injuries or illnesses are what we continue to strive for.

To fully understand the scope of responsibilities of any position, this manual should be reviewed in its entirety. Questions regarding the responsibilities of a position contained herein should be raised with the North Forge Fabrication Lab Director or the Safety Lead.

Responsibilities

Members

Keeping Fabrication Lab tidy is a requirement in maintaining a quality workspace. Work areas, as well as food and lobby area, are expected to be kept clean and presentable. Our 'rule of thumb' is for members to clean an additional few meters of space around them when finishing. This means cleaning up after themselves in the coworking desk area, in the Fabrication Lab as well as the lobby area. Food stored in the fridge should be labeled with member's name and date.

The Fabrication Lab and co-working spaces are public places of business and should be treated as such. Therefore, members and guests should be treated by members with respect and refrain from activities that disturb others in any way.

We expect our members to make efforts to recognize the needs of others, and a balance should always be sought to recognize the needs of one, while not hindering the needs of another.

Members must also:

- Report on the Broken Channel of Slack if any equipment appears not to be in proper working order.
- Make reasonable effort to volunteer within the Fabrication Lab when extra help is needed. Volunteering is especially important when a fabrication lab special project is underway.
- Report any Safety related incidents to the Safety Lead or to the Safety Channel on Slack.

Visitors

All visitors to the Fabrication Lab must:

- Be accompanied by an active member;
- Not use the equipment.
- Sign a Visitor Waiver
- Sign in to the tour check-in form on <https://www.northforge.ca/tours/> If a visitor is not participating in a tour (or build day) and is assisting a member with a project, no tour check-in form is required;
- Abide by our PPE policy by wearing Safety Foot Protection and Eye Protection.

CEO

The CEO will provide overall leadership and support. Their responsibilities are:

- To ensure North Forge Fabrication Lab program is viable and consistent with the Corporate Safety Policy Statement.
- To take all reasonable measures to ensure that North Forge Fabrication Lab complies with all pertinent legislative requirements and standards.
- To lead by example, promote safety and demonstrate the appropriate safety behaviours at all times.

Vice President

The Vice President will:

- Provide the necessary resources to accomplish the objectives of the Safety program;
- Ensure this program is followed, incenting positive safety behaviours and actions and, as per policy;
- Discipline any members wilfully disregarding or contravening it;
- Administer and monitor the program;
- Review any safety related issues;

- Ensure the appropriate participation of safety members in the planning and startup of new projects;
- Review and / or sign the following documents: Initial Hazard Assessment, Incident Reports, Safety Committee Meeting Minutes, and Inspection Reports.
- Maintain incident statistics and records;
- Monitor accident / incident frequencies and safety contraventions for trends;
- Use the trends to eliminate hazards or improve controls;
- Be “on call” for any safety-related emergencies or issues;
- Represent North Forge Fabrication Lab, as required, on safety issues, performance, best practices, or legislative requirements with government officers, safety or industry organizations, and other external parties;

Safety Lead

- Participates in the Safety Sub Committee to ensure the Fabrication Lab is following safe practices and procedures.
- Works with the Security and Training Leads to ensure the shop is safe for all members.
- Continuously monitors all aspects of the North Forge Fabrication Lab Safety Program to ensure legislative and regulatory compliance;
- Reviews the North Forge Fabrication Lab Safety Program to find opportunities for improvement;
- Issues Safety messages on Slack to members, arranges any special Safety Committee meetings, and undertakes safety initiatives as required to support the safety program;
- Assists in the planning and start-up of new projects with respect to potential safety issues;
- Inspects all Fabrication Lab work areas monthly and initiate remedial action where required;
- Monitors changes in safety regulations, review with the Director and disseminate appropriate information to all Fabrication Lab members;
- Has available at the Fabrication Lab the most current version of this Safety Manual.
- Participates and leads the North Forge Fabrication Lab Safety Committee, sharing best practices and continuously improving the Safety Program.

8. A. MEMBER COUNCIL LEADS

Revised: June 9, 2020

Member Council Lead Attributes

- Demonstrated expertise in the required areas.
- Positive attitude.
- Sufficient time availability and commitment to perform required tasks.
- Demonstrated self-starting, trustworthy.
- Passion for North Forge Fabrication Lab and its members.

Roles and Responsibilities for all Member Council Leads

- Attend weekly meetings. Unexpected events happen or during planned vacation, an update is expected via Member Council Slack Channel for the time that you are away from meetings. If three consecutive meetings or more are missed with no explanation or updates, you may be removed from Member Council.
- Provide an update electronically or in person for every member meeting. Strive to update on what you accomplished last week, what you plan on doing next week and is anything in your way preventing you to meet your goals.
- You are empowered to make your lead area as efficient and successful as you want.
- Any requirements for financial support need approval by the Director, North Forge Fabrication Lab.
- Responsible for ensuring any lead tasks are completed by someone or a team of people that the lead coordinates.
- Recruit other members to help you in your lead area and encourage them to submit volunteer hours.
- Bring forward solutions and recommendations to issues.

The benefits to Member Council Leads

- The opportunity to volunteer, give back to the Start-Up Community, help other entrepreneurs, network with other like-minded people, build your resume with experiences.
- 100% discount on your membership with North Forge.

Member Council Leads

Tours Lead:

- Respond to tour requests
- Schedule of tours and conducts tours

Green Team Lead:

- Special events recycling requirements
- Gathering recycling to centralized container, and remove from premises
- Manage and or implement organization of recycling materials. .

Safety Lead:

- Conducts the Orientation and Safety sessions for new members
- Ensure the orientation and safety walk-throughs are up to date
- Works with the Security and Training Leads to ensure the shop is safe for all members.
- Continuously monitors all aspects of the North Forge Fabrication Lab Safety Program to ensure legislative and regulatory compliance;
- Review the North Forge Fabrication Lab Safety Program to find opportunities for improvement;
- Issue Safety messages on Slack to members, arrange any special Safety Committee meetings, and undertake safety initiatives as required to support the safety program;
- Assist in the planning and start-up of new projects with respect to potential safety issues;
- Inspect all Fabrication Lab work areas monthly and initiate remedial action where required;
- Monitor changes in safety regulations, review with the Vice President and disseminate appropriate information to all Fabrication Lab members;
- Have available at the Fabrication Lab the most current version of this Safety Manual.

Clean Work Table Lead:

- Managing the Clean Work Table Policy
- Participate and lead the North Forge Fabrication Lab Safety Committee, sharing best practices and continuously improving the Safety Program.

IT Lead:

- Basic setup for VPN and training access, which is currently shared between the North Forge Office Manager and Executive Assistant and the IT Lead.
- Internal shop network and infrastructure which should be shared between the Maintenance Manager and IT role
 - Maintain the shop computers and switches
 - Make recommendations of cost effective enhancements
 - Work towards a reliable system that meets the needs of the members
- Training Server role to maintain the server and ensure proper operations.

Consumable Lead:

- Tracking and invoicing consumables and other sales to members
- Purchasing and keeping consumables in stock.
- Work with room coordinators to keep consumables ordered and filled

- Determine consumables for supplied or to be sold.
- Labels lockers and monitors locker status
- Check consumable channel on Slack and take action as needed.

Training Lead:

- Train the trainer sessions for the instructors. The sessions would be designed to provide cost-effective methods that help instructors engage participants in the training experience. I.e. instructional techniques, brief lesson plans, and handouts.
- Evaluation of instructor performance;
- Ensures all member demand for training is being addressed
- Check Training channel on Slack and take action as needed.

Volunteer Lead:

- Gather incoming volunteer tasks from all members
- Communicate tasks to members that need filling
- Update volunteer task list posted in Fabrication Lab.
- Collect volunteer accumulated hours and submit them for credit (Google Drive Sheet)
- Check Volunteer channel on Slack and take action as needed.
- Manage fl-volunteer@northforge.ca

Refuse Manager:

- Ensures that the Fabrication Lab, Co-Working Space, Kitchen and Boardroom is clean and excessive garbage is disposed of.
- Organizes Metal Scrap pick-ups.
- Cleans out the fridge and freezer on an as needed basis.

Security Lead:

- Reviews Security Channel on Slack consistently
- Reviews video footage when needed
- Reports back to Member Council with any security video or images.
- Takes the lead with respect to any Security issues or changes at the Fabrication Lab.

NORTH FORGE FABRICATION LAB

Safety Committee: The Safety Committee is to help implement the right to participate.

The Safety Committee meetings are held once every three months to discuss safety and health concerns. Minutes are taken at each meeting, posted in the bulletin board and sent to the Workplace Safety and Health Division.

The committee carries our responsibilities set in legislation, including:

- Reporting near misses.
- Helping to identify, assess and control hazards.
- Develop and monitor policies, plan, procedures, and programs.
- Talking with members about safety and health concerns and helping to resolve them.
- Regularly inspecting the Fabrication Lab.
- Investigating accidents and dangerous occurrences (near misses).
- Promoting safety and health instruction.
- Meets to discuss concerns and making recommendations for corrective actions.

North Forge Board Representative: Kerry Stevenson

- Reports on North Forge Board activities
- Brings North Forge Fabrication Lab issues forward to the Board
- Runs the North Forge Fabrication Sub Committee to the Board.

North Forge Employees -

Manufacturer Mentor: Matt Olson

Contract position.

- Is accessible to assist North Forge Fabrication Lab members at the Fabrication Lab by providing manufacturing mentoring and offering resources and information to assist them with prototyping. This mentoring may involve other individuals or businesses that are potential members of the Fabrication Lab or other individuals or businesses that contact North Forge for manufacturing and prototyping assistance.
- Assist the Maintenance Manager as needed.

Maintenance: Jeff Stobbe

- Detailed maintenance of Fabrication Lab fixed assets. (Tools /Equipment)
- Keep comprehensive equipment records
- Ensure proper and safe use of tools and equipment
- Implement a maintenance schedule of equipment
- Compile list of vendors
- Watch broken channel and Slack and take action as needed.
- Ensure facility is clean and safe
- Plumbing
- Electrical room
- Heating/air conditioning
- Equipment Room (Air Compressor, vacuum motor and vacuum pump)
- Manage the room for organization and cleanliness
- Works to keep all of the equipment at the North Forge Fabrication is good working order.
- Ensures tools at the Fabrication Lab are in good working order.
- Reports any required equipment or maintenance required to be purchased to the Vice President.

Vice President, North Forge Technology Exchange

Related to the North Forge Fabrication Lab:

- Responsible for strategic planning for the North Forge Fabrication Lab.

- The primary point of contact for all inquiries for the Fabrication Lab including: memberships, services, rapid prototyping requests, etc. via web form, emails and drop in.
- The primary point of contact for building related matters at 125 Adelaide Street.
- Maintain and order all material, equipment and office supplies required for the Fabrication Lab including kitchen, co-working space and boardroom.
- Approves all financial requests at the Fabrication Lab and manages a budget for the Fabrication Lab for equipment supplies and maintenance.
- Perform Fabrication Lab related operational duties such as ensuring the Fabrication Lab is reasonably organized and presentable, managing the mailbox, managing storage shelves, etc. Assist with and adhere to the operational processes and procedures
- Serves as a champion and the representative for the Fabrication Lab by promoting the opportunities available through various ways in the community. Examples: at events, during tours, etc.
- Develop, execute and manage a plan to increase the number of paying members at the Fabrication Lab, retain members and reduce churn – all contributing to increased revenue.
- Promote the Fabrication Lab in the community.
- Develop, execute and manage a plan to build a community of support focussing on increasing the number of new start-up businesses in Manitoba using the Fabrication Lab. This includes evolving the Fabrication Lab to have the increased capability to create ready-to-manufacture prototypes.
- Identify sponsorship opportunities and implement at the Fabrication Lab.
- An active member of the North Forge Board of Directors sub-committee for the Fabrication Lab and provides monthly reporting to the chair of the sub-committee.
- Accountable for the North Forge Safety Program for all North Forge locations within Winnipeg.
 - Provide the necessary resources to accomplish the objectives of the Safety program;
 - Ensure this program is followed, incenting positive safety behaviours and actions and, as per policy;
 - Discipline any members wilfully disregarding or contravening it;
 - Administer and monitor the program;
 - Review any safety related issues;

- Ensure the appropriate participation of safety members in the planning and startup of new projects;
 - Review and / or sign the following documents: Initial Hazard Assessment, Incident Reports, Safety Committee Meeting Minutes, and Inspection Reports.
 - Maintain incident statistics and records;
 - Monitor accident / incident frequencies and safety contraventions for trends;
 - Use the trends to eliminate hazards or improve controls;
 - Be “on call” for any safety-related emergencies or issues;
 - Represent North Forge Fabrication Lab, as required, on safety issues, performance, best practices, or legislative requirements with government officers, safety or industry organizations, and other external parties;
-
- Build and maintain relationships / partnerships with education and industry leaders or influencers as it related to digital manufacturing, rapid prototyping and short-run manufacturing.

 - Establishes and maintains relationships with other Fabrication Labs / Makerspaces throughout North America. Become a member of the International Fab Lab Association.



9. Workplace Safety and Health Committee

Revised June 3, 2020

Part 3 of the Workplace Safety and Health Regulations and Section 40(1) - 41.3 of The Workplace Safety and Health Act

Introduction

Safety meetings are an important forum of discussion where issues can be reviewed and discussed and solutions identified. Ensuring an open and “safe” environment where all members feel confident that they are able to share their safety concerns with the Safety Committee without fear of criticism - and that their concerns will be appropriately addressed - is critical to the environment of a true safety culture. The onsite Vice President and Maintenance Manager are charged with ensuring that such an environment is created and supported.

The following policy is following Part 3 Workplace Safety and Health Committees and Representatives, Manitoba Workplace Safety and Health Act and Regulation.

Safety Committee Meetings Policy and Rules

North Forge Fabrication Lab Safety Committee Meetings will take place at least once every three months.

The meeting schedule will be communicated to all members. Generally the Safety Committee meets on the third Thursday every three months. At 4:30 pm - 6:00 pm. The meetings take place in the North Forge Fabrication Lab boardroom located on the 3rd Floor, 125 Adelaide Street. With advance notice, any members of the North Forge Fabrication Lab are welcome to attend and bring forward any topics for discussion. One week notice is required for any date and time of Safety Committee Meetings. Every meeting must have a quorum. At least half present must be members and at least half present must be employers.

As per WSH Act Part 3.3.2, the Safety Committee will conduct an inspection prior to every meeting. Findings from the inspection will become part of the meeting minutes and discussed and corrective actions will be recommended and assigned. Follow-up of corrective actions will be reviewed at each meeting.

Safety Committee Member Roles:

Marney Stapley, Kerry Stevenson, Lawrence Rosdobutko, John Hache (part-time), and Amy Khran.

The Safety Committee is to help implement the right to participate.

Lawrence Rosdobutko is a co-chair along with Marney Stapley.

Minutes are taken at each meeting, signed by both co-chairpersons, posted in the bulletin board and sent to the Workplace Safety and Health Division.

The committee carries out responsibilities set in legislation, including:

- Reporting near misses.
- Helping to identify, assess and control hazards.
- Develop and monitor policies, plan, procedures, and programs.
- Talking with members about safety and health concerns and helping to resolve them.
- Regularly inspecting the Fabrication Lab.
- Investigating accidents and dangerous occurrences (near misses).
- Promoting safety and health instruction.
- Meets to discuss concerns and making recommendations for corrective actions.

The Responsibilities of Employers -

- Providing a safe and healthy workplace
- Providing required safety procedures, programs, and services
- Providing safe tools, equipment and machinery
- Ensuring that equipment, materials, and protective devices are provided, used, and maintained as required.
- Establishing a Committee where required, and consulting and cooperating with it.
- Providing appropriate information and training for members and committee members.
- Knowing and complying with the legislation.

The Responsibilities of Members -

- Using the orientation, information, and training provided by the employer
- Following safe work practices and rules set by the employer
- Correctly using appropriate personal protective equipment provided by the employer
- Inspecting their tools, equipment, and machinery and reporting hazards
- Supporting the Committee and reporting concerns to it
- Knowing and complying with the legislation

10. Inspection and Auditing

Revised: April 2, 2019

Workplace Safety and Health Regulation, Part 2, Inspections of workplace 2.4(1)

Introduction

There are two ways safety programs are typically assessed for strengths and deficiencies in their design and executions: Proactively and Reactively.

Proactive assessment occurs in the form of inspections and audits and is intended to identify potential issues or hazards before an incident occurs. Accordingly, they are considered a good leading indicator of a robust health and safety program if conducted regularly and frequently - as well as on an ad hoc basis - and with appropriate discipline and rigour. These assessments may be undertaken by appropriately qualified internal as well as external parties.

Reactive assessment occurs in the form of incident investigations and is intended primarily to deconstruct the events, circumstances, conditions and decisions that led to an injury, property or environment damage, or a medium or high potential near miss.

While the identification of deficiencies and opportunities for improvement are similarly derived from both inspections and investigations, the trigger for an investigation being the occurrence of an incident - and the possible harm that resulted - makes it a lagging indicator of safety performance and therefore a less desirable vehicle for continuous program improvement.

In all cases, however, it is essential that follow-up and **monitoring** is undertaken to ensure effective implementation of corrective actions and to observe ongoing adherence.

Safety Inspection and Monitoring Policy

North Forge Fabrication Lab will maintain a Safety Program involving both formal and informal inspections and will monitor the corrective actions implemented to address the identified deficiencies.

Informal Safety inspections are to be performed on a continuous basis in the course of their duties by the Vice President and Safety Lead.

In all cases, deficiencies are to be identified, responsibility assigned, and a timeline for remediation established.

Deficiencies observed during formal and informal safety inspections are to be reviewed and considered for discussion at the next safety meeting.

Safety Inspections

Formal Safety Inspections

Formal inspections may be conducted individually; however, the recommended approach is a small inspection team with a maximum of three people. It is also recommended that the inspection team be comprised of at least one member (chosen on a rotational basis). The inspection team will tour the entire fabrication lab.

Following the inspection a form must be completed. All deficiencies found are to be described and an individual assigned responsibility for corrective action. The corrective action must be carried out by the due date identified and sign-off ensured.

Completed online safety inspection forms are to be signed by the Director and Safety Lead, filed digitally, on the Fabrication Lab drop box, and retained for audit purposes.

Informal Safety Inspections

Informal Safety Inspections are to be performed on a continuous basis by the Vice President and Safety Lead during the course of their onsite responsibilities.

Informal inspections are a way of demonstrating leadership by example, maintaining constant awareness and vigilance to ensure safety conditions and behaviors are being maintained at all times, and are promptly addressed if they are not.

Safety Program Audit

North Forge Fabrication Lab will maintain a safety program regimen comprised of both regularly scheduled audits of program elements and practice, as well as a continuous improvement review against program performance targets and industry standards.

Audits

North Forge Fabrication Lab will maintain a program audit regimen comprised of:

- An annual compliance assessment against Made Safe standard requirements;
- Regular scheduled internal audits of the Fabrication Lab compliance to the North Forge Safety Program.
- Annual internal audits must be submitted to Made Safe for review;
- Complete a recertification audit every three years with Made Safe.

It is the responsibility of the Vice President to ensure that annual Internal audits and recertification Made Safe audits (every three years) are coordinated and scheduled.

It is the responsibility of the Vice President to ensure that internal North Forge Safety Program Audits are conducted in accordance with the frequency schedule identified below and / or in the event of a serious injury or fatality at the North Forge Fabrication Lab.

Continuous Improvement

The Vice President and the North Forge Fabrication Lab Safety Committee will continuously review the North Forge Fabrication Lab Safety Manual and key Fabrication Lab Program components such as training to ensure ongoing improvement and relevancy with current technologies and best practices.

It is the responsibility of the Safety Committee to report any improvement initiatives to the Vice President.

Certificate of Recognition (Made Safe) Audits

Annual audits are to be conducted following the process required for North Forge to maintain its Certificate of Recognition standing.

The Vice President of the Fabrication Lab is responsible:

- Maintaining Made Safe audit records, including a list of members trained to deliver the Safety Program, audit and training records, audit scheduled and protocols, and audit reports.
- Scheduling and completing a recertification audit with Made Safe every three years.
- Scheduling and completing annual internal audits and submit to Made Safe for review.
- Ensuring that the audit, audit report and any feedback to the Fabrication Lab area or functions covered by the audit is completed per the audit schedule;

The Vice President, in conjunction with the Safety Lead are responsible for ensuring that Audit Action Items are prepared for audit findings, as appropriate.

Procedures

1. Audit Team Selection - one or more auditors comprise an audit team. When the team consists of more than one auditor, a Lead Auditor will be designated. The Lead Auditor is responsible for audit team orientation, coordinating the audit process, and coordinating the preparation of the audit report.
2. Audit Team Orientation - The Lead Auditor will ensure that the team is adequately prepared to initiate the audit. Pertinent policies, procedures, standards, regulatory requirements and prior audit reports are made available for review by the audit team. Each auditor will have appropriate audit training from Made Safe.
3. Written Audit Plan - The Lead Auditor is responsible for ensuring the preparation of a written plan for the audit.

4. Prior Notification - Notification of the Fabrication Lab to be audited to occur a reasonable time prior to the audit.
5. Conducting the Audit -
 - a. A pre-audit meeting is held by the Safety Committee to review the scope, plan and schedule for the audit.
 - b. Auditors are at liberty to modify the audit scope and plan if conditions warrant.
 - c. Objective evidence is examined to verify conformance to Health, Safety and Environmental Program requirements, including site procedures. All audit findings must be documented.
 - d. Specific attention is given to corrective actions for audit findings from previous audits.
 - e. A post-audit meeting is held to present audit findings, clarify areas of ambiguity or confusions, and summarize the audit results.
6. Reporting Audit Results -
 - a. The Team Leader prepares the audit report, which summarizes the audit scope, identifies the audit team, describes sources of evidence used, and summarizes the audit results.
 - b. Findings requiring corrective action are entered into a corrective action database / tracking system.
7. Audit Report Distribution -
 - a. The Director is responsible for communicating the audit results to the Fabrication Lab Sub Committee to the Board and will make copies of the audit report available.
8. Audit Follow-up
 - a. The Director is responsible for any follow-up actions / remediation required as a result of the audit.
 - b. The Director and / or Safety Lead are responsible for tracking the completion and effectiveness of remedial actions.
9. Record Keeping
 - a. Audit reports are retained for at least two years from the date of audit completion. The Director is responsible for maintaining such records.

North Forge Fabrication Lab Safety Program Audit

Regular audits help to ensure the proper implementation and maintenance of the North Forge Fabrication Lab Safety Program by verifying that prescribed activities conform to legislative requirements and any company safety standards that may exceed those requirements.

The North Forge Fabrication Lab Audit tool is to be utilized to conduct and score audits. Fabrication Lab performance will be tracked by the Vice President and / or the Safety Lead and the results forwarded to the Safety Committee.

List of Forms

Safety Inspection Form

Safety Review Audit



10. A. Safety Inspection

Workplace Safety and Health Regulation. Part 2. 2.4

Date:

Boardroom	
Boardroom clean and free of hazards	
Lobby and Kitchen	
Adequate access or exit for emergencies	
Lobby and kitchen clean and free of hazardous materials	
Waste receptacle provided and emptied regularly	
Coworking space	
General cleanliness and free of clutter	
First Aid and Medical	
First Aid kit and supplies maintained	
Bulletin Board - Minimum Posting	
Fabrication Lab Safety Policy (signed and dated)	

Emergency phone numbers posted above phone	
Fire and emergency evacuation procedures	
Misc Fabrication Lab memos, safety bulletins and safety reminder posters / signs	
Personal Protective Equipment	
Safety Glasses and Safety footwear available	
Proper respiratory protection where needed	
Hearing protection where needed	
Gloves where needed	
Room General Cleanliness and free of hazards	
- Tool Room	
- Paint Room	
- Craft Room	
- CNC Wood	
- Wood Room	
- Metal Room	
- Laser Room	
- IoT Lab	
- Heavy Metal Area	

- 3DP Room	
Garbage containers emptied	
Passageways, stairs, walkways and fire ways kept clear	
Projecting nails, wire, bolts, etc. removed	
Drinking containers and cup dispensers provided	
Tools	
Damaged or defective tools taken out of service.	
Tools and cords in good condition	
Compressed Air	
All compressed air equipment used safely	
Fire Protection and Prevention	
No smoking posted and enforced where prohibited	
Extinguishers supplied	
Fire extinguishers regularly inspected	
Electrical	
Worn, frayed or spliced cords and cables removed from service	
Extension cords protected and in orderly manner	
Welding and Cutting Rooms	

Screens, shields or eye protection provided and used to protect members from welding operations	
Cylinders secured, and capped when not in use	



11. Investigating Incidents

Revised: February 05.19

2.6 - 2.9(3) Serious Incidents at Workplace, Manitoba Regulations, Workplace Safety and Health Regulation.

Investigation Policy

It is the policy of North Forge Fabrication Lab to investigate all injury and incidents. Near misses with high risk potential are also to be formally investigated.

Reporting incidents that don't result in injury assists in monitoring trends and work to make improvements to working conditions in the shop and our safety program.

Definition

- Incident - an event that results in injury, illness, damage or loss, whereby the fabrication lab was a significant contributing factor.
- Near Miss - an incident that did not result in any injury, damage or loss, but had the potential to do so. Reporting and responding to these can prevent more serious Safety and Health incidents from occurring.

Members are to report all incidents and near misses so that greater understanding can be gained through the investigation process and corrective actions initiated. Incidents and near misses should be viewed as opportunities to make as opportunities to make improvements to North Forge's overall safety program and to address deficiencies on-site.

Investigations are conducted with the goal of solving problems and reducing the likelihood of recurrence and are not designed to affix blame.

Incidents not reported are contrary to the personal accountability and commitment expected of all members of the Fabrication Lab.

Investigation Procedure

Investigations are to be conducted by the Vice President. If an incident is of a serious or complicated nature, an investigation team should be used. When possible, teams should include both the member(s), the Vice President and a member(s) of the Safety Committee.

Action Following an Incident

The following steps will be taken following an incident:

- Assess the incident scene. Call and assist emergency services if necessary. Control any remaining hazards.
- Report the incident to the Safety Lead. The safety lead is responsible to report the incident to the Vice President.
- The Vice President, with the Safety Lead, is to determine the potential severity of the incident. The severity will dictate the level of response.
- Assess if the incident requires a comprehensive investigation, the area is to be sectioned off with red tape, and posted as a secured scene.
- The investigation is to be initiated as soon as possible following the incident.

Incident Investigation Process

If medical attention is required, have the member receive appropriate treatment immediately. If there is reason to believe alcohol or other substance use may have been a contributing factor in the incident, refer to the Substance Abuse Policy in this manual and ensure that the appropriate testing is undertaken as soon as possible.

The Vice President is responsible to complete the incident investigation. The following paperwork is to be filled out for all incidents:

North Forge Fabrication Lab Investigation Report - This report will be filled out in all cases.
Witness Statement Form

Investigation Sign Off and Review

Low Risk Incidents

Incidents ranked as low risk in severity and have probability of recurrence deemed as minor will be forwarded to the Vice President who will review and forward a copy of the report to the member.

Medium and High Risk Incidents

Medium and high risk incidents, and near misses with high potential, will be completed then signed-off by the Vice President. The Vice President will review the report and keep an original copy on site, preferably a digital copy in the drop box.

The Vice President will also ensure that remedial actions identified in the report are appropriately assigned and completed.

List of Forms

Incident Investigation Form

Near Miss / Incident Report:

<https://www.northforge.ca/safety/>

11. B. Safety Review Audit				
Auditors: Marney Stapley, Morgan Fiks, Jeff Stobbe and Lawrence R				
Date and Time of Audit: September 2022				
Total Audit Score:				
(YES / # Applicable)				
1. Documentation				
	Yes	No	N/A	
1.1	Is the Current North Forge Safety Manual available and accessible at all locations in Winnipeg?			
1.2	Has Emergency Response Plan been created? And for all locations in Winnipeg?			
1.4	Are Orientations being completed?			
1.5	Are Hazard Assessments being completed?			
1.6	Are Hazard Assessments being updated as conditional change?			
1.7	Are Commitment to Safety forms signed?			
1.8	Are training records available?			
1.9	Are members trained in the use of Fire Extinguishers?			
1.10	Are weekly safety inspections up to date?			
1.11	Are accidents / incidents investigated?			
1.12	Is a visitor log being maintained?			
1.13	Is a safety record log being completed?			
1.14	Are monthly reports submitted during the first week of every month?			
1.15	Is the North Forge Fabrication Lab Disciplinary process being followed?			
1.16	Has Emergency Response Plan been tested?			
	Documentation Score			
2. Observation				
	Yes	No	N/A	
2.1	Is the required First Aid Safety Station in place? And in all locations in Winnipeg?			
2.2	Is required signage in place?			
2.3	Are Fire extinguishers available?			
2.4	Are Fire extinguishers inspected?			
2.5	Are damaged tools removed from site?			
2.6	Is PPE available?			
2.7	Is PPE being used as required?			
2.8	Have controls been implemented as per Hazard Assessments?			
2.9	Are evacuation stations in place?			
2.10	Have Muster Meeting Areas been identified?			
2.11	Are Muster signs posted? In all locations in Winnipeg?			
2.12	Is the current Safety Policy posted?			
2.19	Are Emergency Contacts Posted?			
2.20	Are the Hospital Directions Posted? In all Winnipeg locations?			

	Critical Items Requiring Correction	Personal Assigned to Corrective Action	Due Date	Date Complete	Initials
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
	Sign Off				
	I certify that the Critical Items listed above have been corrected.				
	North Forge Vice President				
	Safety Lead				



12. Supervision of Members

Updated: March 14, 2019

Manitoba Workplace Safety and Health Act and Regulation. Duties of Employers.

Introduction

North Forge Fabrication Lab takes seriously its responsibility to ensure that members are working safely.

We believe strongly in encouraging and supporting positive safety behaviours and practises through: effective orientation and training; providing the necessary safety equipment, resources and supplies; and providing the appropriate supervision to ensure members are applying their knowledge and skills effectively and in accordance with North Forge policies, procedures, and regulatory requirements.

To assist in this process, North Forge has developed general Job Site Rules (provided below) to be followed at the Fabrication Lab as well as a separate Manual of Safe Work Practises and Procedures for specific equipment.

Despite these efforts, in those instances and for those members who nonetheless fail to comply with provincial regulations and the requirements of North Forge Fabrication Lab Safety Program, North Forge will strictly enforce a progressive disciplinary program that can include immediate removal from the Fabrication Lab, deactivation of key fob and cancellation of membership.

Member Supervision Policy

North Forge Fabrication Lab Members are not supervised (similar to a work site), however we do offer some similar regular inspections and monitoring, as follows:

- Offering training on equipment requiring skills not presently possessed by a member.
- Instructing members on Safe Work Practices and Safe Work Procedures developed for the Fabrication Lab.
- Ensuring members supply or are provided with appropriate personal protective equipment and are trained in its proper use.
- Periodically observing members, work practices and shop operations and correcting deficiencies as necessary.

- Ensuring appropriate training and certification of all members that will be operating any North Forge Fabrication Lab equipment as per “manufacturer’s” recommendations for that equipment.
- Strictly enforcing the North Forge disciplinary process for members that wilfully or repeatedly violate safety rules and regulations.

Off-Hours Supervision

Due to the fact that the North Forge Fabrication Lab is open 24 / 7 / 365, on-site supervision is not always possible. Members working on projects, late at night / early morning in the Fabrication Lab should strive to:

- Work on low risk equipment;
- Bring another individual with you to assist;
- Be familiar with the on-site emergency response plan.

Discipline

Members that wilfully or repeatedly violate safety rules, regulations or policies shall be subject to discipline. The following sanctions of increasingly severity may be applied at the discretion of anyone on the Safety Committee. Sanctions which involve discipline outside the guidelines below shall be applied only with the approval of the Vice President.

Step One - Verbal warning (logged)

Step Two - Written notification

Step Three - A 3 day suspension (deactivated key fob) with a review panel interview prior to activation of key fob. The panel will be comprised of the Safety Committee. Determination of reinstatement or any additional discipline up to and including cancellation of membership will result from the interview.

Exceptions to the 3-step process above may be applied and enforced in instances where the safety violation or transgression is in relation to one of the North Forge Safety Absolutes noted below or in other exceptional circumstances where blatant disregard for safety knowingly puts the member or other members at risk.

Cleaning Fee Scale and Suspension

1st Offense: Members not cleaning up after themselves will be invoiced a fine of \$50. If they choose, an alternative option will be 5 hours of volunteer cleaning throughout a month.

2nd Offense: Members not cleaning up after themselves will be invoiced a fine of \$75. If they choose, an alternative option will be 7.5 hours of volunteer cleaning throughout a month.

3rd Offense: Members not cleaning up after themselves will be invoiced a fine of \$100. If they choose, an alternative option will be 10 hours of volunteer cleaning throughout a month.

4th Offense: Members not cleaning up after themselves will be invoiced a fine of \$125. If they choose, an alternative option will be 12.5 hours of volunteer cleaning throughout a month.

5th Offense: Members not cleaning up after themselves will be suspended from entering the Fabrication Lab for one month.

To help keep the Fab Lab a safe and enjoyable atmosphere for everyone, a simple rule of thumb is to clean up after yourself and a little bit more.

General Job Rules

The following are the safety rules and regulations of North Forge Fabrication Lab. It is expected that all employees will understand and abide by these rules and regulations.

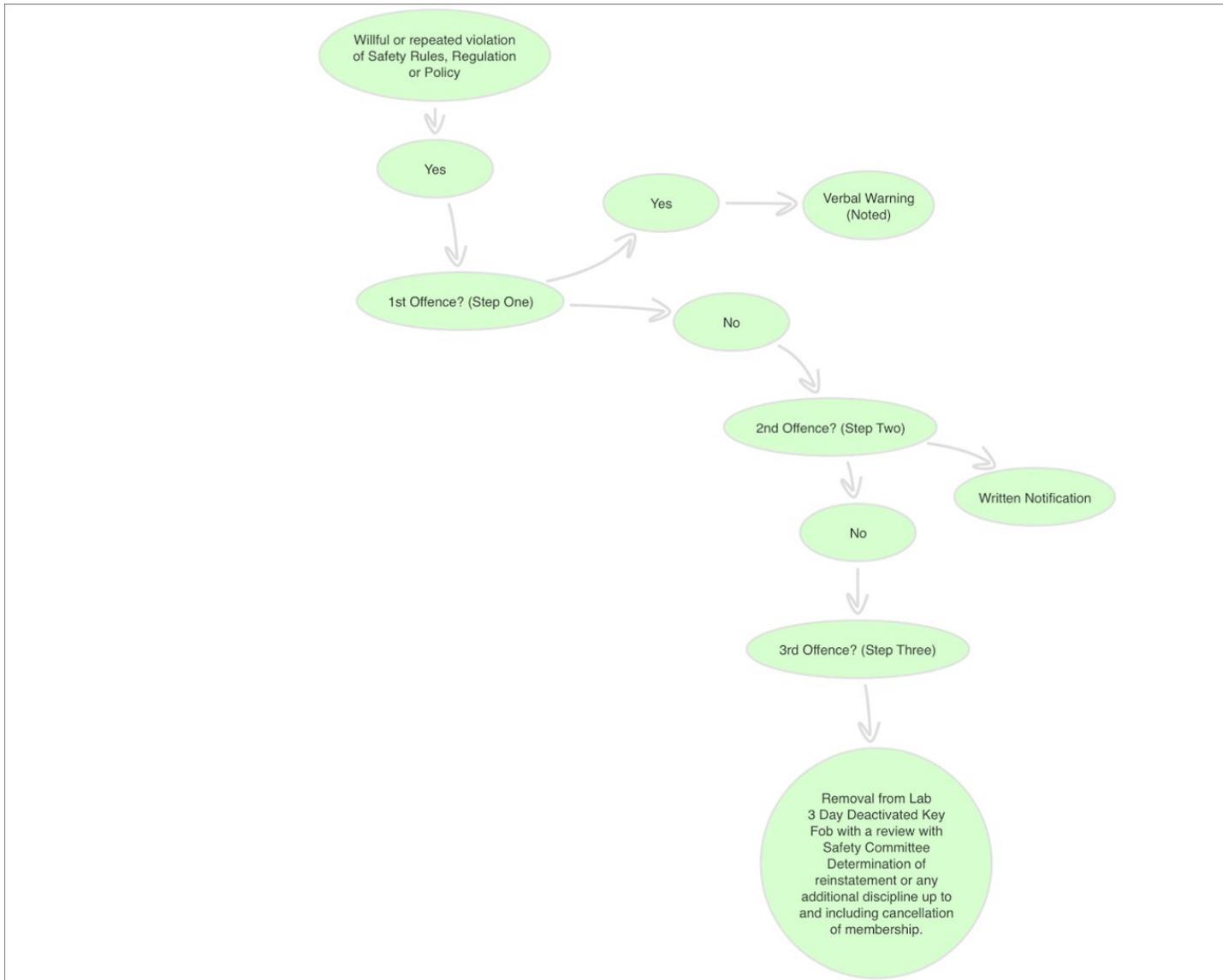
- Accidents, injuries, unsafe conditions and “near misses”, regardless of their nature, are encouraged to be reported on the sheets by the Safety Manual or through the online form: northforge.ca/safety
- CSA approved footwear and safety glasses must be worn at all times.
- Appropriate protective gloves shall be worn by all North Forge Fabrication Lab members when performing work where gloves provide specific hazard protection. Example: wearing the blue nitrile gloves when handling the Form 2 resin post-processing.
- Clothing must also be appropriate for duties being performed. Example: Long jewelry should not be worn around moving machinery or other sources of entanglement.
- No tool shall be used for any purpose other than that intended. All damaged or worn parts shall be promptly repaired or replaced.
- Smoking (including e-cigarettes) is not permitted in the Fabrication Lab.
- Running is not permitted anywhere, except in the case of extreme emergency.
- Possession or use at the Fabrication Lab of intoxicating beverages or unauthorized drugs - or to be under their influence - is strictly forbidden.
- Horseplay, fighting, vandalism, improper activity or behaviour, and possession of firearms are strictly forbidden on the job.
- Housekeeping must be maintained at all times.
- Workers must adhere to appropriate Safe Work Practices and Procedures for the work being performed.

Working Alone Policy

Workplace Safety and Health Regulation.Part 9.

North Forge Fabrication Lab is committed and responsible to provide as safe a work environment as is reasonably possible for any members who are working alone. It is our recommendation that all members working in the Fabrication Lab, outside of a typical work day, to work with another member or acquaintance, work on low risk equipment, be aware of all emergency contact information and procedures.

North Forge Fabrication Lab Disciplinary Process



North Forge Written Disciplinary Notification

Date:

Date of First Notice (Verbal):

Member Name:

We believe that a member wants to know if they fail to follow North Forge Safety Policy. North Forge takes seriously its responsibility to ensure that members are working safely. This disciplinary notice provides you notice of a violation of company policy.

Your conduct is not in keeping with North Forge's safety standards or policies for the following reasons:

Suggestions for improvement:

Employee comments:

Employee signature:

Date:

Safety Committee Member signature:

Date:



13. Maintenance and Equipment

Introduction

The purpose of the Maintenance Program is to ensure the proper use and care of North Forge Fabrication Lab tools and equipment.

It is critical that tools and equipment be properly inspected and maintained on a regular basis to reduce the risk of injury.

Policy

North Forge Fabrication Lab will maintain all tools and equipment as to manufacturer specifications and all regulatory standards to minimize the risk to all members. Any defective tools and equipment are to be removed from service following the procedures for removing defective tools and equipment below.

All tools and equipment that do not meet manufacturer's specifications and regulatory standards are to be removed from service until they meet these standards.

The maintenance program must contain a recording system comprised of appropriate documentation of what maintenance work was done, when and by whom.

Procedure

Purpose

The purpose of this procedure is to ensure that all defective tools and equipment are removed from service in an effective and safe way.

Definition

The definition of a defective tool or equipment is one that is not as per manufacturer's design or performance specifications, or does not meet government regulations.

Training

All North Forge Fabrication Lab members are to be trained by a competent trainer in the proper use of equipment.

Defective Tools and Equipment

This procedure is to be used by all members when they are removing tools and / or equipment from service for repairs.

- When a tool or piece of equipment is found to be defective all power to that piece of equipment should be turned-off, unplugged and disconnected.
- All tools and equipment is to be appropriately labeled with a clear warning not to use.
- Whenever possible, all tools and equipment are to be removed from the Fabrication Lab as soon as possible.
- Repairs to take place as soon as possible by the Maintenance Manager or trained repair technician.
- No defective tools or equipment are to be used until they are repaired.

LOTO Procedures

MACHINE / SUBSYSTEM	GRADE	SCORE	FUNCTION	RELIABILITY	CAPACITY	SUPPORT / TRAINING	SAFETY
NOTE: This machine status is only used to determine the grade for equipment that may be sold, retired, LOTO, etc. This is not a measurement for procurement.			Meeting needs of members	Frequency and duration of outages	Availability for member use	Ability to maintain the equipment and offer member support through training	Potential for damage to members, equipment or facility
			10 - Meets	10 - Exceptional	10 - Exceeds	10 - Full	10 - No danger
			5 - Partially	5 - Sufficient	5 - Sufficient	5 - Partially	5 - Damage possible
			0 - Insufficient	0 - Insufficient	0 - Insufficient	0 - Obsolete	0 - Unsafe
			30% Weight	30% Weight	30% Weight	5% Weight	5% Weight
FACILITY	GOOD	9.4	9.4	9.0	9.6	10.0	10.0
Compressor System	GOOD	9.7	10	9	10	10	10
HVAC	GOOD	8.5	10	5	10	10	10
Lighting	GOOD	9.4	8	10	10	10	10
Plumbing/Sinks	GOOD	10.0	10	10	10	10	10
Dust Collection	GOOD	8.2	8	9	7	10	10
Fire suppression	GOOD	10.0	10	10	10	10	10
Flrst Aid	GOOD	10.0	10	10	10	10	10
LASERS	GOOD	7.7	7.5	7.8	8.0	6.0	8.0
Helix	GOOD	7.9	8	8	8	6	8
Fusion	GOOD	7.9	8	8	8	6	8
Universal	GOOD	7.9	9	7	8	6	8
Fiber	GOOD	7.0	5	8	8	6	8
METAL	GOOD	7.4	6.8	7.5	8.3	8.0	4.3
Plasma	GOOD	7.4	6	6	10	8	7
Welders	GOOD	9.9	10	10	10	10	8
Tormach	GOOD	7.8	5	9	10	10	2

MACHINE / SUBSYSTEM	GRADE	SCORE	FUNCTION	RELIABILITY	CAPACITY	SUPPORT / TRAINING	SAFETY
ELECTRONICS	GOOD	9.3	9.0	8.8	10.0	9.5	10.0
Laser	GOOD	8.7	9	7	10	8	10
Mill	GOOD	9.4	9	9	10	10	10
Pick & Place	GOOD	9.4	9	9	10	10	10
Oven	GOOD	9.7	9	10	10	10	10
CRAFTS	GOOD	9.3	8.5	9.5	10.0	9.0	9.0
Vinyl Cutter	GOOD	8.7	7	9	10	8	10
Heat Press	GOOD	9.9	10	10	10	10	8
HP Poster Printer	GOOD	8.7	7	9	10	8	10



13b. Lock Out Tag Out Procedures

Workplace Safety and Health Regulation 14.14(1) - (4) LockOut

NORTH FORGE FABRICATION LAB EQUIPMENT LOCK OUT PROCEDURE

PERFORM THE FOLLOWING:

1. All pressure - air or hydraulic must be relieved from the equipment.
2. All motion - motors or flywheels must be stopped.
3. All moveable parts - press slides, etc., must be securely blocked to prevent movement.
4. All equipment must be locked out and tagged before any maintenance or service work is performed. *Note on equipment where the power must be **on** in order to repair or diagnose problems, may be done so without locking out the machine, providing other safe guards are exercised. And must be done by a certified mechanic or electrician.*
 - a) Locate correct electrical disconnect (switch/breaker) or valve and turn off.
 - b) Install a multi-hasp and/or lockout lock and do not operate tag. The hasp will allow room for additional locks, if required by other personnel.
 - c) Attempt to start the equipment to ensure that the proper disconnect or valve has been shut off.
 - d) Upon completion of work, remove lock and hasp and turn the power back on.
 - e) In the event that at the end of your shift you have not completed the service work on the equipment and feel that it would be unsafe to have the power source turned back on, replace your lock with a "Maintenance Lock and a Do Not Operate" tag properly completed.

Any employee placing a personal lockout lock on any equipment must ensure that the lock is removed before leaving property.

If any employee fails to remove their lock before leaving, they will be required to return to work at their own time and expense to do so.

If any employee cannot be contacted in such a case, they will be subject to the company Discipline and Discharge Procedure.

5. Refer to attached LOTO method sheets to identify the correct method of locking out a piece of equipment.

MAINTENANCE TAGGING PROCEDURE

**ANY TIME EQUIPMENT IS TAGGED WITH A
“DO NOT OPERATE” TAG THAT TAG MUST INCLUDE:**

- | | | | |
|----|-------|---|---|
| A) | WHO | - | Person putting the tag on the equipment must sign it legibly. |
| B) | WHEN | - | The date. |
| C) | WHAT | - | The machine number and name. |
| D) | WHERE | - | The area or location of the working being done. |
| E) | WHY | - | The reason the work is being done. |

TAGS MUST BE REMOVED WHEN THE WORK IS FINISHED!

WORK AREA PROCEDURE

WHEN WORKING ON ANY HOIST, IN ANY HOIST TRAVEL WAY, OR FROM A LADDER, MAN LIFT, SCAFFOLD, OR PLATFORM, THE FOLLOWING STEPS MUST BE TAKEN:

- A) Lockout and tag any equipment which may present a risk to any worker.
- B) The work area must be identified and cordoned off using yellow “**CAUTION - MEN WORKING**” barrier tape.
- C) Department Supervisors must be notified of the intended work to alert the workers in the area.
- D) These steps must be reversed when the work is completed, that is, inform department Supervisors, remove barrier tape, and remove lockout lock and tag.

CNC ROOM – LOTO METHOD SHEET

3-Axis CNC

Chassis Power - Rotate chassis mounted safety switch to off and padlock in position

Spindle Power – Move wall mounted safety switch to off and padlock in position

5-Axis CNC

Chassis Power - Rotate chassis mounted safety switch to off and padlock in position

Spindle Power – Move post mounted safety switch to off and padlock in position

Dust Collector

Apply Rotating Electrical Plug Lockout and padlock

Thickness Planer

Apply Rotating Electrical Plug Lockout and padlock

Mini CNC Lathe

Apply Rotating Electrical Plug Lockout and padlock

WOOD ROOM – LOTO METHOD SHEET

SawStop Table Saw

Chassis Power - Rotate chassis mounted safety switch to off and padlock in position

Bandsaws

Apply Rotating Electrical Plug Lockout and padlock

Dust Collector

Apply Rotating Electrical Plug Lockout and padlock

Mitre Saw

Apply Rotating Electrical Plug Lockout and padlock

Drill Press

Apply Rotating Electrical Plug Lockout and padlock

Spindle Sander

Apply Rotating Electrical Plug Lockout and padlock

Panel Saw

Apply Rotating Electrical Plug Lockout and padlock

Belt/Disc Sander

Apply Rotating Electrical Plug Lockout and padlock

COMPRESSOR ROOM – LOTO METHOD SHEET

Compressors

Move wall mounted safety switch to off and padlock in position

Vacuum Hold Down

Move wall mounted safety switch to off and padlock in position

Laser Exhaust

Locate correct circuit breaker and apply Circuit Breaker Lockout and padlock in place

Room Dust Extraction

Locate correct circuit breaker and apply Circuit Breaker Lockout and padlock in place

LASER ROOM – LOTO METHOD SHEET

ULS Laser (big red)

Apply Rotating Electrical Plug Lockout and padlock

Helix (little blue)

Remove powercord and apply LOTO sticker to power outlet on machine

Fusion (big blue)

Remove powercord and apply LOTO sticker to power outlet on machine

Fibremark

Remove powercord and apply LOTO sticker to power outlet on machine

IOT ROOM – LOTO METHOD SHEET

LPKF Laser

Chassis Power - Rotate chassis mounted safety switch to off and padlock in position

LPKF Protomat

Apply Rotating Electrical Plug Lockout and padlock

LPKF Protoflow

Apply Rotating Electrical Plug Lockout and padlock

LPKF Exhaust Filters

Remove powercord and apply LOTO sticker to power outlet on machine

LPKF Pick & Place

Remove powercord and apply LOTO sticker to power outlet on machine

Weller Solder Stations

Remove powercord and apply LOTO sticker to power outlet on machine

Various Test Equipment

Remove powercord and apply LOTO sticker to power outlet on machine

Fridge

Apply Rotating Electrical Plug Lockout and padlock

3D PRINT ROOM – LOTO METHOD SHEET

Prusa Printers

Remove powercord and apply LOTO sticker to power outlet on machine

Ultimaker

Remove powercord and apply LOTO sticker to power outlet on machine

3D Wox's

Remove powercord and apply LOTO sticker to power outlet on machine

uPrint

Remove powercord and apply LOTO sticker to power outlet on machine

Makergear

Remove powercord and apply LOTO sticker to power outlet on machine

Form 2's

Remove powercord and apply LOTO sticker to power outlet on machine

Waxer

Remove powercord and apply LOTO sticker to power outlet on machine

zbench

Remove powercord and apply LOTO sticker to power outlet on machine

zPrinter

Remove powercord and apply LOTO sticker to power outlet on machine

Fortus

Locate correct circuit breaker and apply Circuit Breaker Lockout and padlock in place

METAL ROOM – LOTO METHOD SHEET

Grinders

Apply Rotating Electrical Plug Lockout and padlock

Drill Press

Move wall mounted power switch to off and padlock in position

Knee Mill

Move wall mounted power switch to off and padlock in position

Tormach

Apply Rotating Electrical Plug Lockout and padlock

Lathe

Apply Rotating Electrical Plug Lockout and padlock

Plasma

Rotate wall mounted safety switch to off and padlock in position

Welders

Apply Rotating Electrical Plug Lockout and padlock

Metal Chopsaw

Apply Rotating Electrical Plug Lockout and padlock

Metal Bandsaw

Apply Rotating Electrical Plug Lockout and padlock

COMMON AREA – LOTO METHOD SHEET

Iron Worker

Move post mounted power switch to off and padlock in position

Metal Shear

Move post mounted power switch to off and padlock in position

Environment Chamber

Apply Rotating Electrical Plug Lockout and padlock

Injection Molder

Remove powercord and apply LOTO sticker to power outlet on machine

Vacuum Former

Chassis Power - Rotate chassis mounted safety switch to off and padlock in position

Clean Stations

Apply Rotating Electrical Plug Lockout and padlock

Sump Pump

Apply Rotating Electrical Plug Lockout and padlock

CRAFT ROOM – LOTO METHOD SHEET

Vinyl Cutter

Remove powercord and apply LOTO sticker to power outlet on machine

HP DesignJet

Remove powercord and apply LOTO sticker to power outlet on machine

Sewing Machine

Apply Rotating Electrical Plug Lockout and padlock

Heat Press

Apply Rotating Electrical Plug Lockout and padlock

PAINT ROOM – LOTO METHOD SHEET

Exhaust

Locate correct circuit breaker and apply Circuit Breaker Lockout and padlock in place



14. Hazard Identification and Control

Revised: May 13, 2019

Hazard Assessment Policy

It is the policy of North Forge Fabrication Lab that job Hazard Assessment be conducted as follows:

- Prior to the start of all projects; and
- As required during the course of a project in response to changing work conditions and / or the level of hazard that exists.

Definitions

The following definitions are used in this manual:

- Hazard: any condition or circumstance which poses the risk of an incident.
- Incident: any unplanned and unwanted event which results in damage or injury, or which could have resulted in damage or injury.
- Inspection: an observation tour of the fabrication lab for the specific purpose of determining the level of compliance with established safe work practices, procedures and safety rules. Inspections are conducted on an ongoing basis to maintain the effectiveness of a safety program.
- Probability: The likelihood that a specific event or outcome will have an identified effect.
- Risk: Chance of loss or gain; also a measure of potential loss that considers both the severity of a loss and its probability of occurring.
- Severity (Impact): A measure of the magnitude of loss.
- Spot Check: An unscheduled, informal inspection, typically conducted by a Safety Lead or Vice President while walking the Fabrication Lab during the course of a day. The spot check is used to verify appropriate completion of a hazard assessment and check adherence to the controls identified.

Conducting a Project Hazard Assessment

Project Start-Up Hazard Assessment

1. Assemble the people that will be involved and which shall include as a minimum: the Vice President, Maintenance Manager and Safety Lead.
2. Identify the work operations that will be involved in the project.
3. Identify potential hazards pertaining to environment, material, equipment, and people. Keep asking "What if?"
4. Use the checklist to confirm the items that need attention.

5. Review the findings.
6. Rank the items based on the following criteria:
7. Develop a plan to control the hazards that have been identified.
8. Implement and communicate the plan.
9. Retain on-site copies of all completed Hazard and Risk Assessments for reference.

North Forge Fabrication Lab Risk Matrix		Severity			
		Accepted \$0 - \$100	Low \$100 - \$5000	Mid \$5000 - \$10 000	High \$10 000 and up
Probability	1 Negligible Once every 20 years	2	3	4	5
	2 Unlikely Once per 10 years	3	4	5	6
	3 Likely Once per 3 years	4	5	6	7
	4 Certain Twice per week	5	6	7	8
Low Risk		Average Risk		High Risk	

Ongoing Project Hazard Assessment

During the course of a project, the Vice President and Safety Lead shall, from time to time, review conditions on site and procedures in place. If changing conditions, or other factors, suggest that existing procedures may not be adequate then a mid-project Hazard Assessment shall be conducted.

The same procedure shall be followed as when conducting the initial assessment. Since the project is ongoing, touring the fabrication lab will be required to help identify hazards. The Lab Safety Inspection Form should be used as an aid for the lab tour.

After Hazard Identification Follow ups -

All implemented corrective actions will be re-inspected as part of the next safety committee inspection (if not earlier) and the results are noted on the inspection form (which are saved) or if in between meetings, the corrective action follow ups may be sent to all members on the Safety channel on SLACK and communicated during our weekly member meetings.

Conducting an Equipment Level Risk Assessment

Description

An Equipment Level Risk Assessment is a thorough examination of all equipment in the Fabrication Lab for the purpose of identifying what actual and potential hazards and risk exists. Once the hazards have been identified a plan to control, mitigate or eliminate the risk(s) must be developed.

All equipment in the Fabrication Lab are assessed and labeled to a low, average or high degree of risk. The level of risk will determine the required PPE and Training required.

Following a **Plan, Do, Check, Act Plan** is an iterative **four**-step management method used for the control and continual improvement.

Plan -

- Refer to Measuring Success, of the Safety Manual.

Do -

- Identified our risk profile through the Critical Job Analysis.
- Assessed risks, identify what could cause harm in the workplace, who it could harm and how, and what you will do to manage the risk.
- The Critical Job Analysis identified priorities and the biggest risks.
- Organised activities to deliver your plan In particular, aim to: involve members and communicate, so that everyone is clear on what is needed and can discuss issues – develop positive attitudes and behaviours.
- The JHA's will indicate the preventive and protective measures needed and put them in place.
- We will provide the right tools and equipment to do the job and keep them maintained.
- Our training plan will ensure everyone is competent to carry out their work.

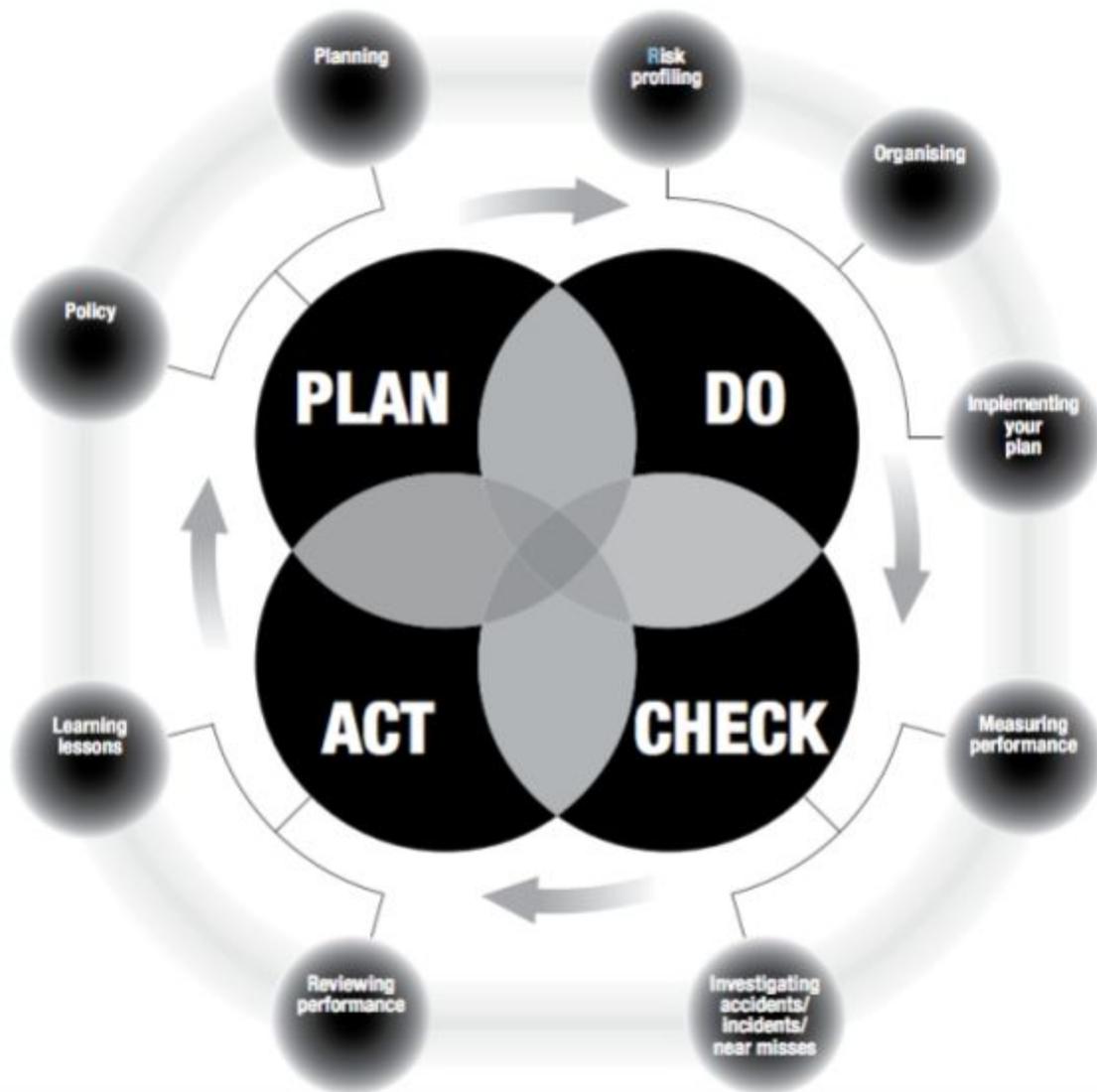
Check -

- Measure your performance and report on a monthly basis at our member meetings.
- Assess how well the risks are being controlled and if you are achieving your aims. In some circumstances formal audits may be useful.
- Investigate the causes of accidents, incidents or near misses

Act -

- Review your performance
- Learn from accidents and incidents. Watch for trends.
- Revisit plans, policy documents and risk assessments to see if they need updating.

- Take action on lessons learned, including from audit and inspection reports



List of Forms

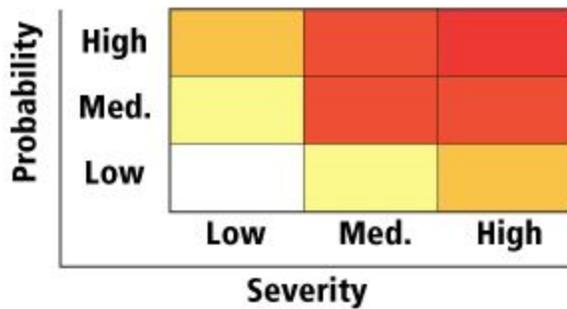
North Forge Fabrication Lab Equipment Risk Assessments

The purpose of the form was to determine the risk of equipment use from High, Medium to Low based on severity and probability.					
All equipment is labeled with a High, Medium and Low Sticker for easy identification on Risk.					
As equipment changes, new equipment added, this form will be updated.					
ROOM	MACHINE	SEVERITY	PROBABILITY	RISK FACTOR	NOTES
CRAFTS	Vinyl Cutter	2	2	4	could cut finger on blade if trying hard
	Plotter	0	0	0	no probability
3D ROOM	uPrint	2	2	4	could scorch arm on side panel. Higher degree burns
	Prusa i3 MK2	2	2	4	Could burn hand or fingers on plate
	Ultimaker 2+ Ext	2	2	4	Could burn hand or fingers on plate
	Fortus 400mc	3	2	5	Higher degree burns
	ZCorp 650	1	1	2	Inhaling Dust
	Waxer	2	2	4	Higher degree burns
		Form 2 and 3	2	2	4
METAL	Ironworker	3	2	5	Eye, pinch, laceration, dismemberment hazard
	Wet Tile Saw	4	4	8	Cuts, Laserations, Amputations
	Lathe	5	4	9	Entanglement, flying debris, finger caught hazard
	Plasma Cutter	5	4	9	Eye damage or blindness, loud, body parts could be severed
	Water Jet Cutting Table	5	4	9	Eye damage or blindness, loud, body parts could be severed
	Mill	4	4	8	Eye damage or blindness
	Tormach	4	4	8	Eye damage or blindness
	MIG Welder	4	4	8	Eye damage or blindness
	TIG Welder	4	4	8	Eye damage or blindness
	Horiz Bandsaw	4	3	7	Eye damage or blindness, cuts
	HEAVY METAL	Grinder	4	4	8
Hydraulic Shop Press		4	3	7	safety googles, work gloves,
Hydronic Shear		4	3	7	Cut hand off
Iron worker		4	3	7	Electrocuted, crushed, cut off fingers
Injection molder		2	2	4	Burns
CNC Wood	Shopbot 3-Axis	4	4	8	wood flying if not secured, fingers hazard, mill hands
	Shopbot 5-Axis			0	Can not assess as not in use. Would be at least the same as Shopbot3-Axis
	7-Axis			0	Can not assess as not in use. Would be at least the same as Shopbot3-Axis
	Mini CNC Lathe	5	4	9	Entanglement, flying debris, finger caught hazard

	Panel saw	4	4	8	ear damage, cutting
WOODWORKING	Sawstop	4	4	8	ear damage, cutting
	Drill Press	4	4	8	ear damage, cutting
	Chop Saw	3	4	7	Debris in eye, ear damage
	Planer	4	4	8	moving blades cutting hands and fingers
	Universal ILS	3	3	6	burns or eye damage. Often lens damage. Fire hazard
LASER	Epilog Helix	3	3	6	burns or eye damage. Often lens damage. Fire hazard
	Epilog Fusion	3	3	6	burns or eye damage. Often lens damage. Fire hazard
	Fibermark	2	2	4	cuts from metal
				0	
	Protolaser	2	2	4	Invisible radiation. Skin and eye exposure to radiation.
ELECTRONICS	Protomat	2	2	4	Invisible radiation. Skin and eye exposure to radiation.
	ProtoFlow Oven	2	2	4	Burns
	LPKF ProtoPlace Pick and place	2	2	4	needle pricks and solder paste on fingers
	Environmental Test Chamber	2	2	4	Burns

14. B. Hazard Risk Assessment
Updated: July 10.19

Table 1: Risk matrix



Name:		Date:		
Task	Hazards (existing and potential)	Risk Level	Controls	Are Controls in place? If not, how and when?
Operating the Laser cutters	Fire	Low Probability and medium severity	Never leave lasers running without supervision. Watch for smoke and turn off laser if smoking excessively	SWP
Woodroom	Fire	Low Probability and medium severity	Never store wood in wood room. Cleanup after every job.	SWP A wood room Champion ensures a thorough cleaning weekly.
3DP Room Roof	Flooding	Low probability and low severity	Do not store 3D printer directly before the patchy roof	Roof is regularly inspected

Working Alone	Injury and not able to initiate help	Probability high, severity low	Always have a buddy with you or a buddy check-in process	Emergency contact numbers are listed beside the phone in the shop. Tell members (during Orientation) not to work alone. Train on Safe Work Procedures. Equipment is labeled by risk. Do not operate High Risk equipment when alone in the shop.
---------------	--------------------------------------	--------------------------------	--	---

North Forge Fabrication Lab - Critical Job Inventory

Task	Machine Type	Department	Hazard Rating	Severity (1-5)	Probability (1-4)	Frequency (1-4)	# Employees Exposed	JHA?	APR19 SWP	LOTO	SDS	Follow-up Hazard Control	
	Panel saw	Wood	320	4	4	2	10	N	Y	Y	N		
	Planer	Wood	90	3	3	1	10	N	Y	Y	N		
	Plotter	Craft	1	1	1	1	1	Y	Y	Y	N		
	Pneumatic Nailer and Stapling Tools	Tool Room	100	2	2	1	25	N	Y	Y	N		
	ProtoFlow Oven	IoT	20	2	2	1	5	N	Y	Y	N		
	Protolaser	IoT	20	2	2	1	5	N	Y	Y	N		
	Protomat	IoT	20	2	2	1	5	N	Y	Y	N		
	Prusa i3 MK2	3DP	300	2	2	3	25	Y	Y	Y	N		
	Shopbot 3-Axis	CNC	960	4	4	3	20	n	Y	Y	N	X	
	Shopbot 5-Axis	CNC	0	4	4	0	0	N	Y	Y	N		
	Sliding Compound Miter Saw	Wood	320	4	4	2	10	N	Y	Y	N		
	Table Saw	Wood	320	4	4	2	10	N	Y	Y	N		
	Wet Tile Saw	Metal	128	4	4	2	4	N	Y	Y	N		
	TIG Welder	Metal	60	3	2	1	10	N	Y	Y	N		
	Tormach PCNC1100 Lathe/Mill	Metal	16	4	4	1	1	N	Y	Y	N		
	Ultimaker 2+ Ext	3DP	160	2	2	2	20	Y	Y	Y	N		
	Universal ILS	Laser	675	3	3	3	25	N	Y	Y	N	X	
	uPrint	3DP	12	2	2	1	3	N	Y	Y	N		
	Utility Knife	Tool Room		2	2	4	75	N	Y	Y			
	Vacuum Former	Assembly	20	2	2	1	5	N	Y	Y	N		
	Vinyl Cutter	Assembly	100	2	2	1	25	Y	Y	Y	N		
	Water Jet Cutting Table	Metal	540	3	3	3	20	N	N	N	N		
	Waxer	3DP	4	2	2	1	1	N	N	Y	N		
	ZCorp 650	3DP	5	1	1	1	5	Y	Y	Y	N		
		#VALUE!	Totals						8	47	53	1	

Steve Driven Steve Draft St Second-Party JHA Link SWP Link
 Amy
 Amy
 Jeff
 Jeff
 X
 Amy
 Lawrence
 Jeff
 X
 Joel/Jeff

Outstanding - 41 7 2 47
 Complete - 8 47 53 1
 % Complete - 16% 87% 96% 2%

NOTE: It is the policy of North Forge that any new equipment or modifications to equipment, must become part of a new critical job inventory analysis, including a job hazard analysis and Safe Work Procedures.

15. Training and Safety Training Orientation

Revised April 2, 2019

2.2.1(1) New Worker Orientation of Part 2 General Duties, General Safety Duties of the Manitoba Workplace Safety and Health Act and Regulation.

Introduction

Appropriate training and safety orientation in the Fabrication Lab is an important requirement and ongoing responsibility of members due to:

- Continuous changes in equipment and processes;
- Ongoing updates and improvements in best practices;
- Technology changes;
- Safe work procedures;
- Equipment and material updates.

Research demonstrates that workers new to an industry and experienced workers new to a task or job are significantly more likely to be injured, particularly within the first month on a job. Further, in the chain of events leading to an incident, lack of orientation and training is often found to be a critical contributing factor and, as such, they are 2 of the 3 most critical components of a robust safety program.

Safety Orientation and Training Policy

Orientation

All new North Forge Fabrication Lab members receive new member orientation and safety conducted by a competent volunteer member. Members must be trained on each piece of equipment by a subject matter expert prior to operating that equipment.

New members are defined as:

- New to the Fabrication Lab
- Returning from a suspended membership and the processes or hazards in the Fabrication Lab have changed while the member was away.

The purpose of the orientation is to familiarize new members with the Fabrication Lab, its training programs, policies, and procedures, our commitment to safety, the environment and general fabrication lab rules.

This orientation does not preclude members from requiring a “room or task specific” orientation when required due to a change in equipment or the environment.

As part of the orientation process, prior to becoming a member, all members shall sign and date their Commitment to Safety by attending a Safety and Orientation Session and all members should review the Roles and Responsibilities as part of this manual.

Annual Training

On an annual basis general safety orientation in the following topics should be reviewed:

- Worksite emergency procedures
- General worksite hazards
- Contact information for the workplace safety and health committee representatives
- Workplace safety rules
- How to summon first aid in the event of an injury.

Training

North Forge Fabrication Lab will provide appropriate training and will strive to provide timely training. Due to the fact that our trainers are currently all subject matter experts and member volunteers themselves, providing timely training is not always realistic. Members must either complete training or demonstrate that they can safely operate equipment. Any high-risk equipment that requires training will be identified and labelled. Safe Work Procedures and Job Hazard Analysis are in the process of being developed for the high risk equipment (determined by our equipment risk analysis). All members completing training on equipment with SWP and JHA will need to indicate completed training on the trainers requisition forms.

North Forge Fabrication Lab will identify and establish training requirements for all equipment rooms and track member participation in the training.

Annual Reviews

In addition, all areas (metal room, laser room, 3DP room, etc.) with specific training should be reviewed annually. (content and outcomes of all Safety Training). In the event of an incident or a failure to follow standard practices covered in job specific training, the specific topic or topics will be reviewed.

Trainer	Room / Equipment	Annual Review
Morgan Fiks	Laser Room	January 2020
Ava Foster	Wood Room	January 2020
Matt Olson	CNC Room	January 2020
Richard Venzon	3D Printing Room	January 2020
Lawrence Rosdobutko	Metal Room	January 2020

Lawrence Rosdobutko	Safety and Orientation	January 2020
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Changes

If there is a change equipment, operational procedures, or new work hazard information becomes available, workers will receive the training appropriate to those changes. These may be covered off with Slack messages in the appropriate channel.

Member Orientation

New Members

All new members receive a digital onboarding program. As well, new members shall agree to the Member Licence Agreement and Code of Conduct. These documents are all part of this manual.

List of Forms

Digital Onboarding Program

Orientation and Safety Walkthrough checklist

Member Licence Agreement and Code of Conduct

**NORTH FORGE FABRICATION LAB
LICENCE AGREEMENT**

This Agreement is made on May 30th, 2017 between 7298375 Manitoba Association Inc. (“North Forge”) and the Licensee named in Item 1 below (the “Licensee”).

WHEREAS:

A. North Forge is the tenant on the third floor at 125 Adelaide Street, Winnipeg, Manitoba, R3A 0W4 (the “Premises”).

B. The Licensee desires to obtain non-exclusive access and use for a limited period of time to the fabrication lab space, tools and equipment (collectively, the “Space and Equipment”) leased or owned by North Forge at the Premises and North Forge agrees to grant the Licensee a licence for such purposes. The term “Space and Equipment” does not include desks located at the Premises.

NOW THEREFORE in consideration of the terms and conditions hereinafter set forth, and for other good and valuable consideration, the parties agree as follows:

1. <u>Licensee</u>	Contact Name:
2. <u>Licensee Particulars</u>	Type of Membership: Address: Phone No. E-mail:
3. <u>North Forge Particulars</u>	Address: 200 – 135 Innovation Drive, Winnipeg, MB, R3T 6A8 Phone No. 204-262-6400 E-mail: info@northforge.ca
4. <u>Parent/ Guardian</u>	Complete and sign Schedule A to this Agreement if Licensee is under 18 years of age.
5. <u>Term</u>	The term of this Agreement is for an annual period starting on June 1, 2017 (the “Term”) and will renew indefinitely for annual terms, unless terminated earlier as herein provided.
6. <u>Fees</u>	During the Term or any renewal thereof, the Licensee shall also pay to North Forge a licence fee of \$0 per year, plus applicable taxes, on the date of renewal. The license fee does not include access to and use of (i) storage lockers and space located at the Premises; (ii) materials (for example wood, plastic, resin, metal, ceramic) for the Space and Equipment; and (iii) certain 3D printing materials. Separate fees are charged for these items and materials as set out in the guidelines and procedures established by North Forge from time to time in its sole discretion. North Forge reserves the right to change the amount of any fee at any time upon 30 days’ written notice to the Licensee.
7. <u>Business Membership</u>	If the Licensee is an entity and has a business membership, only one employee of the Licensee can access and use the Space and Equipment unless the Licensee pays a business membership licence fee for each employee. The Licensee will cause each of its employees to complete and sign Schedule B to this Agreement prior to accessing and using the Space and Equipment.

<p>8. <u>No Warranty & No Liability</u></p>	<p>THIS SECTION LIMITS NORTH FORGE'S LIABILITY TO YOU. PLEASE READ CAREFULLY.</p> <p>North Forge provides the Licensee with the opportunity to attend at the Premises and to access and use the Space and Equipment on an "as is" basis, as a service, and not as a lease of real property, and disclaims all warranties, representations and conditions, whether express, implied or statutory, including but not limited to, merchantability or fitness for a particular purpose or use. There is also no warranty of title, quiet enjoyment or possession.</p> <p>North Forge shall not be liable nor responsible for:</p> <ul style="list-style-type: none">• any loss or damage caused by death or personal injury sustained by the Licensee or its invitees or for any loss or damage to any property belonging to the Licensee or its invitees.• any interruption, cessation, or failure in the Premises or in the Space and Equipment or in the supply of utilities, services or systems in, to or serving the Premises or the Space and Equipment, whether they are supplied by North Forge or others, and the Licensee shall not be entitled to a refund of any fee paid under this Agreement.• the confidentiality, infringement, theft, safety or well-being of equipment, projects, work product, tools and personal items belonging to the Licensee and left on the Premises. North Forge assumes no liability in the event confidentiality is compromised or infringement is alleged. <p>In no event shall either party ever be liable to the other party for special, indirect, consequential, or incidental losses or damages; provided that the foregoing shall not apply to any claim or demand from a third party.</p>
<p>9. <u>Licence</u></p>	<p>Subject to the terms and conditions of this Agreement, North Forge hereby grants a non-exclusive and non-sublicensable right and license to the Licensee to access and use the Space and Equipment for the Term and any renewal thereof as set out in this Agreement and as set out in the guidelines and procedures established by North Forge from time to time in their sole discretion (the "Licence"). The right and license granted to the Licensee hereunder is a licence only, and shall not under any circumstances constitute a lease between the parties and does not create an interest in the Premises. No legal title or leasehold interest in the Premises shall be deemed or construed to have been created or vested in the Licensee by anything contained herein.</p> <p>The Licence shall be subject to the Licensee attending a standard orientation and safety training course provided by North Forge on the use of the Space and Equipment prior to use and access of the Space and Equipment.</p> <p>The Licensee and its invitees shall be bound by all guidelines and procedures provided by North Forge from time to time within its sole discretion and all such guidelines and procedures shall be deemed incorporated into and form part of this Agreement.</p> <p>North Forge may adjust or limit the amount of time the Licensee accesses and uses the Space and Equipment in the event that North Forge, in its sole discretion, acting reasonably, determines that the Licensee is excessively using the Space and Equipment to the detriment of the rights and licenses of other licensees of North Forge.</p> <p>The Licence shall not extend to any employees, agents, guests or invitees of the Licensee unless otherwise provided for in this Agreement.</p>

<p>10. <u>Use of Equipment & Space</u></p>	<p>The Licensee shall not conduct any upgrades to the Space and Equipment without the prior written consent of North Forge. The Licensee shall immediately notify North Forge of any accident, lost, defect, stolen and/or damaged Space and Equipment. The Licensee shall at its sole cost be responsible for the actual cost value of lost, stolen and/or damaged Space and Equipment, except in the case of reasonable wear and tear. The Equipment shall at all times be and remain the exclusive property of North Forge and the Licensee will have no right of property in the Space and Equipment except to use the Space and Equipment on the terms and conditions in this Agreement.</p>
<p>11. <u>Key Fobs</u></p>	<p>Key fobs provide the Licensee with access to the Premises. Lost key fobs must be reported to North Forge within 24 hours. Key fobs will remain active upon payment of the one-time membership set up fee. Key fobs will not remain active when this Agreement is terminated or when the Licensee does not pay its applicable fees. Upon expiration or termination of this Agreement, the Licensee must return the key fob, which key fob shall, at all times, remain the property of North Forge.</p> <p>There will be a replacement fee of \$20 plus applicable taxes for lost key fobs.</p>
<p>12. <u>Licensee Covenants</u></p>	<p>The Licensee:</p> <ul style="list-style-type: none">• Shall pay, if applicable, when they become due and payable, all taxes and fees which are levied, charged or assessed against or in respect of any and every activity carried on in the Premises and/or in the Space and Equipment or in respect of the use of the Premises and/or the Space and Equipment, by the Licensee.• Shall use the Space and Equipment in a careful and diligent manner in accordance with good industry standards and in compliance with applicable laws, bylaws, ordinances and regulations.• Shall not remove the Space and Equipment from the Premises.• Shall not do or omit to do or permit to be done anything upon or in respect of the Premises or the Space and Equipment the doing or omission of which (as the case may be) shall be or result in a nuisance or jeopardize insurance rates and coverage of North Forge.• Shall be entitled to bring a guest with it to the Premises. Guests cannot be on the Premises unless accompanied by the Licensee. Guests cannot use the Space and the Equipment.• If (1) the Licensee is responsible for any loss or injury to any person or property as a result of the Licensee's or any of its invitees' access or use of the Space and Equipment; and (2) the loss or injury results in a claim under an insurance policy held by North Forge, the Licensee shall pay North Forge, upon demand, the amount of the deductible under the insurance policy.• Shall, upon the termination or expiration of this Agreement, remove any or all equipment, projects, work product, tools and personal items belonging to the Licensee from the Premises.• Shall discontinue access and use of the Premises and the Space and Equipment upon the termination or expiration of this Agreement.• Shall be responsible for any loss or injury to any person or property as a result of the Licensee's or any of its invitees' access or use of the Space and Equipment.• Shall immediately provide to North Forge all completed and signed Schedules A and Schedules B prior to access and use of the Space and Equipment.
<p>13. <u>Indemnity</u></p>	<p>THIS SECTION LIMITS NORTH FORGE'S LIABILITY TO YOU AND PROVIDES FOR AN INDEMNITY. PLEASE READ CAREFULLY.</p>

	<p>The Licensee (and/or his/her parent or guardian) shall indemnify and save harmless North Forge (and its directors, officers, shareholders, members, employees, representatives, invitees, agents and licensees) from and against all losses, costs, expenses, liability, actions, suits, damages or claims, including legal fees, which may be made against North Forge (and its directors, officers, shareholders, members, employees, representatives, invitees, agents and licensees) arising out of or by reason of or incidental to the Licensee's exercise of any rights and licenses granted to it under this Agreement or any part thereof.</p>
14. <u>North Forge Covenants</u>	<p>North Forge:</p> <ul style="list-style-type: none">• Shall during the Term and any renewal thereof, at its sole cost, keep, repair and maintain the Premises and the Space and Equipment.• Shall provide the Licensee with free access to all events (except for training events and sessions) provided by North Forge in Winnipeg in accordance with guidelines and procedures established by North Forge from time to time in its sole discretion.• Shall provide the Licensee with access to all boardrooms in Manitoba owned or leased by North Forge as well as the Smartpark Event Centre located at 100-One Research Road, Winnipeg, but they must be pre-booked by the Licensee in accordance with guidelines and procedures established by North Forge from time to time in its sole discretion.
15. <u>Termination</u>	<p>North Forge shall have the right to terminate this Agreement and the Licence, at any time without cost, upon the provision of one (1) day written notice to the Licensee. The Licensee shall have the right to terminate this Agreement, at any time without cost, upon the provision to North Forge of 7 days' written notice prior to the end of the Term or any renewal thereof. Upon expiration or termination of this Agreement and/or the Licence, the Licensee shall peacefully surrender the Premises and the Space and Equipment to North Forge in good repair excepting only reasonable wear and tear. The obligation to pay outstanding amounts under this Agreement shall survive the expiry or earlier termination this Agreement.</p> <p>In the event the Licensee should be in default of any term, covenant or condition (express or implied) in this Agreement, North Forge shall have the right to immediately, without notice, terminate this Agreement.</p>
16. <u>The Landlord and Tenant Act Not to Apply</u>	<p>It is expressly understood that the Licensee is not entitled to any benefits under <i>The Landlord and Tenant Act</i> (Manitoba), as amended, and that such Act in no way applies to this Agreement. Nothing herein shall be interpreted or construed as giving rise to a claim by the Licensee that it has acquired title by possession or prescription to the Premises either during the currency hereof or upon the termination of same. This Agreement shall not be registered on title.</p>
17. <u>General Provisions</u>	<p>The general provisions in Schedule C attached to this Agreement form part of this Agreement.</p>

BY SIGNING THIS AGREEMENT NORTH FORGE AND THE LICENSEE INDICATE ACCEPTANCE OF THE TERMS AND CONDITIONS SET OUT ABOVE.

The Licensee represents that (i) he/she/it is at least 18 years old and has the legal authority to execute this Agreement, and (ii) he/she/it has read this Agreement prior to executing and fully understands its contents, meaning and impact.

Read and Understood

Licensee Name (print name)	Licensee Signature	Date Signed
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Per:

Name:

Title:

7298375 Manitoba Association Inc.



Marney Stapley
Vice President, North Forge Technology Exchange

Schedule C
General Provisions

This Agreement shall enure to the benefit of and be binding on the parties hereto and their respective heirs, executors, personal and legal representatives, administrators, successors and permitted assigns. This Agreement shall not be assigned by the Licensee without the prior written consent of North Forge. All rights and remedies of each party under this Agreement are cumulative and may be exercised at any time and from time to time, independently or in combination. If any provision of this Agreement is determined by a court of competent jurisdiction to be invalid, illegal or unenforceable in any respect, such determination shall not impair or affect the validity, legality or enforceability of any other provision of this Agreement. The parties acknowledge that this Agreement and any schedules attached hereto constitutes the entire agreement between the parties and supersedes all previous representations or agreements, written or oral, between the parties hereto. All reference to dollar amounts in this Agreement shall be lawful money of Canada. This Agreement may not be modified or amended except by written agreement of the parties hereto. No party shall be bound by any waiver of any provision of this Agreement unless such waiver is consented to in writing by that party. No waiver of any provision in this Agreement shall constitute a waiver of any other provision, nor shall any waiver constitute a continuing waiver unless otherwise provided. Time shall be of the essence herein. This Agreement and any amendment may be executed and delivered by the parties in any number of counter parts, each of which when executed and delivered shall be an original and all of which taken together shall constitute one and the same instrument. A faxed copy or photocopy or a .pdf of this Agreement executed by a party in counterpart or otherwise will constitute a properly executed, delivered and binding agreement or counterpart of the executing party. The failure of either party to insist upon strict performance of any of the covenants and provisions hereof shall not be deemed a waiver of any rights or remedies provided herein or a waiver of any subsequent breach or default.

This Agreement will be construed and the legal relationships between the parties determined in accordance with the laws of the Province of Manitoba and the laws of Canada.

Any notice required or authorized under this Agreement to be given by either party to the other party shall be in writing and may be delivered in person or by courier, or sent by prepaid registered mail and addressed to the addresses described above or such other parties or such other addresses as either party shall notify the other party in writing. Any notice given shall be deemed to be received on the date of delivery by person or by courier, as the case may be, or on the fifth business day following the date of mailing.

Any indemnity or any obligation of confidence under this Agreement is independent and survives termination or expiration of this Agreement. All obligations under this Agreement that necessarily extend beyond termination of this Agreement in order to fully achieve their intended purpose shall survive termination of this Agreement, including without limiting the generality of the foregoing, all indemnification provisions, representations, warranties, covenants, limitation of liability provisions and ownership provisions.

Schedule D Code of Conduct

North Forge is dedicated to providing an ethical, safe, peaceful, and enjoyable working environment for everyone; therefore, we have adopted the following codes of conduct to address harassment, and respect of workspace cleanliness and noise level in the co-working space.

Harassment includes, but is not limited to, reasonably offensive verbal comments related to gender, gender identity and expression sexual orientation, disability, physical appearance, body size, race, ethnicity or religion; sexual images in public spaces; deliberate intimidation; stalking; following; harassing photography or recording; sustained disruption of talks or other events; inappropriate physical contact; and unwelcome sexual attention.

Keeping North Forge tidy is a requirement in maintaining a quality workspace. Work areas, as well as food and lobby area are expected to be kept clean and presentable. Our ‘rule of thumb’ is to clean an additional few meters of space around you. This means cleaning up after yourself in your desk area in addition to more space, in the Fabrication Lab as well as the lobby area. Also, food stored in the fridge should be labeled with your name and date.

Proper etiquette in regards to using the Fabrication Lab and co-working spaces are public places of business and should be treated as such. Therefore, you and our guests should be treated by members with respect and refrain from activities that disturb others in any way.

Members must be mindful not to disturb the noise environment, or any specific member of the environment. This is a co-working space. We expect our members to make efforts to recognize the needs of others, and a balance should always be sought to recognize the needs of one, while not hindering the needs of another.

Co-working space members need to be actively working on a start-up business.

If you believe any of the conduct codes outlined above are not being met, please contact (Marney Stapley 204-799-2033 mstapley@northforge.ca). North Forge may take any action they deem appropriate, including warning the offender or revocation of membership. We value all of our members. We expect participants to follow these rules at all event venues and event-related social events.

Current Trainers at North Forge

INSTRUCTORS/TRAINERS		
Name	Email	Subject Matter Expert
Richard Venzon	richard@vnznconcepts.com	3D Printing
Matt Olson	molson@northforge.ca	CNC Wood Room
Lawrence Rosdobutko	i300z24@hotmail.com	Welder, Metal Room
John Hache	superpuzzles.quicksolver@gmail.com	CNC Wood Room Overall Helper
Morgan Fiks	morganfiks@gmail.com	Wood worker, Construction, Laser Room Champion
Doug Campbell	dougfungus@hotmail.com	Woodworker
Jamie O'Neill	philomathcraft@hotmail.com	Vinyl Cutter
Thomas Tataryn	tjet325@hotmail.com	CAD
Matthew Gale	matthew.db.gale@gmail.com	3D Printing, Fortus

17. North Forge Safety Policy Statement

Updated: July 24, 2020

Manitoba Workplace Safety and Health Act & Regulations. Workplace Safety and Health Program. Content of the Program. 7.4(5).

North Forge recognizes that every member has the right to work in a safe and healthy environment. It is the Policy of North Forge that all work and projects be planned and performed in the safest manner reasonably possible, meeting or exceeding the applicable health and safety regulations.

Believing that safety and production should enjoy a symbiotic relationship and that only together can they generate the quality outcomes our members expect and the working environment and conditions all members deserve. North Forge is committed to fostering and supporting a culture of *Safe Production*.

Recognizing that effective hazard identification, assessment and control is a critical component of safe production, North Forge requires all members to actively participate in this process and to work in a manner that is safe and in accordance with local regulations and the North Forge Fabrication Lab Safety Manual.

Compliance with the North Forge Fabrication Lab Safety Manual will be regularly monitored and contraventions addressed promptly in accordance with the *Disciplinary Policy* set out in the Manual. The Manual itself will be reviewed annually and updated as warranted.

All members and employees of North Forge are encouraged to familiarize themselves with this manual and the policies set-out within as we believe they effectively complement the three basic rights of all members under legislation and contribute to ensuring a safe work environment:

- Right to know, or to be informed about, actual potential dangers in the workplace.
- Here is a link to the Workplace Safety and Health Legislation

http://www.gov.mb.ca/labour/safety/pdf/1_2016_wsh_ar_oc.pdf

All members are to take reasonable care to protect their safety and health and the safety and health of other members who may be affected by their acts or omissions at the shop. At all times, members must use all devices and protective equipment designated for their protection or required to be used and worn by them by the regulations.

Members must consult and cooperate with the Safety Committee regarding the duties and matters at the Fabrication Lab. All Safety concerns and issues must be reported in a timely manner in person to the Vice-President at the Fabrication Lab or on the Safety channel on Slack.

North Forge is committed to working in spirit of cooperation with all of our members, contractors, and suppliers to provide a healthy and safe work environment and to build and sustain a strong safety culture. We encourage all parties to offer ideas and suggestions to achieve this objective and to help continuously improve the North Forge Fabrication Lab Safety Program.



Joelle Foster
Chief Executive Officer, North Forge Technology Exchange

Visitor Liability Waiver

It is the policy of North Forge to ensure the Health and Safety of all visitors to our Fabrication Lab.

All visitors are to check in on our tour [check in form](#) . The Check in form includes a liability waiver that is required before entering the Fabrication Lab. A sample waiver is attached to this section.



Joelle Foster
Chief Executive Officer, North Forge Technology Exchange

List of Forms

Copies of the following forms are included in Section xx of this manual and are available in electronic format.

1. Visitor Waiver
2. [Tour Waiver](#)
3. Member Waiver



18. Substance Abuse Policy

The use of drugs or alcohol can impair a person's judgement and pose a significant risk to the individual, other members, the company and the general public. Accordingly, North Forge Fabrication Labs commitment to providing a safe, healthy, productive and lawful working environment requires that we deal quickly and effectively with issues of member impairment.

Policy Statement

Impaired individuals will not be tolerated at the North Forge Fabrication Lab. Individuals under the influence of drugs or alcohol will be escorted out of the Fabrication Lab immediately and their key fob will be deactivated for the remainder of the day.

Prior to returning to the Fabrication Lab, the individual will be warned that any further incident of impairment will result in immediate deactivation of membership indefinitely.

If any member is undergoing prescribed medical treatment with any substance that might adversely affect their performance operating equipment or endanger the safety of others, it becomes mandatory that you do not operate equipment in the Fabrication Lab. All other activities in the Fabrication Lab is acceptable. Example: a member is on a certain drug that could impair them and they recognize the label warnings and therefore, do not intend to use the equipment at North Forge. Always read and follow warnings on drug packaging especially avoiding using heavy equipment until you know how the drug affects you.

North Forge reserves the right to ask members about substance abuse including when an individual is directly involved in a workplace incident.

If North Forge is informed that an alcohol or drug problem exists with any member and there is reasonable and probable cause for suspension it will be implemented immediately. This may include:

- The smell of alcohol or other substance on their breath or person
- Slurred speech pattern
- Unsteadiness in talking and / or standing

- Erratic or unusual behaviour
- Unsafe conduct
- Marked changes in appearance
- Repeated errors or other unexplained changes in job performance

The above listed may be a result of another disease that is an alcohol or drug problem. A letter from the member's Doctor may be required.



Joelle Foster
Chief Executive Officer, North Forge Technology Exchange

19. Tools and Equipment Safety

A comprehensive video platform helps Fabrication Lab members learn more about the equipment safety. The videos, filmed at the Fabrication Lab, include an overview of each room and how to operate the equipment within it in a safe manner. The platform also includes resources including sample projects and templates, and links to manufacturers' manuals and websites. While members are required to attend standard orientation and safety training prior to receiving access into the Fabrication Lab, the training platform offers instruction for equipment use.

The training videos are included on our website as well as QR Codes are located on each equipment room directly members to the training videos.

<http://training.northforge.ca/main-menu/>

The Videos included (but not limited to) the following:

- 3D Printing Room Overview and Safety - An overview of the equipment available in the 3D Printing Room and how to operate it safely.
- Electronics Room Overview and Safety
- Heavy Metal Area Overview and Safety
- Laser Room Overview and Safety
- Using the Dust Interlock System - Learn how to use the dust interlock system in the Wood Room and CNC Room.
- Paint Room Overview and Safety
- Tool Room Overview and Safety - An overview of the equipment available in the Tool Room and how to operate it safely.
- Wood Room Overview and Safety.



20. Positive Incentive Program

Revised: October 14, 2018

Introduction

North Forge Fabrication Lab believes that the best incentive to work safe should be the desire of each member to leave the Fabrication Lab as healthy as when they arrived. Similarly, the desire to see other members remain healthy and safe as well.

Nonetheless, a “Positive Incentive Program” can be to work safely are an effective complement to a company’s safety culture and its discipline policy, reinforcing safe work practices and procedures, contributing to the development of safe work habits, and serving as a vehicle for ongoing safety education and continuous improvement.

Positive Incentive Program Policy

It is the policy of North Forge Fabrication Lab to recognize and reward safe work practices and safe behaviour. To this end we have developed a Positive Incentive Program for members to have recognized achievements to promote and encourage safe behaviours.

Near Miss / Unsafe Conditions

Employees may receive recognition for positive contribution to proactive reporting of Near Misses and / or Unsafe Conditions.

Recognition will typically be based on the content (quality) of the submission. It is the responsibility of the member to ensure that their name is on Near-Miss card in order to be eligible. These cards will be reviewed and evaluated by the Vice President for content and clarity prior to recognition being awarded.

Behaviour Based Observation

Members may receive recognition based on the recommendations of the Safety Lead or Safety Committee based on observed safety behaviours - recurring or event specific.



Safe Work Procedures (SWP) - Table of Contents

SWP - A

- Air Compressor
- Angle Grinder

SWP - C

- CNC 3-Axis Shopbot

SWP - D

- Cordless Drill
- Cordless Hammer Drill
- Drill Press
- Powered Hand Drill

SWP - E

- English Wheel

SWP - F

- 5 Axis Shopbot

SWP - G

- General Safety Department
- Belt Sand/ Disk Grinder
- Bench and Pedestal Grinder

SWP - H

- Hand Held Router
- Hand Tools
- Hydraulic Sheer

SWP - J

- Jointer

SWP - L

- Epilog Fusion Laser
- Epilog Helix Laser
- FiberMark Fusion Laser
- ILS Universal Laser
- LPKF Protolaser S
- LPKF ProtoMat

SWP - M

- Manual Metal Lathe BD920W
- Miller 212 MIG Welder

SWP - O

- Oscillating Sander

SWP - P

- Paint Room
- Thickness Planer
- ArcLight Arc Pro 9600 CNC Plasma Cutter
- HP DesignJet Wide Format Plotter
- Pneumatic Nailer and Stapling Tools
- Polyurethanes
- Board Pick and Place ProtoPlace S

SWP - S

- Disc-Belt Sander
- Band Saw
- Chop Saw
- Circular Saw
- Compound Mitre Saw
- Horizontal Band Saw
- Panel Saw
- Saw Stop
- Table Saw
- SMT Solder Oven LPKF Protoflow

SWP - T

- TIG Welder
- Tormach PCNC1100 Lathe/Mill

SWP - U

- Utility Knife

SWP - V

- Formech Vacuum Former
- Variety Sander
- Vinyl Cutter

3D PRINT ROOM

- Form 1 3D Printer
- Fortus 400 mc 3D Printer
- MakerGear 3D Printer
- PRUSA 3D Printer
- Ultimaker 3D Printer
- uPrint
- ZPrinter 650 3D Printer



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Hearing Protection Required
- No loose fitting clothing
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required
- No jewelry, watches, rings, necklaces etc.

Potential Hazards

- Unsecured hoses whipping under pressure
- Compressed air

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Check that all fittings and connections are in good condition prior to starting.
- Check all fittings are securely connected prior to being pressurised.
- Faulty equipment must not be used. Immediately report suspect machinery.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Disconnect power before servicing air compressor

Prohibited Activities

- Do not leave air hose pressurized when unattended

Safe Work Procedure

1. Wear appropriate personal protective equipment (PPE).
2. Make all adjustments with POWER OFF. Start the compressor noting pressure increase and cut-out/cut-in pressure.
3. Listen for any air leaks from any flexible airlines and immediately report if any

leaks are observed.

4. Adjust pressure regulator to suit work requirements.
5. Check the compressor at regular intervals.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Switch off machine.
- Leave the machine, hose and work area in a safe, clean and tidy state.



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Approved Dust Mask Required
- No loose fitting clothing
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required
- No jewelry, watches, rings, necklaces etc.
- Hearing Protection Required
- Face-Shield Required
- Leather Gloves Required

Potential Hazards

- Cuts, lacerations and amputations
- Dust/debris irritation
- Noise
- Projectile work pieces/tools from improper set up or speed setting
- Burns
- Sparks
- Fumes
- Hot materials

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Make sure guards, if present, are installed and are working properly.
- Faulty equipment must not be used. Immediately report suspect machinery.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Disconnect power supply before changing or adjusting grinding wheels

Prohibited Activities

- Do not leave this equipment unattended while running

Safe Work Procedure

1. Wear appropriate personal protective equipment (PPE).
2. Make sure all guards are in place, properly adjusted, and secured. Check grinding wheel carefully for cracks or damage before operation.
3. Make all adjustments with power cord unplugged.
4. Ensure power switch is on OFF position before plugging in. Check that cord is away from path of tool.
5. Remove any wrenches and adjusting tools before turning ON.
6. Ensure that work piece is properly secured, clamp if necessary.
7. During use, keep power cords clear of tools and the path that the tool will take.
8. Keep power cords away from heat, water, oil, sharp edges and moving parts. They can damage the insulation and cause a shock.
9. Turn power ON and allow motor to come to full speed before using. (Anticipate torque on start-up).
10. Perform operation safely and at a moderate pace; use the specified surface of the wheel to perform the grinding.
11. Turn power OFF and allow machine to stop before setting down.
12. Clean up dust and debris with POWER OFF.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Ensure equipment is off.
- Place all materials in their proper storage areas.
- Ensure the equipment is safe, clean and tidy before you leave it.



Required Personal Protective Equipment and Devices

- Use Personal Safety Equipment when using the CNC equipment. Must **wear safety glasses and hearing protection.**
- Loose clothing, long hair, personal stereo wires and jewelry may become entangled in rotating equipment.
- Know what you are doing. Ideally, get training on the equipment.

Safety Warnings

Never leave a machine running and unattended. Understand that a spinning tool generates friction and **heat, creating a risk of fire.** This risk is minimized by using correct chip load, using sharp bits, and by always double-checking your files before cutting. Be prepared to pause or stop the cut if something seems incorrect or unsafe.

Using the equipment

- **Do not let the machine run without being trained.** Software/program glitches can cause the cutting head to veer off unexpectedly resulting in severe damage equipment
- **Stay out of the way of a moving machine:**

- Never touch a rotating tool bit
- Never attempt to measure parts or clean the machine while the milling cutter is rotating.
- Never reach over the machine while the cutter is rotating.
- **Secure the workpiece:** Make certain that the workpiece is securely fixed and that all components of the fixture are securely fastened to the table. Parts that have not been properly secured to the cutting table can become lethal projectiles.
- **Sharp edges:**
 - Milling cutters can be extremely sharp. When changing tools, always wrap the cutter in a rag.
 - The chips produced in milling metal can be razor sharp. Always use a brush to clean a machine. **Do not use compressed air to blow the chips off of the machine or your clothes.**
- **Avoid fixtures:** Before powering up the spindle, make certain that the milling cutter, its tool holder, and the spindle, are free of the workpiece and will not run into any of the fixturing components.
- **Feeds and speeds**
 - If improperly used, milling cutters may shatter. If this occurs, sharp fragments of metal will fly off at high velocity.
 - Calculate the proper spindle speed and table feed rate before beginning a cut.
 - If the workpiece begins to vibrate, or the cutter makes excessive noise, stop cutting immediately.
 - Do not attempt to take a heavier cut than the cutter or the workpiece setup can handle.
 - Know how the physical properties of the material being cut affect the way that cut should be done.
- **Remove loose parts:** make certain all loose tools, spindle wrenches, chuck

keys, and measuring tools have been removed from the machine.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Approved Dust Mask Required
- No loose fitting clothing
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required
- No jewelry, watches, rings, necklaces etc.
- Hearing Protection Required

Potential Hazards

- Foreign materials in workpiece
- Cuts, lacerations and amputations
- Dust/debris irritation
- Noise
- Electrical shock

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Make sure guards, if present, are installed and are working properly.
- Faulty equipment must not be used. Immediately report suspect machinery.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Disconnect power supply before changing or adjusting bits
- Ensure insulated gripping surfaces are in working condition

Prohibited Activities

- Do not leave this equipment running unattended
- Use the correct drill bits for the work material.

Safe Work Procedure

1. Wear appropriate personal protective equipment (PPE).
2. Make all adjustments with battery unplugged.
3. Ensure batteries are installed and handled correctly, and that attachments (example: drill bits and auxiliary handles) are secured properly to tool.
4. Remove any wrenches and adjusting tools before turning on a tool.
5. Mark the center of the hole to be drilled with a center punch.
6. Lubricate the drill bit with cutting oil when drilling iron or steel. Use a coolant when drilling nonferrous metals such as copper, brass or aluminum.
7. Before drilling, clamp down material securely.
8. Hold drill by insulated gripping surfaces.
9. Turn power ON and allow motor to come to full speed before using. (Anticipate torque on start-up.) Perform operation safely and at a moderate pace.
10. Do not touch the workpiece immediately after operation; it may be extremely hot and could burn your skin.
11. Turn power OFF and allow machine to stop before setting down.
12. Clean up debris with power OFF.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Switch off the machine and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.
- When servicing equipment (ex. changing a bit), power must be disconnected.
- Return tools to proper storage location after use.

Safe Work Procedure

Cordless Hammer Drill

Revised: September 18, 2018



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Approved Dust Mask Required
- No loose fitting clothing
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required
- No jewelry, watches, rings, necklaces etc.
- Hearing Protection Required

Potential Hazards

- Foreign materials in concrete
- Cuts, lacerations and amputations
- Dust/debris irritation
- Noise
- Electrical shock

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Make sure guards, if present, are installed and are working properly.
- Faulty equipment must not be used. Immediately report suspect machinery.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Disconnect power supply before changing or adjusting bits
- Ensure auxiliary handle is securely attached
- Ensure insulated gripping surfaces are in working condition

Prohibited Activities

- Do not leave this equipment running unattended
- Use the correct drill bits for the work material.

Safe Work Procedure

1. Wear appropriate personal protective equipment (PPE).
2. Make all adjustments with battery unplugged.
3. Ensure batteries are installed and handled correctly, and that attachments (example: drill bits and auxiliary handles) are secured properly to tool.
4. Remove any wrenches and adjusting tools before turning on a tool.
5. Before drilling, clamp down material securely.
6. Hold hammer drill by insulated gripping surfaces and auxiliary handles.
7. Turn power ON and allow motor to come to full speed before using. (Anticipate torque on start-up.) Perform operation safely and at a moderate pace.
8. Do not touch the workpiece immediately after operation; it may be extremely hot and could burn your skin.
9. Turn power OFF and allow machine to stop before setting down.
10. Clean up debris with power OFF.
11. Return tools to proper storage location after use.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

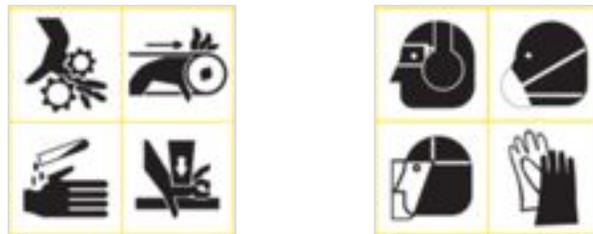
- Switch off the machine and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.
- When servicing equipment (ex.changing a bit), power must be disconnected.



Required Personal Protective Equipment and Devices

- Long or loose hair must be tied back or contained
- No loose fitting clothing
- No jewelry, watches, rings, necklaces etc.
- Safety Eye Wear (welding goggles) and face shields

Hazards



Rules of Safe Operation

- Do not operate the drill press when tired, distracted, or under the effects of drugs, alcohol or any medication that impairs reflexes or alertness.
- The working area should be well lit, clean and free of debris.
- Keep children and visitors at a safe distance when the drill press is in operation ; do not permit them to operate the drill press.
- Childproof and tamper proof your shop and all machinery with locks, master electrical switches and switch keys, to prevent unauthorized or unsupervised use.

- Stay alert! Give your work your undivided attention. Even a momentary distraction can lead to serious injury.
- Fine particulate dust is a carcinogen that can be hazardous to health. Work in a well-ventilated area and whenever possible use a dust collector and wear eye, ear and respiratory protection devices.
- Do not wear loose clothing, gloves, bracelets, necklaces or other jewelry while the drill press is in operation.
- Be sure that adjusting wrenches, tools, drinks and other clutter are removed from the machine and/ or the table surface before operating.
- Keep hands well away from the drill bit and all moving parts. Use a hold-down or clamp to secure the stock, and use a brush, not hands, to clear away chips and dust.
- Be sure that the drill bit is securely installed in the chuck before operation.
- Be sure the drill bit has gained full operating speed before beginning to drill. Always use a clean, properly sharpened bit. Dirty or dull bits are unsafe and can lead to accidents. Use suitable workpiece support if the workpiece does not have a flat surface.
- Do not push or force the bit into the stock. The drill will perform better and more safely when working at the rate feed for which it was designed.
- Avoid working from awkward or off balance positions. Do not overreach and keep both feet on floor.
- Keep guards in place and in working order. If a guard must be removed for maintenance or cleaning be sure it is properly re-attached before using the tool again.
- Never leave the machine unattended while it is running or with the power on.
- Use of parts and accessories NOT recommended by GENERAL® INTERNATIONAL may result in equipment malfunction or risk of injury.
- Never stand on machinery. Serious injury could result if the tool is tipped over or if the drill bit is unintentionally contacted.
- Always disconnect the tool from the power source before servicing or changing accessories such as bits, or before performing any maintenance, cleaning, or if

the machine will be left unattended.

- Make sure that the switch is in the “OFF” position before plugging in the power cord.
- Make sure the tool is properly grounded. If equipped with a 3-prong plug, it should be used with a three-pole receptacle. Never remove the third prong.
- Do not use this drill press for other than its intended use. If used for other purposes, GENERAL® INTERNATIONAL disclaims any real implied warranty and holds itself harmless for any injury, which may result from that use.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Switch off the machine and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.
- When servicing equipment, power must be disconnected.

Safe Work Procedure

Powered Hand Drill

Revised: September 19, 2018



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Approved Dust Mask Required
- No loose fitting clothing
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required
- No jewelry, watches, rings, necklaces etc.
- Hearing Protection Required

Potential Hazards

- Loose knots or foreign materials in wood
- Cuts, lacerations and amputations
- Dust/debris irritation
- Noise

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Make sure guards, if present, are installed and are working properly.
- Faulty equipment must not be used. Immediately report suspect machinery.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Disconnect power supply before changing or adjusting bits

Prohibited Activities

- Do not leave this equipment running unattended
- Do not use drill bits designed for wood with metal

Safe Work Procedure

1. Wear appropriate personal protective equipment (PPE).

2. Make all adjustments with power cord unplugged.
3. Ensure batteries are installed and handled correctly, and that attachments (example: drill bits and grinding wheels) are secured properly to tool.
4. Ensure power switch is on OFF position before plugging in. Check that cord is away from path of tool.
5. Remove any wrenches and adjusting tools before turning on a tool.
6. Ensure that work piece is properly secured in vice or clamped to table.
7. During use, keep power cords clear of tools and the path that the tool will take.
8. Keep power cords away from heat, water, oil, sharp edges and moving parts. They can damage the insulation and cause a shock.
9. Follow good housekeeping procedures - keep the work area free of clutter and debris that could be tripping or slipping hazards.
10. Turn power ON and allow motor to come to full speed before using. (Anticipate torque on start-up.) Perform operation safely and at a moderate pace.
11. Do not touch the workpiece immediately after operation; it may be extremely hot and could burn your skin.
12. Turn power OFF and allow machine to stop before setting down.
13. Clean up debris with power OFF.
14. Return tools to proper storage location after use.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Switch off the machine and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.
- When servicing equipment (ex. changing a bit), power must be disconnected.



Required Personal Protective Equipment and Devices

- ALWAYS WEAR SAFETY GLASSES OR ANY APPROVED EYE PROTECTION DEVICES WHEN OPERATING THIS MACHINE.
- Safety Footwear
- Before operating this English wheel, remove tie, rings, watches and other jewelry, and roll sleeves up past the elbows. Remove all loose clothing and confine long hair.

Potential Hazards

- KEEP WORK AREA CLEAN AND WELL LIGHTED.
- Stay alert, watch what you are doing and use common sense when you are using this equipment. Do not operate this tool when you are tired, ill or under the influence of alcohol, drugs or medication.
- Do not over-reach. Keep your proper footing and balance at all times.
- Concentrate on the job in hand, no matter how trivial it may seem. Be aware that accidents are caused by carelessness due to familiarity.
- Do not wear loose clothing or jewellery which may get caught in moving parts. Wear protective hair covering to contain long hair. For best footing, wear rubber soled footwear. Keep floor clear of oil, scrap wood, etc.
- Keep equipment clean for the best and safest performance. Check for misalignment or binding of moving parts, broken parts, or any condition that may

affect the tool's operation. If damaged, have the tool repaired before use.

- Always hold the workpiece securely. Large workpieces should always be well supported to avoid loss of control.
- Secure the English Wheel frame to the floor to prevent it from moving or tipping over in use.
- Sheet metal may have sharp edges. Always wear gloves when handling sheet metal and use caution when bending and cutting.
- Rollers are heavy, take care when handling.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Safe Work Procedure

5 Axis ShopBot

Created: September 28, 2018



Required Personal Protective Equipment and Devices

- Eye and ear protection **MUST** be worn by the machine operator as well as any bystanders or observers.

Potential Hazards

Flying sawdust, material chips, and other debris can cause serious eye injury. Wear closed-toe shoes at all times. Make sure that your material is properly secured before cutting, and be aware of any small parts that may come loose after being cut. If a small part catches the edge of a spinning bit, it can be thrown forcefully in any direction, causing injury or damage.

Never place your hands on the rails of the ShopBot. Be aware that the machine may move unexpectedly in any direction, which can cause serious injury if your hands are in the path of movement.

Never wear gloves while operating the machine. As with any power tool, a glove can get caught in moving or spinning parts and pull your hand into the machinery.

Never leave a machine running and unattended. Understand that a spinning tool generates friction and heat, creating a risk of fire. This risk is minimized by using correct chip load, using sharp bits, and by always double-checking your files before cutting. Be prepared to pause or stop the cut if something seems incorrect or unsafe.

Keep a working fire extinguisher within reach of the machine, for the reasons listed

above.

Usage Procedures

Show the process from a solid model to finished object. The process of selecting and manipulating geometry is totally different. I just learned this one trick to test things with the software that AW has a license for. --Ensure the part origin is suitable. Import the model. Delete any faces you don't want the tool to go over. Make sure the origin is in the right place. I only know how to change it by changing tUse the parallel paths option. It can be changed using the "plane manager" if you can find it. Otherwise, it is assumed to be the same as whatever the origin in the solid model is, which is manageable. --Show changing the stock size. --Show simulation of the process. How you can change it and re-simulate. Which settings to use for the simulator. -measure the tool length, post it, modify the posted file. Set wcs, air test and then checklist, put stock in place, then run the program. -separate part, cleanup, done

Operation

- turn everything on:
 - air
 - main box
 - computer
 - monitor and spindle interlock

zeroing the axis

In 5 axis milling, the rotary axis must be zeroed relative to each other for the tool to be at the right tilt angle.

First, move the rotary axis using the jog or by hand to the pre-home position, in which the side marked with the marked to such effect is facing the monitor/computer keyboard area, and the tool is roughly straight down, then run the program in c:\sbparts with

"xyzab zero" in the name.

Setting the tool length:

Tool length must be set separately with 5 axis milling.

There is the program to measure the tool length named "tool_length.sbp" in c:\sbparts\five axis. Not the other with similar names. Attach the electrode clip to the tool and run this program.

Remove the clip afterwards! Put it on the plastic part, not connected to any metal parts of the machine, or it may lead to a conductive path to the z measurement plate, which can lead to unexpected behaviour, as this is used as an input sometimes.

It does a little routine and then displays a value, but changes no settings anywhere. This value is approximately the right value to enter in to the post processor when it asks you for the tool length. It may be not very accurate. To get a more accurate value, cut a cylinder as accurately as you can with a given tool, measure the diameter of it, and adjust the tool length you tell the post such that the cylinder is of the size specified in the solid model. I have not taken the time to do this. It appears that the figure that the measuring program gives is within 5 or ten thou.

Post processing your toolpath

After the pathing, feed and speeds are set up, Mastercam uses an internal format to describe toolpaths. To convert this to actual gcode that the machine will run, you post-process this internal data. We got the post processor, from mastercam.

It is important to note that the feet rate is limited by the linear axis feed rates, and I have not checked to see if the shopbot obeys the gcode commands accurately, either.

Because of the way the machine moves, the tip of the tool in many cases, if moving around a relatively small circle near the pivot point, for instance, cannot move nearly as

fast as the linear feed rate limit of the the axis.

setup of the post in mastercam

Ok, so when you start your file in mastercam select the shopbot machine under routers from the machines menu. Make sure it is reflected in the machine group you are using. See mastercam tutorials.

Modifying the post processed file

It is important to note that the post inserts code to return the a and b axis to zero at the end of each operation, not just each program. So a pocket followed by a contour operation will after posting, contain two such stray moves in the program. This is in addition to what was simulated in mastercam. This may cause the cutter to hit something accidentally, especially as the head tends to be lower at the end of the cut, so it may hit the bottom of the machine. I recommend removing it.

However it continues to be a problem, as every time you modify the program and re-post it you have to remember to remove it. Eventually someone will forget. Always watch the machine closely, ready to e-stop it, and test the whole program before assuming how things will go. This is not very practical for large programs. In normal CNC machine use, you are supposed to be able to depend on the simulation, and there is a feed rate override on the machine, which lets you increase the speed of things so you can test a program in a more reasonable time frame.

If the thing moves very slowly at the beginning of the program, that always happens.

The b axis seems to go slowly for whatever reason at the beginning of programs, but picks up later. It might be increased by adding F100 word to the g0 command to set the feed rate. Gcode letters must be in capitals, for the shopbot interpreter. This is a deviation from the standard.

Also the spindle fails to start with the code as is. The following works and should

replace the two lines at the beginning of the file which start (after the Nwhatever)with TR and SO, but with the numbers changed to whatever was in your file, as it is the spindle RPM. TR,9000 SO,1,1

The post probably just makes a mistake in the spacing in one of the lines above.

Removing the cn 61 command is part of getting the g0 command to move the rotary axis at a reasonable speed, but I haven't figured that out yet.

So after post processing, you need to change the code in the above manner to get the spindle to start, and I recommend also removing that last rotation move at the end.

It is very important to note that the system will not give any kind of error if the rotary or other axis are unable to maintain the ordered feed rate. It just won't and it may not be obvious. This may lead to the tool being tilted wrong etc.during some portions of the cut.

I also have not checked if it obeys the feed rates in the gcode very well even within the speed limits of the machine, or what the feed rate limits are. This should be done and added to this doc. This is fundamental to the milling process, so something needs to be figured out, maybe just how to calculate the limits manually, so you can avoid them.

Fortunately for wood and foam, they are not very picky anyway.

Remember that the system fails to pay sensible attention to the limit switches. If the pathing tells the head to go outside the working volume of the machine, it will jam the machine axis at an extreme. This isn't super harmful, but I don't know about wear and tear. Also, it can cause the system to lose the zero, possibly without you realizing it.

This can lead to the cutter etc. going places you did not expect, which were different from the air test and sim etc.

Setting the work coordinates system origin

Essentially the same as the 3 axis shopbot. I have not checked to see if the metal plate thing works with the new firmware to set the z height, but it did with the old. I just set it manually, just slow the jog rate down.

After setting the work coordinates, it is good practice to raise the z up a few inches.

Normal CNC and shopbot type things like air testing, good fixturing: Not something I was going to spend much time on. Five axis is different re fixturing due to the clearance needed around the parts. One major issue is that you can't produce very many parts in one run, due to the complications here. -Pre-program start checklist, five most important things: --Stock is thoroughly fixtured, --WCS origin is set, --Feeds and speeds are good. --Nothing will run into anything inadvertently. --Safety glasses on

5 axis milling generally -The program code (mostly gcode) speaks of the controlled point. In the case of the shopbot, that is the intersection of the rotary axis inside the head. In most machines it is the actual tip of the tool.

Things to be aware of: shopbot software sucks badly. When you press the software stop, it raises the x axis, which often makes no sense as the tool is buried. The preview feature does not work. It backplots the point in the center of the head, not the tool tip.

-The operators log. It doesn't seem like much, but it is a good, time tested way to help people work together, and improve efficacy.

-It often crashes if you stop a program with the software stop.

-The rotary axis will droop when the estop is engaged in many cases, and the tool keeps rotating, so it can easily hit something.

So there is no really good way to stop the machine. The e-stop is probably the better option. Wear eye protection at all times in case the motions cause cutter breakage. A spring on the b axis to prevent droop might be the best way to improve the system, so the e-stop can be safely used.

-What shopbot calls an A axis is what the industry standard terminology refers to as a C axis. This is a head-head machine.

-The location of the computer should be changed so you can see things better.

-There is an area on such machines near the top of a part, when the tool is nearly vertical, where the two rotary axis cannot move fast enough to keep in sync with each other and thusly produce the necessary tool tilt angle change rate at a given desired/commanded feed rate.

-The cables twist when the A axis moves. Pathing software is accustomed to this sort of limitation and almost always takes care of that, avoiding continuous motions.

-The software keeps crashing constantly. It fails to use the limit switches to stop the motion of the machine when you get to the extreme end of an axis. However if you home the axis it remembers the positions of the axis and uses a software limit to stop the axis before they hit the physical stop. If the axis positions become unknown accurately to the computer, which it may not tell you, then the software limit may not work.

-- The software crashes if the motors reach the end of an axis and jam there.

--Problems can fairly often be solved by closing and reopening the software. Sometimes the tool measurement program just fails to show the actual number, for instance. Just close and re-open. It is that poor.

-If the motors jam against something, the controller box at the firmware level recognizes this after a second or two, and drops power to the motors. This can cause them to droop, which can be dangerous if the cutter hits something.

- The spindle warm up for 3 minutes routing may be useful to increase accuracy. I observed some large changes >50 thou in dimensions of some cutting after the spindle had been running for a while.

- I recommend looking through the digital manual for the 5 axis, not the same as the printed one in the cupboard. It explains what the air cylinder is for etc.(it is like a

counterweight for the z axis).

More stuff: -There is a pdf document on the mastercam and other computers entitled "introduction to 5 axis milling with mastercam" or somesuch, which is helpful. It is the only 5 axis specific training stuff for mastercam I could find anywhere, searching and googling high and low, except for some serious \$.

All the old files and teh post processor should be backed up. Some of the new five axis files that come with the shopbot program do not work, whereas the old do.

The post processor is supplied by Mastercam, fortunately for free. Usually they charge tons of money for these posts. It took many back and forths with tech support. The generic post for the fanuc router which shopbot recommends I could never get working, and stopped trying after getting the shopbot post. The fanuc one was giving a perplexing problem in which the part was skewed at about 22 degrees, or the y axis would fail to go back to zero when commanded to in the code, instead going slightly off each time, and apparently related somehow to the arc feed commands. Serious bugs with the shopbot software itsself are implicated, as the gcode produced checked out ok, telling the controlled point to go to all the right places.

-The industry standard is for the gcode to speak only of the controled point. The machine then does the necessary calculations to determine how to position the motors, given tool length etc.. In the shopbot's gcode, it speaks of the point inside the head where the rotary axis intersect.

-ao there are 4 coordinate systems involved here, and fortunately they all overlap or are very easy to take into consideration: the machine's absolute, which play a minor role, the toolpath WCS in mastercam, the program wcs after post-processing, and the part's wcs, which determines where the part appears relative to where the current program WCS is.

But they can sometimes change in ways that are not obvious.

-When turning the machine off, move everything so that the head is resting on the floor of the machine or a block of wood or something, because the whole head will drop after the air in the piston bleeds out.

-export from your solid modelling software as iges, step or parasolid recommended.
Step and Parasolid I read are the best.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.



General Safety Procedures

1. No person is to operate a machine without an instructor present.
2. Keep your mind and eyes on the job. No conversation, other than that associated with the job at hand should be conducted. Never approach a machine operator from behind. In plain words: no horseplay!
3. No person is to operate a machine or power tool unless he/she is familiar with its operation and understands the safety precautions.
4. Personal Protective Equipment (PPE) must be worn when working in this shop (safety glasses, safety shoes, and hearing protection).
5. All saw blades and knives must be sharp. Machines must be in good running condition with moving parts turning freely.
6. The work area around the machine must be clear of scrap materials. Tripping or stumbling can be serious.
7. Loose or torn clothing, neckties, etc. Must not be worn. Jewellery may be hazardous.
8. Guard and safety devices must be used whenever possible.
9. Keep machine top clear of tools and scrap materials. Vibrations may cause them to move into the revolving blades and cutters.
10. Allow the machine to come to a complete stop before making adjustments.
11. Do not force the stock into the machine. Get the feel of the machine. Feeding stock too fast will stall the motor; feeding it too slow will overheat the blade and cutters.
12. Do not stand in the line of motion behind any machine that can produce kickbacks.
13. Check used material for nails prior to machining. If painted material must be machined, neither blades nor knives will last long.
14. Turn off the power before leaving a machine.
15. No person is to operate a machine while intoxicated or under the influence of

prescription/non-prescription medication.

All procedures obtained from operator manuals or other samples must be thoroughly reviewed to ensure they are accurate for your workplace and your jobs!



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Approved Dust Mask Required
- Face-Shield Required
- Protective Apron Required
- CSA Approved Safety Footwear Required
- Long or loose hair must be tied back or contained
- Hearing Protection Required
- No jewelry, watches, rings, necklaces etc.
- No loose fitting clothing

Potential Hazards

- Cuts, and lacerations
- Sparks/Debris
- Noise

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Check workspaces and walkways to ensure no slip/trip hazards are present.
- Ensure all guards and safety shields are in position before starting the grinder.
- Disconnect power supply before changing grinding wheel or making adjustments.
- Ensure that the wheels do not touch the work rest and that the gap between wheel and rest is no greater than 1.5mm (1/16 inch).
- Check that wheels are running true and are not glazed or loaded.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Faulty equipment must not be used. Immediately report any suspect machinery.

Prohibited Activities

- Workpiece must never be held with gloves, cloth, or apron.

- Grinding non-ferrous metals
- Do not leave this equipment running unattended

Safe Work Procedure

1. Wear appropriate personal protective equipment (PPE).
2. Make all adjustments with POWER OFF. Adjust tool rest to within 1.5 mm (1/16 inch) of the wheel face.
3. Make sure all guards are in place, properly adjusted, and secured.
4. Inspect grinding wheel for cracks or damage before use.
5. Ensure area is free of flammable materials. Usage will produce sparks.
6. Turn POWER ON, stand to the side and allow motor to come to full speed before using. Dress grinding wheel with appropriate tool as needed.
7. Grind only on the face of the wheel, never the sides.
8. Hold work piece flat against worktable keeping fingers a minimum of 5 cm (2 inches) away from grinding wheel face. Hold small pieces of stock in a jig or holding device to prevent injuries to the fingers or hands.
9. Move the work back and forth across the wheel face.
10. Clean up dust and debris with POWER OFF.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Switch off the machine and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.
- When servicing equipment (exchanging a grinding wheel), power must be disconnected.



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Approved Dust Mask Required
- CSA Approved Safety Footwear Required
- No loose fitting clothing
- Hearing Protection Required
- Long or loose hair must be tied back or contained
- No jewelry, watches, rings, necklaces etc.

Potential Hazards

- Loose knots or foreign materials in wood
- Cuts, lacerations and amputations
- Dust/debris irritation
- Noise
- Projectile work pieces from improper clamping

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Make sure guards, if present, are installed and are working properly.
- Faulty equipment must not be used. Immediately report suspect machinery.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Hold tool by insulated gripping surfaces
- Check the bit carefully for cracks or damage before operation

Prohibited Activities

- Feed router in opposite direction from cutter rotation
- Do not smear the tool base carelessly with thinner, gasoline, oil or the like
- Do not leave this equipment running unattended

Safe Work Procedure

1. Wear appropriate personal protective equipment (PPE).
2. Make all adjustments with power cord unplugged.
3. Securely tighten cutter, and adjust depth of cut.
4. Ensure power switch is on OFF position before plugging in. Check that cord is away from cutting path.
5. Turn router ON before cutting head enters work piece. Wait for cutter to reach maximum speed before using.
6. Feed router into wood at moderate pace and in direction opposite from cutter rotation.
7. Keep router base flat against work piece during operation.
8. Remove cutter head out of work piece.
9. Turn router OFF.
10. Allow the router to stop rotating before setting machine down.
11. Clean up dust and debris with POWER OFF.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Switch off the machine and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.
- When servicing equipment (ex. changing a grinding wheel), power must be disconnected.
- Ensure ventilation openings and switch levers are kept clean and free of foreign matter.



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Approved Dust Mask Required
- No loose fitting clothing
- No jewelry, watches, rings, necklaces etc.
- CSA Approved Safety Footwear Required
- Long or loose hair must be tied back or contained
- Hearing Protection Required

Potential Hazards

- Loose knots or foreign materials in wood
- Cuts, lacerations and amputations
- Musculoskeletal injuries
- Dust/debris irritation
- Noise
- Fingers pinched

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Make sure guards, if present, are installed and are working properly.
- Faulty equipment must not be used. Immediately report suspect machinery.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Use with proper posture and body position appropriate to task
- Take breaks from static positions often

Prohibited Activities

- Use tools only for their intended purpose

Safe Work Procedure

1. Wear appropriate personal protective equipment (PPE).
2. Select the right tool for the job. Substitutes increase the chance of having an accident.
3. Ensure that workspace is free of clutter and allows room for task.
4. Ensure tool is in proper working order. For example: cutting tools are sharp, hammer heads and file handles are secure.
5. Use tools only for their designed purpose. Never use cheater bars, handles, or pipes to gain additional leverage. Do not apply excessive force or pressure on tools.
6. During operation, ensure that both hands are positioned safely, and feet are positioned for proper balance. Tool operation should be directed away from hands and body.
7. Pull on a wrench or pliers. Never push unless you hold the tool with your palm open.
8. Point sharp tools (e.g., saws, chisels, knives) laying on benches away from aisles and handles should not extend over the edge of the bench top.
9. Clean, then put tools away in appropriate spot immediately after use.
10. Clean up dust and debris.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Clean and inspect tools after each use
- Leave the tools and work area in a safe, clean and tidy state.

Safe Work Procedure
Hydraulic Shear

Created: September 22, 2018



Required Personal Protective Equipment and Devices

- ALWAYS WEAR SAFETY GLASSES OR ANY APPROVED EYE PROTECTION DEVICES WHEN OPERATING THIS MACHINE

Potential Hazards

DO NOT operate this machine WITHOUT manufactures hold-down assembly or an APPROVED Finger Guard installed.

DO NOT operate or store this machine in Damp or Wet conditions.

NEVER place any part of your body under the blade area.

NEVER allow anyone to support material being cut from the rear position of the machine.

NEVER operate this machine with the front and/or back panels removed.

DO NOT stack material to be cut, design is for single layer only.

Keep floors dry and free of clutter, maintain good footing, and do not "OVERREACH.

DO NOT use machine as a work table, material may slip into cutting path and cause serious damage and injury.

ALWAYS UNPLUG this machine before performing any type maintenance.

ALWAYS operate this machine from the front area.

Always lay material FLAT on table, do not support material as clamping may result in serious injury.

Always keep children, pets, and visitors at a SAFE distance from this machine when operating.

Feed material from the FRONT only.

Never FORCE the machine to cut, check Trouble Shooting Guide and Design Standards if problems arise.

Wear clothing that will NOT become caught on material.

NEVER wear neckties, long jewelry around the neck or on an arm, loose garments, or accessories of any type.

Check machine before every use for Damaged or loose material between blades.

Turn this machine OFF before leaving the work area.

KEEP FINGERS CLEAR OF THE BLADE AREA AND THE HOLDDOWN.

DO NOT CUT MATERIALS NOT DESIGNED FOR THIS MACHINE.

EXTREME AND / OR COSTLY DAMAGE AND / OR SERIOUS INJURY MAY OCCUR.

This machine is designed and manufactured to SAFELY cut "MILD STEEL" by GAUGE and TOLERANCES outlined below. DO NOT cut materials that are not within the specified tolerances of this machine... SERIOUS DAMAGE and / or INJURY MAY OCCUR.....

Carbon	Thickness	Tensile	Yield	Rockwell	Composition	Tolerance	Strength
Strength (Hardness)	GAUGE	(Ksi)	(Ksi)	(Ksi)	1/4"	20 - 25	.220 – .270 50 30 B65 **

Maximum tolerance are "Built Into" above stated figures ** Thickness of material must be ADJUSTED accordingly to compensate for HIGHER Tensile and / or HIGHER Rockwell. Aluminums, Stainless, Galvanized, and ALL alloys MUST fall within the above standards to accomplish a SAFE and SATISFACTORY CUT.

Keep work area and safe zones clean.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock

out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Approved Dust Mask Required
- No loose fitting clothing
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required
- No jewelry, watches, rings, necklaces etc.
- Hearing Protection Required

Potential Hazards

- Cuts, lacerations and amputations
- Dust/debris irritation
- Noise
- Loose knots or foreign materials in wood
- Projectile work pieces/tools from improper set up or speed setting
- Musculoskeletal injury from manoeuvring long stock

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Make sure guards, if present, are installed and are working properly.
- Faulty equipment must not be used. Immediately report suspect machinery.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Disconnect power supply before changing or adjusting blades

Prohibited Activities

- Do not Smoke (Fire Hazard)
- Do not leave this equipment unattended while running
- Do not reach across machine

- Do not let your hands come closer than 10 cm (4 inches) to the operating blade
- Do not cut stock free hand
- Do not plane end grain unless the board is at least 30 cm (12 inches) wide.
- Do not plane material under 30 cm (12 inches) in length
- Do not machine material thinner than 9 mm (3/8 inch)

Safe Work Procedure

1. Open dust chute and turn on dust collector.
2. Wear appropriate personal protective equipment (PPE).
3. Make sure all guards are in place, properly adjusted, and secured.
4. Make all adjustments with POWER OFF.
5. Provide a minimum clearance of at least 1 meter (3 feet) greater than the length of the longest stock being worked.
6. Set fence at required angle.
7. Adjust the fence to so that the distance from the end of the knives and the fence is 1 cm (½ inch) wider than the surface being planed.
8. Grasp wood firmly with both hands and press wood against middle of fence (fingers should not be lower than middle of fence) Always use push sticks if stock is shorter than fence.
9. Feed through jointer at a moderate speed with the grain. Do not run hands over top cutter head –maintain 10 cm (4 inch) margin of safety on either side.
10. Repeat steps 8 and 9 until edge is fully jointed.
11. Turn power OFF. Wait for machine to stop rotating before leaving.
12. Clean up dust and debris with POWER OFF.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Ensure equipment is off.
- Place all materials in their proper storage areas.
- Ensure the equipment is safe, clean and tidy before you leave it.



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required
- No jewelry, watches, rings, necklaces etc.
- Hearing Protection Required

Potential Hazards

- Noise
- Burns
- Sparks
- Fire
- Fumes

General Safety

Your laser system uses a high intensity beam of light that can generate extremely high temperatures when it comes into contact with the material being engraved, marked or cut. Some materials are extremely flammable and can easily ignite and burst into open flame setting the machine afire. This open flame is very dangerous and has the potential to destroy not only the machine, but the building in which it is housed. Experience shows that vector cutting with the laser has the most potential to create an open flame. Many materials are susceptible to igniting, but acrylic, in all its different forms, has been shown to be especially flammable when vector cutting with the laser. Please read the following warnings and recommendations and follow them closely at all times!

- NEVER let the laser system operate if it will be unattended.
- KEEP the area around the machine clean and free of clutter, combustible materials, explosives, or volatile solvents such as acetone, alcohol, or gasoline.
- ALWAYS keep a properly maintained and inspected fire extinguisher on hand. Epilog

recommends a Halotron fire extinguisher or a multi-purpose dry chemical fire extinguisher. The Halotron extinguishers are more expensive than a dry chemical, but offer certain advantages should you ever need to use an extinguisher. The Halotron extinguisher discharges a clean, easily removable substance that is not harmful to the mechanics or wiring of the laser system. The dry chemical extinguisher discharges a sticky, corrosive powder that is very difficult to clean up.

- ALWAYS use air assist when vector cutting.
- BE CAREFUL! when vector cutting. Many materials have the potential to burst suddenly into flames – even materials that may be very familiar to the user. Always monitor the machine when it is operating.
- KEEP YOUR LASER SYSTEM CLEAN – A build up of cutting and engraving residue and debris is dangerous and can create a fire hazard in its own right. Keep your laser system clean and free of debris. Regularly remove the vector grid to clean any small pieces that have fallen through the grid.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Ensure equipment is off.
- Place all materials in their proper storage areas.
- Ensure the equipment is safe, clean and tidy before you leave it.



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required
- No jewelry, watches, rings, necklaces etc.
- Hearing Protection Required

Potential Hazards

- Noise
- Burns
- Sparks
- Fire
- Fumes

General Safety

Fire Warning: Your laser system uses a high intensity beam of light that can generate extremely high temperatures when it comes into contact with the material being engraved, marked or cut. Some materials are extremely flammable and can easily ignite and burst into open flame setting the machine afire. This open flame is very dangerous and has the potential to destroy not only the machine, but the building in which it is housed.

Experience shows that vector cutting with the laser has the most potential to create an open flame. Many materials are susceptible to igniting, but acrylic, in all its different forms, has been shown to be especially flammable when vector cutting with the laser.

Please read the following warnings and recommendations and follow them closely at all times!

- Stay with the laser. Never operate the laser system while unattended.
- Keep the area clear. Clean around the machine and keep the area free of clutter, combustible materials, explosives, or volatile solvents such as acetone, alcohol, or gasoline.

- Be prepared with a fire extinguisher. Always keep a properly maintained and inspected fire extinguisher on hand. Epilog recommends a Halotron fire extinguisher or a multi-purpose dry chemical fire extinguisher. The Halotron extinguishers are more expensive than a dry chemical, but offer certain advantages should you ever need to use an extinguisher. The Halotron extinguisher discharges a clean, easily removable substance that is not harmful to the mechanics or wiring of the laser system. The dry chemical extinguisher discharges a sticky, corrosive powder that is very difficult to clean up.
- Use Air Assist. Always use the system's Air Assist feature when vector cutting.
- Use caution when vector cutting. Many materials have the potential to suddenly burst into flames when cut with a laser – even materials that may be very familiar to the user. Always monitor the machine when it is operating.
- Clean the laser. A buildup of cutting and engraving residue and debris is dangerous and can create a fire hazard in its own right. Keep your laser system clean and free of debris. Regularly remove the Vector Cutting Table to clean any small pieces that have fallen through the grid.

Do Not Run the Laser Unvented: Never operate the machine without a properly operating vent to the outside or to a filtration unit! Most material will only produce an irritating smoke when engraved. Some materials, including but not limited to paint, varnish, composition board and plastics, produce compounds that can be harmful if concentrated. A properly installed vent is the only way to ensure that problems do not occur.

Do Not Engrave or Cut PVC: Never engrave or cut any material containing PVC or vinyl. When engraved, a corrosive agent is produced that will destroy your machine. Your warranty will be void if your machine is damaged by corrosion from engraving or cutting PVC or Vinyl.

Do Not Operate Machine While Unattended: Never operate your machine without someone watching the system. There is a significant risk of fire if the machine is set improperly, or if the machine should experience a mechanical or electrical failure while operating.

Do Not Vector Cut While Machine is Unattended: Never laser cut any material with the laser without someone watching the system. Because vector cutting moves relatively slowly compared to raster engraving, a tremendous amount of heat is applied to the material being cut. This buildup of heat can cause significant fire risk and the machine should always be monitored. Additionally, the Air Assist should always be turned on when vector cutting to reduce the risk of fire.

Do Not Operate The System While Doors are Open: Never operate with any of the covers or enclosures removed, and never modify the enclosure. The laser beam is invisible and is very dangerous!

If an emergency situation occurs while conducting this task, or there is an equipment

malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Ensure equipment is off.
- Place all materials in their proper storage areas.
- Ensure the equipment is safe, clean and tidy before you leave it.



Required Personal Protective Equipment and Devices

- Long or loose hair must be tied back or contained
- No loose fitting clothing
- Eye Protection

Potential Hazards

- Fire
- Eye or skin damage

Safety

Laser systems can represent a significant fire hazard. Some engraving materials are inherently combustible (including some metals and coatings) and can ignite without warning. Should the work piece actually ignite into flames, the fire must be extinguished by the operator at once!

- Stay with the laser. Never operate the laser system while unattended.
 - Keep the area clear. Clean around the machine and keep the area free of clutter, combustible materials, explosives, or volatile solvents such as acetone, alcohol, or gasoline.
 - Be prepared with a fire extinguisher. Always keep a properly maintained and inspected fire extinguisher on hand.
-

Laser Safety

The laser beam produced by the FiberMark laser can cause severe damage to the eye or skin if direct contact is made with the beam. To prevent direct contact with the laser beam, it is fully contained in the laser cabinet. The laser cabinet has safety interlocks that turn the laser off if either the front door or top window is opened during operation. The green window in the top access door is made of a special acrylic that is designed to block the infrared wavelength of light that is produced by the laser. It is common to see bright reflections coming from the marking surface when viewing through the green window as the laser operates. The reflections are normal and it is not harmful to view the machine in action through the green window, but because the reflections can be very bright, it is recommended that viewing be limited while the machine is operating. No special precautions are necessary to operate the laser safely; however the visible output beam of the Laser Diode Pointer (Red Dot Pointer) is accessible to the operator. While this device employs the same technology as the familiar laser pen-pointers, like them it is potentially hazardous if its beam is directed into the eye. We have made every effort to make the Laser Diode Pointer (Red Dot Pointer) as safe as possible. Its beam path is located well inside the cabinet, and under normal conditions, no hazardous levels of laser radiation can escape.

Electrical Safety

The AC input power to the Epilog Model 8000 Laser System is potentially lethal and is fully contained within the cabinet.

- DO NOT open any of the machine's access panels while the unit is plugged in. Opening a panel may expose the operator to the unit's AC input power.
- DO NOT make or break any electrical connections to the system while the unit is turned on.

Emergency Stop Button

The Emergency Stop Button is a safety feature designed to immediately stop the laser from firing and stop the motion control system from moving should an emergency occur. By depressing the Emergency Stop Button, the electrical circuits leading to the laser source and the main power supply are opened and all system functions, except the cooling fans, come to an immediate stop. In order to restore the laser system to its standard operating mode after activating the Emergency Stop Button, follow these steps:

1. Press the main power switch to the off position.

2. Reset the Emergency Stop Button by twisting it in a clockwise direction to spring it back into its active position. This step is important as the laser system will not function if the Emergency Stop Button remains in its recessed position.
3. Power on the system using the main power switch.

Do Not Run the Laser Unvented: Never operate the machine without a properly operating vent to the outside or to a filtration unit! Most material will only produce an irritating smoke when engraved. Some materials, including but not limited to paint, varnish, composition board and plastics, produce compounds that can be harmful if concentrated. A properly installed vent is the only way to ensure that problems do not occur.

Do Not Engrave or Mark PVC: Never engrave or mark any material containing PVC or vinyl. When engraved, a corrosive agent is produced that will destroy your machine. Your warranty will be void if your machine is damaged by corrosion from engraving or marking PVC or Vinyl.

Do Not Operate Machine While Unattended: Never operate your machine without someone watching the system. There is a significant risk of fire if the machine is set improperly, or if the machine should experience a mechanical or electrical failure while operating.

Do Not Operate in Vector Mode Unattended: Never run the laser in vector mode without someone watching the system. Because vector mode moves relatively slowly compared to raster engraving, a tremendous amount of heat is applied to the material. This buildup of heat can cause significant fire risk and the machine should always be monitored.

Do Not Operate The System While Doors are Open: Never operate with any of the covers or enclosures removed, and never modify the enclosure. The laser beam is invisible and is very dangerous!

About This Equipment

The Epilog Laser FiberMark Fusion is a 50 watt laser capable of etching and annealing different metals. Annealing means the laser melts the surface and it quickly hardens again, resulting in a dark raised mark on the metal surface. It has a fiber laser, but does not have a CO2 laser, which is an option for this model. This laser is not meant for woods or plastics. Unlike the other lasers in the room, which can cut through wood and plastic, this laser is incapable of cutting through metal.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required
- No jewelry, watches, rings, necklaces etc.
- Hearing Protection Required

Potential Hazards

- Noise
- Burns
- Sparks
- Fire
- Fumes

General Safety

EXPOSURE TO THE LASER BEAM MAY CAUSE PHYSICAL BURNS AND CAN CAUSE SEVERE EYE DAMAGE.

NEVER OPERATE THE LASER SYSTEM WITHOUT CONSTANT SUPERVISION OF THE CUTTING AND ENGRAVING PROCESS. Exposure to the laser beam may cause ignition of combustible materials which can lead to a fire. A properly maintained fire extinguisher should be kept on hand at all times.

NEVER LEAVE MATERIALS IN THE LASER SYSTEM AFTER LASER PROCESSING HAS FINISHED. Always remove all material including scrap material from the machine after use. Scrap material left in the laser system including materials that collect in the removable cutting table can be a fire hazard. It is also recommended you allow scrap materials to cool prior to leaving the work area. A properly maintained fire extinguisher should be kept on hand at all times.

A PROPERLY CONFIGURED, INSTALLED, MAINTAINED AND OPERATIONAL

PARTICULATE AND FUME EXHAUST SYSTEM IS MANDATORY WHEN OPERATING THE LASER SYSTEM. Fumes and smoke from the engraving process must be extracted from the laser system and filtered or exhausted outside.

SOME MATERIALS, WHEN ENGRAVED OR CUT WITH A LASER, CAN PRODUCE TOXIC AND CORROSIVE FUMES.

DISCONTINUE processing any material that causes chemical deterioration of the laser system such as rust, metal etching or pitting, peeling paint, etc. Damage to the laser system from corrosive fumes is NOT covered under warranty.

DO NOT ATTEMPT TO MOVE OR LIFT THIS SYSTEM ALONE. Obtain the assistance of additional people when lifting or carrying (secure motion system and doors before lifting). Injury may occur if improper lifting techniques are used or the system is dropped.

CO2 Laser Safety

DO NOT STARE AT THIS INTENSE LIGHT FOR LONG PERIODS OF TIME OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS SUCH AS BINOCULARS OR MICROSCOPES.

This device contains a visible Red Diode Pointer (Class 2) to aid in positioning material to be cut or engraved.

DO NOT LOOK DIRECTLY INTO THE RED LASER BEAM OR USE A REFLECTIVE SURFACE TO REDIRECT OR VIEW THE RED LASER BEAM. NEVER ATTEMPT TO VIEW THE RED LASER BEAM USING OPTICAL INSTRUMENTS SUCH AS BINOCULARS OR MICROSCOPES.

The user door(s) are safety interlocked which will prevent the CO2 laser beam from firing when the user door(s) are opened. The Red Diode Pointer is NOT safety interlocked and can be automatically activated with the door(s) either open or closed.

DO NOT OPERATE THE LASER SYSTEM IF ANY SAFETY FEATURES HAVE BEEN MODIFIED, DISABLED OR REMOVED. This may lead to accidental exposure to invisible CO2 laser radiation which may cause severe eye damage and/or severe burns to your skin. • Always use caution when operating a laser system

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Ensure equipment is off.

- Place all materials in their proper storage areas.
- Ensure the equipment is safe, clean and tidy before you leave it.

Safe Work Procedure

LPKF Protolaser S

Created: October 8, 2018



Required Personal Protective Equipment and Devices

- Eye Protection and gloves are required
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required

Potential Hazards

- Razor sharp cuts
- Burns

Safety Procedures

Danger to life! Missing or inadequate fuse protection may result in deadly electric shocks and/or cause fire. N e v e r bridge the automatic fuse switch!

WARNING Risk of injury! Since the materials you are handling with have a small size and razor-sharp rough edges, a big risk of injury exists. Make sure to wear protective gloves!

WARNING Health hazard! Direct contact of the laser beam with skin results in intensive burn and causes invisible interior injuries. Diffused light which contacts your skin over a space of time takes the same effects as well. Beware in any case of direct contact between the laser beam and the skin.

WARNING Health hazard! Hazardous substances can be generated when materials are processed by the laser beam. These may be cancer-causing. Only use materials which are approved by LPKF for work with and always activate the provided exhausting unit during operation.

Health hazard! All safety measures which are described in the material safety data sheets must be strictly adhered to!

- Utilize this system only for its conventional use.
- Never use this system in an environment where danger of explosion or fire exists.

- Operate this system in permitted environments only.
- Make sure that unauthorized persons cannot enter the room. The international safety regulations specified for this class of laser product must be complied with.
- Never look directly into the beam, even if you are wearing laser protective goggles.
- Operate this system only with accessories which are approved by LPKF and with original LPKF tools.
- Operation with this system is only allowed if it is in a proper state. Before usage a visual check is required. In this process look out for defective cables and hoses.
- Make sure that all protection devices are working properly. Bridging, avoiding of or switching of the protection devices is not allowed!
- Make sure that there is no risk of stumbling by cables or hoses.
- This system has only to be operated, maintained and repaired by persons who are authorized.
- Eating, drinking or smoking in the workspace is not allowed.
- Make sure to comply with the generalities and rules for accident prevention and environment protection.
- Operation, maintenance and repair is only permitted with prescribed protective equipment.
- Check performance of the emergency stop switch regularly.
- The system must never be operated by more than one person.
- Disconnect the system from the mains during all maintenance work on the system.
- Maintenance and service operations must be done regularly.
- Whenever damage or malfunctions occur, shut down the system immediately. Delete failures immediately. If it is not possible to correct the failures, switch off the system and assure it against starting up.

Conventional usage The ProtoLaser S is used for structuring ultra fine circuit paths in copper materials, for abrasion-resistant marking and for engraving. The system must be used only in combination with the applications described in this manual and the LPKF Software CircuitMaster. Incorrect usage

Do not use the ProtoLaser S for the machining of easy flammable material like paper, plastic and so on. Contact LPKF service if you are in doubt about the usage of the process material. It is not allowed to operate the system without the standard cover and housing parts. Do not control the laser system with another or modified software.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR

SAFETY CHANNEL ON SLACK.

Housekeeping

- Ensure equipment is off.
- Place all materials in their proper storage areas.
- Ensure the equipment is safe, clean and tidy before you leave it.

Safe Work Procedure

LPKF ProtoMat

Created: October 8, 2018



Required Personal Protective Equipment and Devices

- Eye Protection and gloves are required
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required

Potential Hazards

- Razor sharp cuts
- Jammed fingers or hand
- Burns
- Electrical Shock
- Inhaling fine particle and gases

Safety Procedures

Danger to life due to electrical shock! Missing or inadequate electrical grounding may cause deadly current strokes and/or fire. The machine must operate connected with a tested protective earth contact socket and the correct earthing must be checked.

WARNING Danger to life due to electrical shock! Missing or inadequate electrical fuse protection may cause deadly current strokes and/or fire. Never bypass any fuses! Use only the fuses recommended by the manufacturer. ATTENTION Health hazard due to fine particle and gases! During machining of work parts harmful fine particles and gases may develop that can be inhaled! Make sure that dust extraction is activated during machining of the work piece. Use fine particle filters exclusively.

Risk of injury by unintended operations! Any accidental starting of the motor and moving of the mill/drill head during repairs and servicing may cause considerable injuries. Make sure that only one person operates the machine. Secure the machine during servicing and repair activities appropriate.

Risk of injury by burning! During the machining process the used tools and the collet chuck heat up so that direct contact may cause burn-ups. Use safety gloves and a pair of tweezers during manual exchange of tools during operation.

ATTENTION Risk of injury due to sharp edges! The employed tools are sharp-edged and cause cuts and stab wounds whenever used improperly. Always store the tools in their toolbox and protect the toolbox against unauthorised usage.

ATTENTION Risk of injury by sudden cover closing! The opened soundproof cover may close accidentally and jam fingers or the complete hand. Always lift the soundproof cover up to the latching position and secure the machine against any shocks.

ATTENTION Risk of injury by unstable underground! An unstable surface level can collapse and hurt the operator during machining of a workpiece due to vibrations and the machine powers. The machine must be placed on a solid surface.

General safety notes

- Please wear adequate work clothes respective protective clothing when working at the machine.
- Use the machine only according to intended usage.
- Never operate the machine in an environment with danger of fire or explosions.
- Only operate the machine in proper condition.
- Make a visual check before any usage and replace faulty cables and tubes at once.
- Only operate the machine with correct operating protective devices.
- Only operate the machine with tools and accessories licensed by LPKF.
- Perform the required service and repair procedure according to the described periods.
- Separate the machine from mains power supply whenever you have to perform repairs or servicing.
- Always remove damages or functional disturbances at the machine at once.
- Put the machine out of service and secure it against further usage whenever the damage cannot be removed.
- Remove dust and remains of material using a paint brush or draw off any machining remains.
- Never use compressed air to clean the machine! Dispose of machining remains according to legal regulations.
- Make sure that your work space is always clean.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR

SAFETY CHANNEL ON SLACK.

Housekeeping

- Ensure equipment is off.
- Place all materials in their proper storage areas.
- Ensure the equipment is safe, clean and tidy before you leave it.



Required Personal Protective Equipment and Devices

- Long or loose hair must be tied back or contained
- No loose fitting clothing
- Safety Glasses
- Safety Boots

Potential Hazards

- Flying objects such as the chuck key left in chuck.
- Cutting tool injury when cleaning, filing or polishing.
- Hair/clothing getting caught in moving machine parts.
- Metal splinters and swarf.
- Eye injuries.

PRE-OPERATIONAL SAFETY CHECKS

- Locate and ensure you are familiar with all machine operations and controls.
- Ensure all guards are fitted, secure and functional. Do not operate if guards are missing or faulty.
- Check workspaces and walkways to ensure no slip/trip hazards are present.
- Check the job is clamped tight in the chuck.
- Remove all tools from the bed and slides of the machine.
- Ensure the correct speed for machining process is selected.
- Remove the chuck key before starting the lathe.

OPERATIONAL SAFETY CHECKS

- Before making adjustments or measurements, switch off and bring the machine to a complete standstill.
- Always remove the chuck key from the chuck.

ENDING OPERATIONS AND CLEANING UP

- Switch off the machine when work completed.
- Reset all guards to a fully closed position.
- Avoid letting swarf build up on the tool or job. Stop the machine and remove it.
- Leave the machine in a safe, clean and tidy state.

General Safety Information

- This lathe is designed and intended for use by properly trained and experienced members only. If you are not familiar with the proper and safe operation of a lathe, do not use until proper training and knowledge have been obtained.
- Do not use this lathe for other than its intended use.
- KEEP GUARDS IN PLACE and in working order.
- REMOVE ADJUSTING KEYS AND WRENCHES. Form habit of checking to see that keys and adjusting wrenches are removed from tool before turning it on.
- KEEP WORK AREA CLEAN. Cluttered areas and benches invite accidents.
- DON'T USE IN DANGEROUS ENVIRONMENT. Don't use power tools in damp or wet locations, or expose them to rain. Keep work area well lighted.
- DON'T FORCE TOOL. It will do the job better and safer at the rate for which it was designed.
- USE RIGHT TOOL. Don't force tool or attachment to do a job for which it was not designed.
- WEAR PROPER APPAREL. Do not wear loose clothing, gloves, neckties, rings, bracelets, or other jewelry which may get caught in moving parts.
- ALWAYS USE SAFETY GLASSES.
- SECURE WORK. Use clamps or a vise to hold work when practical. It's safer than using your hand and it frees both hands to operate tool.
- DON'T OVERREACH. Keep proper footing and balance at all times.
- MAINTAIN TOOLS WITH CARE. Keep tools sharp and clean for best and safest performance. Follow instructions for lubricating and changing accessories.

- Give your work undivided attention. Looking around, carrying on a conversation and “horse-play” are careless acts that can result in serious injury.
- DISCONNECT TOOLS before servicing; when changing accessories, such as blades, bits, cutters, and the like.
- REDUCE THE RISK OF UNINTENTIONAL STARTING. Make sure switch is in off position before plugging in.
- NEVER STAND ON TOOL. Serious injury could occur if the tool is tipped or if the cutting tool is unintentionally contacted.
- CHECK DAMAGED PARTS. Before further use of the tool, a guard or other part that is damaged should be carefully checked to determine that it will operate properly and perform its intended function - check for alignment of moving parts, binding of moving parts, breakage of parts, mounting, and any other conditions that may affect its operation. A guard or other part that is damaged should be properly repaired or replaced.
- DIRECTION OF FEED. Feed work into a blade or cutter against the direction of rotation of the blade or cutter only.
- NEVER LEAVE TOOL RUNNING UNATTENDED. TURN POWER OFF. Don't leave tool until it comes to a complete stop.
- Some dust created by power sanding, sawing, grinding, drilling and other construction activities contains chemicals known to cause cancer, birth defects or other reproductive harm. Some examples of these chemicals are: • Lead from lead based paint • Crystalline silica from bricks and cement and other masonry products, and • Arsenic and chromium from chemically-treated lumber. Your risk from those exposures varies, depending on how often you do this type of work. To reduce your exposure to these chemicals: work in a well-ventilated area, and work with approved safety equipment, such as those dust masks that are specifically designed to filter out microscopic particles
- Do not operate this machine while tired or under the influence of drugs, alcohol or any medication.
- Tighten all locks before operating.
- USE PROPER EXTENSION CORD. Make sure your extension cord is in good condition. When using an extension cord, be sure to use one heavy enough to carry the current your product will draw. An undersized cord will cause a drop in line voltage resulting in loss of power and overheating.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE

**PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY
CHANNEL ON SLACK.**



Required Personal Protective Equipment and Devices

- Personal safety products (welding helmet, gloves).
- Safety Glasses

Potential Hazards

Possible ELECTRIC SHOCK, MOVING PARTS, HOT PARTS hazards, FUMES AND GASES.

Electrical Shock -

Do not touch live electrical parts. Wear dry, hole-free insulating gloves and body protection. Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground. Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling. Use AC output ONLY if required for the welding process. If AC output is required, use remote output control if present on unit.

FUMES AND GASES -

Keep your head out of the fumes. Do not breathe the fumes. If inside, ventilate the area and/or use local forced ventilation at the arc to remove welding fumes and gases. If ventilation is poor, wear an approved air-supplied respirator. Read and understand the Material Safety Data Sheets (MSDSs) and the manufacturer's instructions for metals, consumables, coatings, cleaners, and degreasers. Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained

watchperson nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe. Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases. Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld. ARC RAYS can burn eyes and skin. Wear an approved welding helmet fitted with a proper shade of filter lenses to protect your face and eyes when welding or watching. Wear approved safety glasses with side shields under your helmet. Use protective screens or barriers to protect others from flash, glare and sparks; warn others not to watch the arc. Wear protective clothing made from durable, flame-resistant material (leather, heavy cotton, or wool) and foot protection.

Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding. WELDING can cause fire or explosion. Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers. Do not weld where flying sparks can strike flammable material. Protect yourself and others from flying sparks and hot metal. Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Watch for fire, and keep a fire extinguisher nearby. Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side. Do not weld on closed containers such as tanks, drums, or pipes, unless they are properly prepared. Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock, sparks, and fire hazards. Do not use welder to thaw frozen pipes. Remove stick electrode from holder or cut off welding wire at contact tip when not in use. Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap. Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.

Welding, chipping, wire brushing, and grinding cause sparks and flying metal. As welds cool, they can throw off slag. Wear approved safety glasses with side shields even under your welding helmet.

Hot Parts -

Do not touch hot parts bare handed. Allow cooling period before working on gun or torch. To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.

Moving Parts -

Keep away from moving parts such as fans. Keep all doors, panels, covers, and guards closed and securely in place. Have only qualified persons remove doors, panels, covers, or guards for maintenance as necessary. Reinstall doors, panels, covers, or guards when maintenance is finished and before reconnecting input power. Keep away from pinch points such as drive rolls.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Approved Dust Mask Required
- No loose fitting clothing
- No jewelry, watches, rings, necklaces etc.
- CSA Approved Safety Footwear Required
- Long or loose hair must be tied back or contained
- Hearing Protection Required

Potential Hazards

- Loose knots or foreign materials in wood
- Cuts, lacerations and amputations
- Dust/debris irritation
- Noise
- Projectile work pieces from improper clamping
- Fingers pinched

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Make sure guards, if present, are installed and are working properly.
- Faulty equipment must not be used. Immediately report suspect machinery.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Set up work table or mitre gauge at correct angle (up to 45°)
- Ensure that table is no more than 1/8" or 3mm away from spindle.

Prohibited Activities

- Attempting to sand very small items
- Attempting to sharpen tools

- Attempting to sand metal
- Do not leave this equipment running unattended

Safe Work Procedure

1. Open dust chute and turn on dust collector.
2. Wear appropriate personal protective equipment (PPE).
3. Make all adjustments with POWER OFF.
4. Install appropriate sized spindle for operation. Use appropriate table insert for spindle selected.
5. Turn machine ON.
6. Hold wood flat against tabletop, keeping fingers a minimum of 5 cm (2 inches) away from abrasive surface. Feed wood in direction opposite of spindle rotation.
7. Begin operation: press wood LIGHTLY against spindle.
8. Turn spindle sander OFF and let spindle come to a rest before removing work piece.
9. Clean up dust and debris with POWER OFF.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Switch off the machine and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.
- When servicing equipment (ex. changing a grinding wheel), power must be disconnected.
- Ensure ventilation openings and switch levers are kept clean and free of foreign matter.

Safe Work Procedure

Paint Room



Paint Room Safe Work Procedures

- Any paints, stains, clears, oils etc. that contain this symbol must be contained in the flammable liquid container. As per 19.5 of the Workplace Safety and Health Regulations, Containers for combustible or flammable liquids.
- Your items contained must be labeled with your name and date.
- All flammable liquids not labeled are cleaned out on a monthly basis. Bring home empty flammable liquids and recycle on your own.



When using these products we cannot exceed 33.8 oz (1 Liter) in an 8 hour period.

Follow procedures within the paint room by recording amount of paint used in the last 8 hours.

- Record the amount of paint used in the last 8 hours. Note: a standard 6 " spray can can contain 4 oz.

Failure to follow this procedure will result in monetary penalties, up to and including, suspension of membership.

Paint Room Rules

- No painting / staining outside of the hood when the product is labeled.
- Keep your paint off walls, floor, table and equipment.
- Do not spray the inside walls of the hood directly.
- Do not spray the filters directly.



- When purging a spray can, spray towards the lower right filter from just inside of the front of the hood.
- No "Air Assisted" painting.
- Fan must be running when applying paint, stain, etc. also fan must be running when the item painted or stained is still wet or emitting odor.
- If leaving items to dry leave a note in case another member needs to use the hood. Treat others items the way you would like your items treated.



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Approved Dust Mask Required
- No loose fitting clothing
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required
- No jewelry, watches, rings, necklaces etc.
- Hearing Protection Required

Potential Hazards

- Cuts, lacerations and amputations
- Dust/debris irritation
- Noise
- Loose knots or foreign materials in wood
- Projectile work pieces/tools from improper set up or speed setting
- Musculoskeletal injury from manoeuvring long stock

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Make sure guards, if present, are installed and are working properly.
- Faulty equipment must not be used. Immediately report suspect machinery.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Disconnect power supply before changing or adjusting blades

Prohibited Activities

- Do not Smoke (Fire Hazard)
- Do not leave this equipment unattended while running
- Do not reach across machine

- Do not let your hands come closer than 10 cm (4 inches) to the operating blade
- Do not plane material under 30 cm (12 inches) in length
- Do not machine material thinner than 9 mm (3/8 inch)

Safe Work Procedure

1. Open dust chute and turn on dust collector.
2. Wear appropriate personal protective equipment (PPE).
3. Make all adjustments to the thickness planer with POWER OFF. Make initial thickness adjustments with POWER OFF.
4. Provide a minimum clearance of at least 1 meter (3 feet) greater than the length of the longest stock being worked.
5. Turn power ON to thickness planer.
6. Stand to the side of the planer. With an open palm, feed wood into the planer best side down, with the grain.
7. Carefully remove work piece. Adjust planer thickness. If work piece is stuck, shut off machine to remove it.
8. Repeat steps six (6) and seven (7) until desired thickness is achieved.
9. Clean up dust and debris with POWER OFF

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

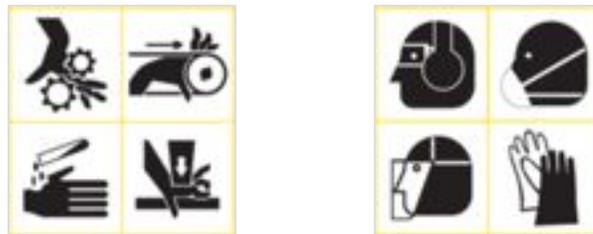
- Ensure equipment is off.
- Place all materials in their proper storage areas.
- Ensure the equipment is safe, clean and tidy before you leave it.



Required Personal Protective Equipment and Devices

- Long or loose hair must be tied back or contained
- No loose fitting clothing
- No jewelry, watches, rings, necklaces etc.
- Safety Eye Wear (welding goggles) and face shields

Hazards



SAFETY CONCERNS

- Proper eye protection such as [welding goggles](#) and face shields are needed to prevent eye damage called [arc eye](#) as well as damage from debris.
- It is recommended to use lens shade #6 or darker for cutting to prevent the retina of your eye being "flashed" or burned.

DAMAGE CONCERNS

- Do not operate without water in the table
- Refresh water in table / tub every two weeks. Flushing is not needed. The green color is an anti-rust/a-bunch-of-other-stuff additive. It's good for three years. However, the water does need to be topped up periodically due to evaporation.
- Check tool paths in simulation before cutting part to ensure to tip will not hit material or bed

BASIC MAINTENANCE

The Electrode

Electrodes wear off gradually, which results in a lower quality of cut than the torch is capable of. Old and worn-out electrodes can also damage the plasma torch in other ways. You can find the wear of an electrode by examining its insert and measuring the depth of its pit. Correct torch parts go a long way in reducing wear of an electrode. Other than mismatched parts, some other factors in making an electrode wear more are gas leaks, incorrect gas settings, build up of moisture and impurities in the gas being used.

The Nozzle

Apart from acting as the exit point for the gas in its plasma state, the nozzle also constrains the plasma arc to a small diameter. The gas is constricted through its small hole, which increases its velocity. Just like the electrode, mismatched torch parts are once again the most common reason for damage to the nozzle. Incorrect cutting distance, incorrect amperage and gas settings and cutting thicker than the plasma cutter's capability are other prominent causes of plasma torch wear. Regular inspections and replacements using OEM parts is the solution to extending the life of your nozzle and thus of the torch.

The Shield

Surrounding the plasma consumables stack, the shield protects other parts of a torch from damage from the extreme temperature and pressure that it generates. The most common problem with the shield is the wear of the main hole when it is blocked by spatter or dross. Unless you can pick up the dross, which can be done easily most of the time, you will have to replace it.

The Swirl Ring

As the gas exits and flows through the nozzle and the electrode, the swirl ring controls the gas to create a swirling action. Swirl rings outlast nozzles and electrodes for many replacement cycles. Swirl rings are most often damaged by clogged. Once that happens the gas flow will be hampered, the quality of the plasma cutter will be reduced and the life of the torch will be lessened. Replacing a swirl ring when it gets clogged or otherwise worn out is one of the things you should do to get the most life out of your torch.

THINGS TO KNOW

How a plasma cutter works

Plasma cutters work by sending an electric arc through a gas that is passing through a constricted opening. The gas can be shop air, nitrogen, argon, oxygen. etc. This elevates the temperature of the gas to the point that it enters a 4th state of matter. We all are familiar with the first three: i.e., solid, liquid, and gas. Scientists call this additional state plasma. As the metal being cut is part of the circuit, the electrical conductivity of the plasma causes the arc to transfer to the work.

The restricted opening (nozzle) the gas passes through causes it to squeeze by at a high speed, like air passing through a venturi in a carburetor. This high speed gas cuts through the molten metal. The gas is also directed around the perimeter of the cutting area to shield the cut.

In many of today's better plasma cutters, a pilot arc between the electrode and nozzle is used to ionize the gas and initially generate the plasma prior to the arc transfer.

Other methods that have been used are touching the torch tip to the work to create a spark, and the use of a high-frequency starting circuit (like a spark plug). Neither of these latter two methods is compatible with CNC (automated) cutting.

While these parts are all referred to as consumables, it is the electrode and nozzle that wear and require periodic replacement.

CNC (computer numerically controlled) plasma cutters fully automate the shape production process. Early CNC machines used a tape with small holes punched through to provide instructions to a primitive (by today's standards) computer.

Today's CNC units use either expensive limited production computers made specifically for running burning machines, or personal computers adapted to run the machines. Both provide the same cut quality and production speed. In CNC cutting, you arrange your shapes on the computer screen and cut them automatically, without having to touch the material. CNC software lets you program pauses for piercing, scale up or down in seconds, set acceleration and deceleration at corners, and other functions not

possible with electric eye units.

CAPABILITIES

- 65W Plasma Cutter
- Automatic torch height control
- Water pan (eliminates dust and smoke)
- Filtered control cabinet
- Computer, software and LCD flat screen
- Dual drive gantry w/ +3000 oz of torque
- Precision Rack and Pinion drive system
- Magnetic release torch holder
- Industrial strength frame
- Home switches on all axes
- Bent slats with center support
- 3 to 1 belt drives provide optimum torque
- Cable chain on gantry
- 98" by 52" cutting envelope

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Switch off the machine and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.
- When servicing equipment, power must be disconnected.



Required Personal Protective Equipment and Devices

- Long or loose hair must be tied back or contained
- No loose fitting clothing
- No jewelry, watches, rings, necklaces etc.

Potential Hazards

"No known safety Hazards"

Damage Concerns

If you notice the paper is not laying flat along the right side (it has been caught by the print head and crumpled/bent slightly), this can lead to damage to the Service Station (the part with the print head):

1. **immediately** hit the red cancel button on the console.
2. Raise the blue lever
3. Unroll the spool
4. Snip away the crumpled paper and reload the paper.

About This Equipment

- Large format colour inkjet printer
- maximum paper width: 42 inches / 1066.8 mm

- true resolution of up to 2400x1200-dpi on glossy paper
 - connectivity: USB
 - Print Speed (Black): 85 square metres per hour
-

Some roll paper media is available. It will either be installed in the machine, or likely be on the vinyl shelf.

Consumable Details

The printer uses 4 ink cartridges: (~60\$ at staples as of 13:15, 1 March 2015 (CST))

- 1x HP No 10 Black Ink Cartridge (69 ml)
- 3x HP No 82 Cyan, Magenta, and Yellow Ink Cartridge (69 ml)

Various print media are also used, usually in rolls. Print media can be up to 42 inches wide. A few examples:

- HP Universal Gloss Photo Paper (24" x 100 feet roll) Product ID: Q1426B
- HP Bright White Inkjet Paper (24" x 150 foot roll) Product id: C1860A
- A complete list of media can be found in the product manual

Usage Procedures

These are the procedures for printing an image using Windows Photo Viewer. Printing from other applications will vary, but are likely to follow similar steps.

1. Turn on the printer, power button in on left front
2. Load paper if not already loaded; the control panel on the left top will walk you through it
3. The data connection between a Windows PC and the printer is currently handled by a long white USB extension cable. You should be able to plug the cable into either PC in the Textiles room. Make sure all the USB connections along the length of the cable are firmly joined.
4. Double click your image to bring it up in Windows Photo Viewer.
5. When you select print with a document, it will allow you to choose the

printer to output to. Choose "HP Designjet 800PS 42 by HP HPGL2".

6. Go to the Properties for the printer. Select Autorotate, and then select the width of your roll (for example 24 inch). NOTE: When you see the print preview for your image it might look like it will print sideways, but it will not. With autorotate it will print so it fills the width to the maximum.
7. For the paper type, make sure 11 x 8.5 is NOT selected. You need to select something larger, such as OVERSIZED ANSI D (36" x 24") or you can crease a custom sized piece of paper. As long as it fits within the width of the roll, you'll do fine.
8. If you don't see a preview, try unchecking "Fit Frame to Picture"
9. Hit print and the output will go to the printer. You should see the name of your job on the printer's LCD. It needs to think for under a minute before printing.
10. When done, hit the button "Form Feed and Cut" on the front of the printer.
11. Turn off the printer, power button in on left front

Unloading paper

1. Using the up-down and enter keys on the printer menu, select Paper menu > Unload roll
2. Lift the blue lever
3. Now you need to get to the back of the printer. Make sure the wheel locks are in the up position on the caster wheels, then roll the right side of the printer away from the wall.
4. The rod pops out of the spool holder with a little pressure. Place the roll on a table.
5. Pull the blue paper end off to the right, then remove the roll from the spool and place it on the shelves.

Loading paper

Note that picture-instructions for loading paper are found on the top of the printer.

1. The spool has picture-instructions showing the orientation to place the roll on the spool. Place a roll of paper on the spool.
2. Push hard on the roll until the black spool end is flush with the paper. This acts as a paper guide.
3. Place the blue end cap on the roll, and push it until it is flush with the paper.
4. Place the paper on the back of the printer with the blue end to your right (when facing the back of the printer)
5. Unroll some paper and feed it into the slot on the back. The printer will chime when it is fed enough and will prompt you on the menu to select "Load roll"
6. Select the type of paper you are loading. (For example, plain paper)
7. Follow the menu instructions until done. The printer will trim the paper during this procedure.

Maintenance Procedures

No regular maintenance required.

Troubleshooting

- see <File:Hp designjet800 service manual.pdf>
- By holding the Up-arrow and enter while the machine is plugged in/turned on, it will bring you to a service menu. This can be helpful for troubleshooting without requiring HP's assistance.
- Clean ink from inside if there are problems

Error Message 21:10

This comes up occasionally and usually cleaning and a reboot fixes it.

- System Error 21:10 - This means the Service Station and Aerosol Fan needs to be cleaned. If you open the front cover, on the right hand side you will see

a "wheel". This wheel has a scraper that scrapes ink off. After awhile the ink gets clogged between the scraper and wheel. The clogged ink will not let the wheel turn which messes up the timing of the service station and throws the error code. Refer to the [Service Manual](#) on page 8-52 for instructions on removing it. For cleaning, this link has great detailed information and photos by civiljoe. [Cleaning the HP designjet 800 Service Station](#)

- If error 21:10 persists, it's possible a printer head needs to be replaced. You can test the printer heads from the service menu (see below).
- If all else fails with error 21:10, the Service Station must be replaced. Part number c7769-60149. They are available in the \$100 range from HP or eBay.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Switch off the machine and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.
- When servicing equipment, power must be disconnected.

Safe Work Procedure
Pneumatic Nailer and Stapling Tools
Created: October 8, 2018



Required Personal Protective Equipment and Devices

- Eye Protection and hearing protection
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required

Potential Hazards

- Serious injury by nails

Safety Procedures

- Permit only trained and experienced workers to operate pneumatic nailing and stapling tools.
- Wear proper eye and hearing protection.
- Make sure the tool is maintained in safe operating condition.
- Inspect the tool before connecting to the air supply.
- Check safety mechanisms if applicable.
- Ensure the screws and cylinder caps are securely tightened.
- Make sure the air pressure is as specified by the manufacturer of the tool.
- Before using, check that the tool is properly connected to the air supply and is in working order, with the safety mechanism operable.
- Do not operate the tool at air pressures above the manufacturer's specifications.
- Always handle the tool as if it contains fasteners.
- Always use a work-contacting element that limits the contact area to one as small as practicable.
- Make sure the mechanical linkage between the work-contacting element and the trigger is enclosed.
- Disconnect the tool from the air supply and exhaust all air from the tool by squeezing the trigger when: - Not in use, - Cleaning or adjustment, or - Clearing a blockage.
- Use only fasteners recommended by the manufacturer of the tool, and follow the

manufacturer's instructions when reloading.

- Do not point the tool at yourself or any other person.
- Do not squeeze the trigger unless the nosepiece of the tool is directed at a safe work surface.
- Do not transport or load the tool with your finger on the trigger.
- Do not secure the trigger in the ON position.
- Do not overreach when using the tool.
- Ensure you have the right amount of air pressure for the size and type of nail you are using. Caution: Too much pressure can cause a nail to go right through the material and could cause serious injury to other workers.
- Follow the manufacturer's safe operating procedures when using nailers powered by butane.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Ensure equipment is off.
- Place all materials in their proper storage areas.
- Ensure the equipment is safe, clean and tidy before you leave it.

Safe Work Procedure

Polyurethanes

North Forge Fabrication Lab

Storage

Generally speaking Polyurethanes are moisture sensitive. Most formulators manufacture both resins and hardeners under vacuum and purge each container with Nitrogen before shipping the products. The Nitrogen blanket, being heavier than air, remains on top of the liquid in the container and provides a moisture barrier. **Containers should be stored with closed lids and part containers should be purged with Nitrogen before being committed to storage.**

Handling

Polyurethane products, like any other chemicals, must be treated with caution and using common sense at all times. This includes the following:

- **Wear gloves to avoid skin contact**
- Certain types of urethanes will actually stain the skin if contact occurs. Being moisture sensitive, these products will react with the moisture in the skin and the stain will be hard to remove.
- **Do not breathe vapours**
- Urethanes are moisture sensitive. They will react with moisture in the lungs. Provide adequate ventilation in the work area, especially if any of the components being used require heating.
- **Skin contact**
- If skin contact occurs, follow the recommendations on the MSDS since, depending on the formulation, the recommended cleaning procedures may be different. If the recommended cleaning procedure is not readily available and an accidental exposure occurs, **do not use solvents**, use a waterless hand cleaner cream first and wash thoroughly with soap and water after.

Ventilation

Do not use any chemicals, including polyurethanes in enclosed areas without ventilation. The ventilation should be such that the fumes are drawn away from the operator. Air should not be drawn across the face of the operator but rather away from the face to eliminate breathing any fumes that may be present. **This is very important when using products that are heated for processing. Make certain that the ventilation system provides positive air flow.**

Although it is not a frequent occurrence, **some products require "personal breathing apparatus" to be worn during use.**

Use a mask

A good organic or fresh air mask is suitable but, since there are a variety of products on the market.

Protective clothing

Do not wear clothing that stains easily. Remove any stained clothing to eliminate continued skin contact. Wear gloves and aprons made from non-porous, synthetic, chemical resistant materials.

Work area

Keep the work area clean and uncluttered. This will prevent accidental spills. Keep tools clean. It is best to clean tools shortly after use, before the residual material has a chance to react with the moisture in the air.

Tools

It is best to use stainless steel tools and containers if possible. Wooden stir sticks contain moisture that can react with the urethane as well as soaking up the material increasing the chance for skin contact.

Wooden stir sticks are suitable if first sealed with an epoxy.

Machining the cured product

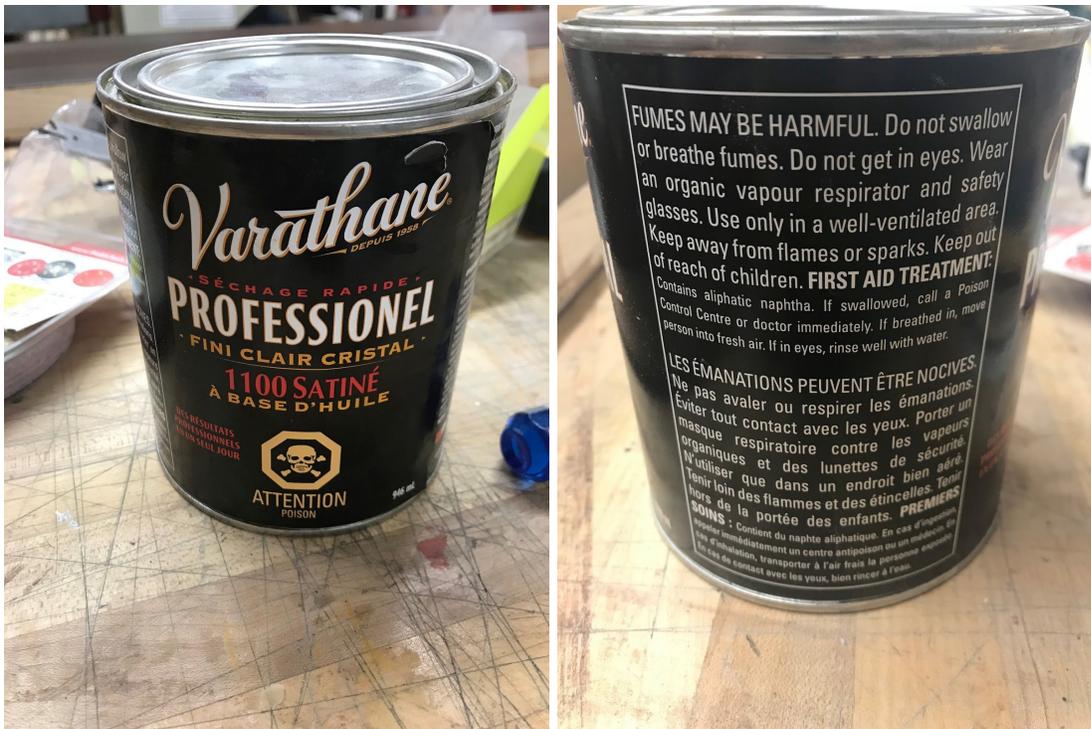
Although solidified (cured) epoxy and urethane products are inert and relatively harmless, traces of residual components may be left on the surface. The finished parts may have to be machined to remove flash or to trim the component to the proper size. Machining or sanding finished parts will inevitably generate dust that should not be

inhaled. Provide **ventilation, wear a suitable mask, gloves and cover exposed skin** to prevent contact with the dust.

The above are common sense precautions that should be followed not just with Urethane compounds but with all chemical products. The focus should be to prevent any chemical from entering the body either through inhalation or through the skin.

Remember that **"any chemical that is considered safe today may be declared dangerous tomorrow"**.

Example:





Required Personal Protective Equipment and Devices

- Safety Glasses
- Nitrile disposable gloves

Safety Hazards

- When using solder paste in the dispenser, keep in mind it **contains lead**, which can be absorbed through the skin and is highly toxic to the brain and other organs. Wear plastic gloves when loading and cleaning the syringes, and especially never allow the paste to come into contact with food or your mouth.

Damage Concerns

- Replace it with a slow blow 3.15A 250V type F fuse (5mm x 20mm). There might be a replacement fuse in the wooden box under the desk. If none is available, for a short period you can use the one located in the ProtoPlace for the European voltage. Fuses can be obtained from Amazon, DigiKey, The Source, or other local stores. NOTE: please record the date below if the fuse is blown. It's possible to accidentally suck small SMD components through large-diameter needles into the vacuum system, where they become jammed. In order to prevent this, make sure the appropriate needle diameter is installed on the machine.
- The user manual recommends covering the machine when not in use so dust

does not accumulate on the machine and degrade it.

- The fuse has very infrequently blown after shutting off the machine. Unplug the cord after you turn off the machine.
- If you try to turn it on (with power cable plugged in) and the LCD screen does not display, the fuse is probably blown. The fuse compartment is right under the power cable plug

Consumable Details

- **SMD components** (transistors, resistors, capacitors, IC's, etc...) You can order from Mouser.com, aliexpress.com, or sometimes eBay.
- **Solder Paste** This stuff is expensive in buckets, but you can find 42g bottles of the material on eBay (Mechanic brand in orange and blue container) for around \$3.50.

Usage Procedures

Before beginning, you need to plug in the power and air supply.

1. The ProtoPlace machine is not near a convenient air supply, and the existing air-hose does not reach. Find an extension air-hose in the equipment room and plug it into the ProtoPlace air hose.
2. The ProtoPlace airhose connected to an extension hose.
3. Plug in power cables in the back of the ProtoPlace and the LCD monitor.
4. Turn on the monitor (glowing red button) followed by the power switch on the back of the ProtoPlace.
5. Insert your PCB board in between the mounting rails.
6. Hand turn the 4 black knobs to tighten the frame in place.
7. Inserting a copper clad board into the protoplace frame.

We need the correct needle to dispense the solder paste. LPKF recommends 0.5, 0.61, or 0.69 mm to do the job, but the closest we have is the green dispenser needle at 0.8mm. The amount of paste dispensed by the machine depends on temperature and solder viscosity.

1. If the plastic syringe is mounted on the ProtoPlace machine, remove it by unscrewing the nut using the smaller hex wrench.



2.

3. Unscrewing the syringe using a hex key
4. Pull out the syringe and unhook the tube by turning the black rubber adapter a quarter turn.



5.

6. Turning the rubber top to remove.
7. Screw in the dispensing needle into the syringe. A quarter turn is plenty to secure the needle.
8. Put on your disposable gloves for filling (nitrile gloves are located in the 3D printer room near the back corner). Open your solder paste and use a plastic coffee stir stick to insert some into the syringe. The amount depends on how much solder paste your PCB requires. For a couple of small PCB's you probably only need a few mm depth in the syringe.



9.

10. Adding solder paste to the syringe.

11. Insert the white suction cap (located in the wooden box) into the syringe. Push it down with a clean coffee stir stick and the cap will clean off the solder on the sides of the syringe.



12.

13. Inserting the white cap and pressing down.
14. Insert the needle into the ProtoPlace cuff and lightly screw in with the hex wrench. Place the black suction cap on the syringe and give it a quarter turn to tighten.
15. You want the syringe at approximately a 45 degree angle to the board. Also, it needs to be able to touch the board when you press down on the rotary knob.



16.

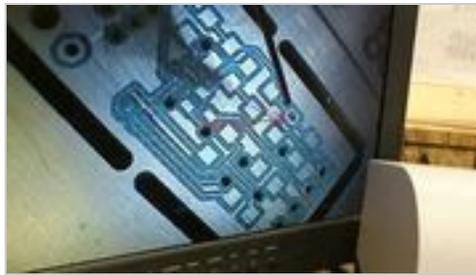
17. The syringe should be at a 45 degree angle to the board.

18. Plug in and turn on the ProtoPlace and the monitor. Make sure the foot pedal is connected to the ProtoPlace and under the desk in a comfortable position.



19.

20. Connect the foot pedal and move to a comfortable position.
21. **Manual dispensing** causes the solder to extrude as long as the pedal is pressed down. From the main menu, press up to enter Dispense mode, then press right arrow to enter manual mode. Place a piece of paper to catch the solder, lower the needle to the surface by pressing the metal knob, then press the foot pedal to see how it dispenses. You will need to time your foot presses to dispense accurate amounts of solder to the pads.
22. You want the solder blob centered and covering about 25% of the surface



23.

24. Note the size of a blob of solder paste (as viewed on the monitor).
25. If it is dispensing too quickly, you can adjust the dispense pressure. Turn the knob labeled disp pressure counter-clockwise to make it extrude slower.
26. The dispenser vacuum can suck back the paste after each shot to keep it from leaking out. If the solder paste continues dripping after each shot, rotate the knob labelled disp vacuum counter-clockwise until it stops dripping after each shot.
27. If the pads on your circuit are mainly the same size, you can use **auto-dispense** to place a set amount of solder on each pad. From the dispense menu, press up for auto. Now when you press the peddle, by default it pulses for 0.5 sec and then (if you continue holding down the peddle) pauses for 0.5 seconds until extruding another glob. You can adjust these values by pressing up or down on the menu to select pulse or pause, then altering the values.

28. When autodispensing, the trick is to hold the pedal down for the full 0.5 seconds. If you release before then, it will not place the full amount on the pad.

Cleanup

- Leftover solder paste can temporarily (a few days) be stored in the syringe. Remove the syringe from the ProtoPlace, then place the orange end caps on the syringe. It is best to refrigerate with some solders so they don't dry out. *Warning: Don't contaminate food. Properly label it as hazardous and place in a baggie and a disposable plastic container. Never use a food container you plan to use for food later.*
- You can also extrude the paste back into your original container for longer term storage. Just place the container under the needle and hold down the foot pedal.

For cleanup, you will need your disposable gloves on, as well as a disposable cup of some kind (coffee cup).

1. The plastic syringe, needle and white suction cap can be cleaned with isopropyl alcohol. If you don't have any you might find some in the 3D printer room near the back corner.
2. Remove the needle from the syringe and place it in the coffee cup.
3. Poke a small wire into the hole of the syringe to force the white cap out, and drop it into the coffee cup. A discarded piece of plastic 3D printing wire works well.
4. Pour a small amount of isopropyl alcohol in the cup and let the parts soak for a few minutes. Agitate the cup periodically to clean. (see photo to right)



5.

6. Add a small amount of isopropyl alcohol to a cup.
7. Solder paste can become stuck in the syringe. Use a brush dipped in isopropyl to scrub it out, and keep rinsing with water until clean. You can also use the air hose to blow out the contents but be careful none of the paste ends up in your eyes.
8. In the sink near the CNC Wood Room, half-fill the syringe with isopropyl alcohol from the coffee cup and shake vigorously with your thumb covering the large opening. Point the smaller end towards the sink to catch the drops.
9. Repeat the previous step two or three times until the syringe is clean. Scrub with brush if needed.
10. Rinse all parts with water in the sink and dry with a paper towel, then return to wooden box.

Pick and Place

- The ProtoPlace does not have the reel spools module, so parts are only available from the carousel trays. Place your parts in these trays. You can preload all your parts if you are doing many PCB's, or dump a few parts one at a time as you are working. You can rotate the tray by selecting the menu: press the left key, then manual, then tray. Press left and right keys to rotate the tray.

Manual Pick & Place Procedure

Manual pick & place mode causes the vacuum to activate when the needle gently presses on a part. You then guide the part over the PCB and gently press down to

deactivate the suction.

1. From the main menu, select Place and then Man
2. Move the needle over a part in the tray
3. Press the large knob down to lower the needle until it touches a part in the tray, then press down gently. Suction will activate. Release the knob to raise the needle above the PCB level.
4. Move the component over your PCB and lower it down to the contact pads, then *gently* press down to deactivate suction and release the part.

Semi-Automatic

Semi-automatic mode keeps suction going when picking up a part. No need to press on the part and exert force.

1. From the main menu, select Place and then Auto
2. Move the needle over the part tray and press the knob down to lower the needle. The part will suck to the needle.
3. Move the needle over the PCB contact pads, then press down gently to release suction.

Fine Adjustment

It's possible to finely adjust the component position while the part is above the PCB, then automatically place the part.

1. In semi-automatic mode, pick up a component from the tray.
2. Position the part less than 4.5 mm over the PCB contact pads, then press the right arrow to select BrakeOn. This will freeze the x, y, and z axes (you can still rotate).
3. You can now use the small knobs at the bottom of the ProtoPlace to finely adjust x and y [need photo]. Use the monitor and rotate the camera to make sure all pads are in position.
4. When it is positioned, press down arrow for Place and it will deposit the part where you have it positioned.

Maintenance Procedures

- The manual recommends oiling the rails periodically with machine oil.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Approved Dust Mask Required
- No loose fitting clothing
- No jewelry, watches, rings, necklaces etc.
- CSA Approved Safety Footwear Required
- Long or loose hair must be tied back or contained
- Hearing Protection Required

Potential Hazards

- Loose knots or foreign materials in wood
- Cuts, lacerations and amputations
- Dust/debris irritation
- Noise
- Projectile work pieces from improper clamping
- Fingers pinched

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Make sure guards, if present, are installed and are working properly.
- Faulty equipment must not be used. Immediately report suspect machinery.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Set up work table or mitre gauge at correct angle (up to 45°)
- Ensure that table is no more than 1/8" or 3mm from belt or disc

Prohibited Activities

- Attempting to sand very small items
- Attempting to sharpen tools

- Attempting to sand metal
- Do not leave this equipment running unattended

Safe Work Procedure

1. Open dust chute and turn on dust collector.
2. Wear appropriate personal protective equipment (PPE).
3. Adjust worktable to provide minimum clearance between the belt and the table, with POWER OFF. The worktable should be secured properly.
4. Inspect abrasive belts before using them. Replace belts worn, frayed, or excessively worn in spots.
5. Turn power ON and check tracking of sanding belt (call for assistance of instructor as needed).
6. Hold work piece flat against worktable keeping fingers a minimum of 5 cm (2 inches) away from abrasive surface. Hold small or thin pieces of stock in a jig or holding device to prevent injuries to the fingers or hands.
7. Sand on the downward side of a disc sander so that the work piece is driven onto the table by the machine's rotation.
8. Begin operation: press work piece lightly and slowly against belt or disc.
9. Push stop button, wait for sanding belt or disc to stop.
10. Clean up dust and debris with POWER OFF.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Switch off the machine and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.
- When servicing equipment (ex. changing a grinding wheel), power must be disconnected.
- Ensure ventilation openings and switch levers are kept clean and free of foreign matter.



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Approved Dust Mask Required
- No loose fitting clothing
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required
- No jewelry, watches, rings, necklaces etc.
- Hearing Protection Required

Potential Hazards

- Loose knots or foreign materials in wood
- Cuts, lacerations and amputations
- Dust/debris irritation
- Noise

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Make sure guards, if present, are installed and are working properly.
- Faulty equipment must not be used. Immediately report suspect machinery.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Ensure push stick is available.
- Lower the blade guide and guard to full effect.
- Start the dust extraction unit before using the saw

Prohibited Activities

- Do not leave this equipment running unattended
- Attempting to cut very small items
- Cutting cylindrical or irregular stock

Safe Work Procedure

1. Open dust chute and turn on dust collector.
2. Wear appropriate personal protective equipment (PPE).
3. Make all adjustments with POWER OFF.
4. Make sure all guards are in place, properly adjusted, and secured.
5. Adjust blade guard height to about 6 mm (1/4 inch) above the top of the material being cut.
6. Ensure the blade is tracking correctly and runs freely in and against the upper and lower guide rollers.
7. Keep hands outside of danger zone – 5 cm (2 inches) out from the blade in all directions. Keep your hands on either side of the blade - not in line with the cutting line and the blade.
8. Turn saw ON; wait for blade to reach maximum speed before using.
9. Firmly hold work piece with both hands. Feed material into the blade at a slow and moderate speed. Use a push stick if work piece is smaller than 16cm (6 inches). Use a jig to support round stock.
10. Hold work piece flat on the table.
11. Make relief cuts when cutting a sharp curve.
12. Turn band saw OFF and let blade come to a rest before removing work piece.
13. Clean up dust and debris with POWER OFF

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Switch off the machine and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.
- When servicing equipment (ex. changing a blade), power must be disconnected.
- Ensure ventilation openings and switch levers are kept clean and free of foreign matter.



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Approved Dust Mask Required
- No loose fitting clothing
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required
- No jewelry, watches, rings, necklaces etc.
- Hearing Protection Required

Potential Hazards

- Loose knots or foreign materials in wood
- Cuts, lacerations and amputations
- Dust/debris irritation
- Noise
- Projectile work pieces from improper clamping

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Make sure guards, if present, are installed and are working properly.
- Faulty equipment must not be used. Immediately report suspect machinery.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Start the dust extraction unit before using the saw

Prohibited Activities

- Do not leave this equipment running unattended
- Cutting branches, wood with embedded nails or screws
- Cutting dowel
- Ripping solid timber along the grain

- Cutting short lengths of timber

Safe Work Procedure

1. Open dust chute and turn on dust collector.
2. Wear appropriate personal protective equipment (PPE).
3. Make all adjustments with POWER OFF.
4. Use a crosscut or combination blade.
5. Ensure guard is in place.
6. Clamp wood piece firmly against the fence (where possible) and align with blade.
Do not cut pieces smaller than 20 cm (8 in.) in length.
7. Keep one hand on the trigger switch and handle; use the other hand to hold the stock against the fence.
8. When cutting bowed timber place the bow against the table to avoid the saw binding.
9. Ensure hands are at least 6" away from blade.
10. Turn saw ON; wait for blade to reach maximum speed before using.
11. Cut work piece at slow/moderate speed. Do not force the saw.
12. Return saw to the rear of the table after completing cut.
13. Turn off saw and wait for blade to stop before removing stock.
14. Clean up dust and debris with POWER OFF.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Switch off the machine and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.
- When servicing equipment (ex. changing a blade), power must be disconnected.
- Ensure ventilation openings and switch levers are kept clean and free of foreign matter.



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Approved Dust Mask Required
- No loose fitting clothing
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required
- No jewelry, watches, rings, necklaces etc.
- Hearing Protection Required

Potential Hazards

- Loose knots or foreign materials in wood
- Cuts, lacerations and amputations
- Dust/debris irritation
- Noise
- Projectile work pieces from improper clamping

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Make sure guards, if present, are installed and are working properly.
- Faulty equipment must not be used. Immediately report suspect machinery.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.

Prohibited Activities

- Do not leave this equipment running unattended
- Cutting irregular stock, branches or wood with embedded nails or screws

Safe Work Procedure

1. Wear appropriate personal protective equipment (PPE).
2. Check the retracting lower blade guard frequently to make certain it works freely.

3. Make all adjustments with power cord unplugged.
4. Set the depth of the blade and lock it at a depth so that the lowest tooth does not extend more than about 3 mm (1/8 inch) beneath the wood.
5. Secure stock being cut to avoid movement.
6. Keep all cords clear of cutting area.
7. Circular saws are designed for right-hand operation; left-handed operation will demand more care to operate safely.
8. Use two hands to operate saws - one on a trigger switch and the other on a front knob handle.
9. Allow the saw to reach full power before starting to cut.
10. Allow it to cut steadily. Do not force it. Do not twist the saw to change, cut or check alignment.
11. Keep motor free from accumulation of dust and chips.
12. Turn saw OFF and let blade come to a rest before removing work piece.
13. Check that the retracting lower blade guard has returned to its starting position before laying down the saw.
14. Clean up dust and debris with POWER OFF.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Switch off the machine and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.
- When servicing equipment (ex.changing a blade), power must be disconnected.



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Approved Dust Mask Required
- No loose fitting clothing
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required
- No jewelry, watches, rings, necklaces etc.
- Hearing Protection Required

Potential Hazards

- Loose knots or foreign materials in wood
- Cuts, lacerations and amputations
- Dust/debris irritation
- Noise
- Projectile work pieces from improper clamping

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Make sure guards, if present, are installed and are working properly.
- Faulty equipment must not be used. Immediately report suspect machinery.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Start the dust extraction unit before using the saw

Prohibited Activities

- Do not leave this equipment running unattended
- Cutting branches, wood with embedded nails or screws
- Cutting dowel
- Ripping solid timber along the grain

- Cutting short lengths of timber

Safe Work Procedure

1. Open dust chute and turn on dust collector.
2. Wear appropriate personal protective equipment (PPE).
3. Make all adjustments with POWER OFF.
4. Use a crosscut or combination blade.
5. Ensure guard is in place.
6. Clamp wood piece firmly against the fence (where possible) and align with blade.
Do not cut pieces smaller than 20 cm (8 in.) in length.
7. Keep one hand on the trigger switch and handle; use the other hand to hold the stock against the fence.
8. Ensure hands are at least 6" away from blade.
9. Turn saw ON; wait for blade to reach maximum speed before using.
10. Cut work piece at slow/moderate speed. Do not force the saw.
11. Turn off saw and let blade come to a rest before raising.
12. Clean up dust and debris with POWER OFF.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Switch off the machine and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.
- When servicing equipment (ex. changing a blade), power must be disconnected.
- Ensure ventilation openings and switch levers are kept clean and free of foreign matter.



Required Personal Protective Equipment and Devices

- Use Personal Safety Equipment when using the equipment. At a minimum, **use safety glasses**. Some of the CNC equipment is also noisy, so use hearing protection
- Loose clothing, long hair, personal stereo wires and jewelry may become entangled in rotating equipment.
- Know what you are doing. Training is required before you use the equipment.

Potential Hazards



Using the equipment

- **Stay out of the way of a moving machine:**
 - Never touch a rotating tool bit
 - Never attempt to measure parts or clean the machine while the milling cutter is rotating.
 - Never reach over the machine while the cutter is rotating.

- **Secure the workpiece:** Make certain that the workpiece is securely fixed and that all components of the fixture are securely fastened to the table. Parts that have not been properly secured to the cutting table can become lethal projectiles.
- **Sharp edges:**
 - Milling cutters can be extremely sharp. When changing tools, always wrap the cutter in a rag.
 - The chips produced in milling metal can be razor sharp. Always use a brush to clean a machine. **Do not use compressed air to blow the chips off of the machine or your clothes.**
- **Avoid fixtures:** Before powering up the spindle, make certain that the milling cutter, its tool holder, and the spindle, are free of the workpiece and will not run into any of the fixturing components.
- **Feeds and speeds**
 - If improperly used, milling cutters may shatter. If this occurs, sharp fragments of metal will fly off at high velocity.
 - Calculate the proper spindle speed and table feed rate before beginning a cut.
 - If the workpiece begins to vibrate, or the cutter makes excessive noise, stop cutting immediately.
 - Do not attempt to take a heavier cut than the cutter or the workpiece setup can handle.
 - Know how the physical properties of the material being cut affect the way that cut should be done.
- **Remove loose parts:** make certain all loose tools, spindle wrenches, chuck keys, and measuring tools have been removed from the machine.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE

**PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY
CHANNEL ON SLACK.**



Required Personal Protective Equipment and Devices

- Safety footwear and safety glasses.
- Work gloves when operating the press.
- Do not wear loose-fitting clothing or jewelry. Wear a protective hair covering to contain long hair, as it may be caught in moving parts. When working outdoors, wear rubber gloves and insulated, non-skid footwear. Keep hands and gloves away from moving parts.
- Everyone in the work area should wear safety goggles or glasses with side shields that comply with current safety standards. Wear hearing protection during extended use and a dust mask for dusty operations.
- Keep a fire extinguisher nearby.

Potential Hazards

- **KEEP WORK AREA CLEAN AND WELL LIT.** Cluttered, dark work areas invite accidents. Provide at least 200 watts of lighting at the front work area of the tool. Eliminate all shadows that could interfere with clear viewing of the work area.

Safe Procedures

- **NEVER LEAVE THE TOOL RUNNING UNATTENDED.** Turn the power off. Do not leave the tool until it comes to a complete stop.
- **PROTECT OTHERS IN THE WORK AREA** from debris such as chips and sparks. Provide barriers or shields as needed.
- **SECURE THE WORK.** Use a clamp, vise, or other practical means to hold your

work securely, freeing both hands to control the tool.

- **USE THE RIGHT TOOL.** Do not use a tool or attachment to do a job for which it is not recommended. For example, do not use a circular saw to cut tree limbs or logs. Do not alter the tool, remove guards, or operate the saw when removed from the carriage and frame.
- **USE PROPER ACCESSORIES.** Using non-recommended accessories may be hazardous. Be sure accessories are properly installed and maintained. Do not defeat a guard or other safety device when installing an accessory or attachment.
- **CHECK FOR DAMAGED PARTS.** Inspect guards and other parts before use. Check for misalignment, binding of moving parts, improper mounting, broken parts, and any other conditions that may affect operation. If abnormal noise or vibration occurs, turn the tool off immediately and have the problem corrected before further use. Do not use a damaged tool. Tag damaged tools “DO NOT USE” until repaired. Repair or replace a damaged guard or other part. For all repairs, insist on identical replacement parts or factory certified conversions.
- **REMOVE ALL ADJUSTING WRENCHES AND TOOLS** from the tool before turning it on. Make this a habit.
- **AVOID ACCIDENTAL STARTING.** Be sure your tool is turned off before plugging it in. Do not use the tool if the power switch does not turn it on and off. Observe correct lockout/tag out procedures when performing maintenance on the tool.
- **DO NOT FORCE THE TOOL.** Your tool will perform best at the rate for which it was designed. Excessive force only causes operator fatigue, increased wear, increased risk of binding or sudden breakage, and reduced control.
- **KEEP HANDS AWAY FROM ALL CUTTING EDGES, MOVING PARTS AND PINCH POINTS.**
- **DO NOT ABUSE THE CORD.** Never unplug the cord by yanking it from the outlet. Pull the plug rather than the cord to reduce the risk of damage. Keep the cord away from heat, oil, sharp objects, cutting edges, and moving parts.
- **DO NOT OVERREACH. MAINTAIN CONTROL.** Keep proper footing and

balance at all times. Maintain a firm grip.

- **STAY ALERT.** Watch what you are doing, and use common sense. Do not use a tool when you are tired, distracted, or under the influence of drugs, alcohol, or any medication causing decreased control.
- **UNPLUG THE TOOL** when it is not in use, before changing items such as blades, and before performing recommended maintenance. Observe appropriate lockout/tag out procedures.
- **MAINTAIN TOOLS CAREFULLY.** Keep handles dry, clean, and free from oil and grease. Keep cutting edges sharp and clean. Follow instructions for lubricating and changing accessories. Periodically inspect tool cords and extension cords for damage. Have damaged parts repaired or replaced.
- **MAINTAIN LABELS AND NAMEPLATES.** These carry important information. If unreadable or missing, contact Safety Speed for a free replacement.
- **AVOID KICKBACK.** Kickback is a violent reaction to a pinched or binding saw blade. It throws the saw upward when crosscutting and throws the work piece out when ripping. Firm control, proper support of the work piece, and concentration on the job are essential to reduce the risk of injury from kickback:
 - **KEEP SAW BLADE CLEAN AND SHARP.** A dull or improperly sharpened blade produces a narrow kerf and is likely to be pinched by the work piece. Any blade with a small set, even though sharp, may be likely to kick back. A dull blade encourages you to force the saw, causing reduced control and blade binding. The excessive friction generated can cause the blade to warp or bind. Use only blades that are recommended for use with your tool. Do not use blades with mounting holes that are not the correct size or shape. Never use defective or incorrect blade flanges or bolts. Be sure the blade bolt is tight. Select the proper blade for the application. Blade speed specifications must be at least as high as the nameplate RPM.
 - **DO NOT FORCE THE TOOL.** Let the saw do the work. A saw is more

easily controlled and will do a better job when used in the manner for which it was designed.

- SECURE WORK PROPERLY. If a piece is supported on both sides of the cut in such a way that it allows the material to bow and pinch the blade, it may produce kickback. Do not cut pieces smaller than the saw carriage. Support large panels properly.
- IF THE BLADE BINDS, TURN SAW OFF! The saw or work piece may kick back. Keep hands, body, and bystanders out of the path of the blade and material.
- STAY ALERT. Watch what you are doing and use common sense. Do not allow yourself to be distracted. Do not operate the tool when you are tired or under the influence of drugs or alcohol. Hold the tool and material firmly and exercise control at all times. Position yourself and co-workers out of the kickback path. Repetitive cuts that lull you into careless movements can also cause kickback. A brief “stretch” may be all that is necessary to avoid a problem.
- RESTARTING IN MID-CUT. If the saw is stopped in mid-cut, TURN SAW OFF! Allow the blade to stop. Then back up the saw (if crosscutting) or the board (if rip cutting) before restarting.
- IF THE BLADE STALLS, TURN SAW OFF! DO NOT TURN THE SWITCH ON AND OFF. A dull blade or excess pressure may cause stalling. TURN OFF the switch immediately if the blade binds or the saw stalls, and remove the saw from the cut.
- VOID CUTTING NAILS OR OTHER FASTENERS. Inspect for and remove all metal fasteners before cutting.
- SUPPORT THIN MATERIAL. Large sheets such as paneling, Formica, etc., tend to warp or sag and must be well supported over their entire length to avoid pinching the blade. Optional hold down bar recommended for this application.

- HANDLE THE COUNTERBALANCE WITH CARE. The counterbalance cable is under tension.
- Always attach the cable to the saw carriage before removing the cable clip. Do not pull on the cable by hand or attempt to disassemble or repair the counterbalance. Replacement counterbalances can be purchased directly from Safety Speed, or an authorized dealer.
- DO NOT USE PUSH STICKS.
- CROSSCUTTING (VERTICAL CUTTING) MUST ALWAYS BE DONE FROM THE TOP DOWN. Raise the saw carriage to the uppermost position on the guides and lock it into position with the carriage lock whenever the tool is not in use. See “Operating Procedure: Crosscutting”, for more information.
- RIPPING (HORIZONTAL CUTTING) MUST ALWAYS BE DONE WITH THE DIRECTION OF THE ARROW. Raise the saw carriage to the top of the guides and lock it into position with the carriage lock whenever the tool is not in use. See “Operating Procedure: Rip cutting”, for more information.
- ALWAYS WAIT FOR THE BLADE TO STOP COMPLETELY BEFORE CHANGING POSITIONS. Unplug the tool before transporting or moving it.
- DO NOT PLACE YOUR HANDS ON OR UNDER THE SAW CARRIAGE OR IN THE PATH OF THE BLADE. Do not try to retrieve a piece of cut material while the blade is rotating.
- DO NOT DEFEAT THE GUARDS OR OPERATE THE TOOL WITHOUT THE GUARDS IN PLACE. Do not remove the saw motor from the carriage.
- NEVER STAND ON THE TOOL. Serious injury could occur if the tool is tipped or if you unintentionally contact the cutting tool.
- DIRECTION OF FEED. Always feed work into the blade or cutter against the direction of the rotation of the blade or cutter.
- HOME CENTERS AND COMMERCIAL LOCATIONS should check with their local electrical contractor to be sure the proper amount of electrical power (volts/amps) will be available for this machine during all operating hours and

conditions. Be aware of any special electrical safety requirements for this machine (examples: key lock offs, timers, coded security, touch pads, disconnects, or time lockouts) required by local codes.

- DISCONNECT AND LOCK THE POWER OFF before changing saw blades or making any adjustments.
- BEFORE CONNECTING THE SAW MOTOR TO THE POWER SUPPLY BE SURE THE SAW MOTOR SWITCH IS IN THE OFF POSITION.
- KEEP THE CARRIAGE LOCK SECURELY TIGHTENED when the machine is not in use.
- DO NOT PLACE HANDS UNDER CARRIAGE OR IN LINE WITH CARRIAGE TRAVEL. Be aware of potential pinch points at top of saw carriage. Only hold or operate saw with designated handles. Do not place hands under carriage or in-line with carriage travel.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.



Required Personal Protective Equipment and Devices

- Safety footwear and safety glasses.

Potential Hazards

- A table saw is a dangerous tool and there are hazards inherent with using this saw. Some of these hazards are discussed below. Use common sense when operating the saw and use the saw only as instructed. You are responsible for your own safety.
- The risk from exposure to these chemicals and to dust varies depending on how often you do this type of work. To reduce your exposure, work in a well ventilated area and work with approved safety equipment including dust masks or respirators designed to filter out such dust and chemicals.
- This saw must be connected to a grounded metal permanent wiring system or to a system having an equipment grounding conductor. In the event of a malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. Improper connection of the equipment-grounding conductor can result in a risk of electric shock and/or malfunction. Check with a qualified electrician or service personnel if the grounding instructions are not completely understood or if in doubt as to whether the tool is properly grounded.
- Use only identical replacement parts when servicing the saw.

- Keep guards in place and in working order.
- Remove adjusting keys and wrenches from the saw before turning it on.
- Keep the top of the saw clean and free from clutter. Cluttered areas invite accidents.
- Do not use the saw in dangerous environments. For example, do not use the saw in damp or wet locations or expose it to rain; and keep the work area well lighted
- Do not try to force the saw to do something it was not designed to do. For example, do not try to cut wood faster than the motor can handle, and use the right blade for the job.
- Wear proper apparel when using the saw. Do not wear loose clothing, gloves, neckties, rings, bracelets, or other jewelry which may get caught in moving parts. Non-slip footwear is recommended. Wear a protective hair covering to contain long hair.
- Always wear safety glasses when using the saw. Also use a face or dust mask if the cutting operation is dusty. Everyday eyeglasses are not safety glasses.
- Do not overreach or stretch to get something when using the saw. Keep proper footing and balance at all times.
- Maintain the saw as specified in this manual.
- Turn the power disconnect switch to OFF before servicing the saw and when changing components or accessories such as blades, brake cartridges, and the like.
- Use only recommended accessories with the saw. Consult this manual for recommended accessories. The use of improper accessories may cause risk of injury to persons.
- Never stand on the saw. Serious injury could occur if the saw is tipped or if the cutting tool is unintentionally contacted.
- Check to make sure the saw is in proper working order before using the saw. For example, check the alignment of moving parts, look to see whether moving parts are binding or rubbing, check to see whether parts are broken, make sure

accessories are properly mounted in the saw, and check any other conditions that may affect the operation of the saw. A guard or other part that is damaged should be properly repaired or replaced.

- Feed work into the blade or cutter against the direction of rotation of the blade or cutter only. Feeding the work in the direction of rotation may cause the work to be thrown by the blade and could result in serious personal injury.
- Never leave the saw running unattended. Wait until the blade comes to a complete stop, and then turn both the Main Power switch and the Disconnect switch to OFF when you are finished using the saw.
- This saw is packaged without a rip fence. You must install a rip fence before using this saw. Attempting to use the saw without a rip fence could result in a serious personal injury.
- Always maintain firm control over the material being cut. Never cut any material freehand.
- Never operate the saw with the access doors open. Do not attempt to bypass or defeat the access door interlock switches.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.



Required Personal Protective Equipment and Devices

- Eye Protection Required
- Approved Dust Mask Required
- No loose fitting clothing
- Long or loose hair must be tied back or contained
- CSA Approved Safety Footwear Required
- No jewelry, watches, rings, necklaces etc.
- Hearing Protection Required

Potential Hazards

- Cuts, lacerations and amputations
- Dust/debris irritation
- Noise
- Loose knots or foreign materials in wood
- Projectile work pieces/tools from improper set up or speed setting
- Musculoskeletal injury from manoeuvring long stock

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Make sure guards, if present, are installed and are working properly.
- Faulty equipment must not be used. Immediately report suspect machinery.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Disconnect power supply before changing or adjusting blades

Prohibited Activities

- Do not Smoke (Fire Hazard)
- Do not leave this equipment unattended while running
- Do not reach across machine

- Do not let your hands come closer than 10 cm (4 inches) to the operating blade
- Do not cut stock free hand
- Do not let small scrap cuttings accumulate around blade

Safe Work Procedure

1. Open dust chute and turn on dust collector.
2. Wear appropriate personal protective equipment (PPE).
3. Make sure all guards are in place, properly adjusted, and secured.
4. Use a guard high enough to cover the part of the blade rising above the stock and wide enough to cover the blade when it is tilted. Adjust blade height so it does not extend more than about 6 mm (1/4 in) above the height of the piece being cut.
5. Use anti-kickback devices for all ripping or cross cutting operations.
6. Ensure that the fence is locked in position after the desired width has been set, when ripping. Do not use fence during crosscut operations.
7. Ensure that there is adequate support to hold a work piece; use extension tables or roller supports at the side or back for larger pieces. If an assistant is at the back (outfeed) end of the saw, an extension table should be in place so the back edge is about 1.2 m (4 ft) from the saw blade. The assistant should wait for the work piece to reach the edge of the extension table and should not reach toward the saw blade.
8. Hold the work piece firmly down on the table and against the fence when pushing the work piece through.
9. Feed work piece into the blade against the direction of its rotation. Move the rip fence out of the way when cross cutting. Never use it as a cut off gauge.
10. Use a push stick when ripping narrow or short stock (e.g., when the fence is set less than about 15 cm (6 in) from the blade; when the piece is less than 30 cm (12 in) long or when the last 30 cm (12 in) of a longer piece is being cut).
11. Keep hands outside of danger zone – 10 cm (4 inches) out from the blade in all directions. Keep your hands on either side of the blade - not in line with the cutting line and the blade.
12. Keep the body and face to one side of the saw blade out of the line of a possible kickback.
13. Turn table saw OFF and let blade come to a rest before removing work piece.
14. Clean up dust and debris with POWER OFF.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Ensure equipment is off.
- Place all materials in their proper storage areas.
- Ensure the equipment is safe, clean and tidy before you leave it.



Required Personal Protective Equipment and Devices

- Safety Glasses
- Kevlar gloves

Safety Hazards

- The inner surfaces of the oven can reach temperatures of 320 C and can cause intense burns. Always wear protective gloves when removing or inserting boards into the oven.
- Keep hands away from the drawer when it is opening or closing, as your hand can become entrapped and cause damage and/or burns.
- Avoid contact with solder paste as it contains lead which is toxic to the nervous system and organs, and can be absorbed through the skin. Wash immediately if contact occurs.

Damage Concerns

- The only way to really damage the oven through normal use is if something gets caught in the automatic door when it is opening or closing. Ensure all people and objects are away from the door when it is opening or closing.

Consumable Details

There are no consumables for the ProtoFlow oven, other than inserting a stuffed PCB

board into it.

Usage Procedures

An entire temperature profile (to melt the solder paste) will usually run in under 5 minutes.

1. Turn on the oven with the power button. Do not insert your PCB yet.
2. Select Profile with the up-down arrows, then press right to enter. Select the profile you will be using and hit enter (right). The profile names can be looked up in the online manual (top right of this page). Typically LF means lead free solder, PB means leaded solder, and SMALL, MEDIUM and LARGE refers to the size of the PCB.
3. Selecting the profile using the menu.



4.

5. Select START-PROF (hit right arrow) and the oven will begin heating up without your PCB inside.
6. Put on the kevlar gloves located under the ProtoPlace machine in the cardboard box.



7.

8. Protecting your hands from burns.
9. When the oven beeps and the door opens automatically, insert your

PCB(s) in the holders. Press right arrow when done and the oven will close.

10. The oven will execute the temperature profile and the door will pop open when done. Do not pick up your PCB yet! Wait the 80 seconds or so while the blower fans cool it off.

11. Put on the gloves again and remove the board.

12. Press enter (right) when your PCB is removed and the oven will close.

You can now turn off the oven and remove the gloves.

Inspect the solder joints using the 10x hand magnifier to make sure they are shiny and each pad has solder connecting the component. You can use a multimeter to test connections. Also make sure no solder bridges are shorting out components. Repair manually with soldering iron if needed.

Maintenance Procedures

- The oven requires no real maintenance. Try to keep the interior clean and free of objects that might pose a fire hazard. Since it is closed most of the time, this is not much of an issue.

About This Equipment

The ProtoFlow S is a reflow oven. Its purpose is to melt solder paste, joining SMD components to the conductive pads on PCB's. The reflow oven takes the temperature through 5 phases:

1. Warmup (PCB is inserted in oven after this step)
2. Preheat
3. Ramp up temperature to peak
4. Reflow
5. Cooldown (PCB is removed at this point)

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock

out procedure.

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PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY
CHANNEL ON SLACK.**



Required Personal Protective Equipment and Devices

- Personal safety products (welding helmet, gloves).
- Safety Glasses

Potential Hazards

Possible ELECTRIC SHOCK, MOVING PARTS, HOT PARTS hazards, FUMES AND GASES.

Electrical Shock -

Do not touch live electrical parts. Wear dry, hole-free insulating gloves and body protection. Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground. Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling. Use AC output ONLY if required for the welding process. If AC output is required, use remote output control if present on unit.

FUMES AND GASES -

Keep your head out of the fumes. Do not breathe the fumes. If inside, ventilate the area and/or use local forced ventilation at the arc to remove welding fumes and gases. If ventilation is poor, wear an approved air-supplied respirator. Read and understand the Material Safety Data Sheets (MSDSs) and the manufacturer's instructions for metals, consumables, coatings, cleaners, and degreasers. Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watchperson nearby. Welding fumes and gases can displace air and lower the oxygen

level causing injury or death. Be sure the breathing air is safe. Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases. Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld. ARC RAYS can burn eyes and skin. Wear an approved welding helmet fitted with a proper shade of filter lenses to protect your face and eyes when welding or watching. Wear approved safety glasses with side shields under your helmet. Use protective screens or barriers to protect others from flash, glare and sparks; warn others not to watch the arc. Wear protective clothing made from durable, flame-resistant material (leather, heavy cotton, or wool) and foot protection.

Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding. WELDING can cause fire or explosion. Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers. Do not weld where flying sparks can strike flammable material. Protect yourself and others from flying sparks and hot metal. Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Watch for fire, and keep a fire extinguisher nearby. Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side. Do not weld on closed containers such as tanks, drums, or pipes, unless they are properly prepared. Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock, sparks, and fire hazards. Do not use welder to thaw frozen pipes. Remove stick electrode from holder or cut off welding wire at contact tip when not in use. Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap. Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.

Welding, chipping, wire brushing, and grinding cause sparks and flying metal. As welds cool, they can throw off slag. Wear approved safety glasses with side shields even under your welding helmet.

Hot Parts -

Do not touch hot parts bare handed. Allow cooling period before working on gun or torch. To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.

Moving Parts -

Keep away from moving parts such as fans. Keep all doors, panels, covers, and guards closed and securely in place. Have only qualified persons remove doors, panels, covers, or guards for maintenance as necessary. Reinstall doors, panels, covers, or guards when maintenance is finished and before reconnecting input power. Keep away from pinch points such as drive rolls.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

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Required Personal Protective Equipment and Devices

- Use Personal Safety Equipment when using the equipment. At a minimum, **use safety glasses**. Some of the CNC equipment is also noisy, so use hearing protection
- Loose clothing, long hair, personal stereo wires and jewelry may become entangled in rotating equipment.
- Know what you are doing. Training is required before you use the equipment.

Potential Hazards



Using the equipment

- **Stay out of the way of a moving machine:**
 - Never touch a rotating tool bit
 - Never attempt to measure parts or clean the machine while the milling cutter is rotating.
 - Never reach over the machine while the cutter is rotating.

- **Secure the workpiece:** Make certain that the workpiece is securely fixed and that all components of the fixture are securely fastened to the table. Parts that have not been properly secured to the cutting table can become lethal projectiles.
- **Sharp edges:**
 - Milling cutters can be extremely sharp. When changing tools, always wrap the cutter in a rag.
 - The chips produced in milling metal can be razor sharp. Always use a brush to clean a machine. **Do not use compressed air to blow the chips off of the machine or your clothes.**
- **Avoid fixtures:** Before powering up the spindle, make certain that the milling cutter, its tool holder, and the spindle, are free of the workpiece and will not run into any of the fixturing components.
- **Feeds and speeds**
 - If improperly used, milling cutters may shatter. If this occurs, sharp fragments of metal will fly off at high velocity.
 - Calculate the proper spindle speed and table feed rate before beginning a cut.
 - If the workpiece begins to vibrate, or the cutter makes excessive noise, stop cutting immediately.
 - Do not attempt to take a heavier cut than the cutter or the workpiece setup can handle.
 - Know how the physical properties of the material being cut affect the way that cut should be done.
- **Remove loose parts:** make certain all loose tools, spindle wrenches, chuck keys, and measuring tools have been removed from the machine.

CAPABILITIES

The Tormach PCNC is a 3 Axis mill with 1.5HP drive motor. It is a small CNC mill and used for prototyping, short run production, education, and hobby. With proper machining methods, it is

capable of machining most materials – aluminum, steel, stainless, titanium, wood, etc.

Basic Mechanical Specifications:

-Table Size: 34" x 9.5"

-Travel or work envelope (X,Y,Z) 18", 9.5", 16.5"

-Spindle Type: R8

-Spindle RPM: 100-4750

-Maximum workpiece weight: 500 lbs

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.



Required Personal Protective Equipment and Devices

- Eye Protection Required
- CSA Approved Safety Footwear Required
- Long or loose hair must be tied back or contained
- No jewelry, watches, rings, necklaces etc.
- Hearing Protection Required
- No loose fitting clothing

Potential Hazards

- Cuts, lacerations and amputations
- Musculoskeletal injuries (strain, etc.)

Pre-Operational Safety Checks

- Read and follow the manufacturer's instructions and warning labels.
- Wear appropriate personal protective equipment such as safety glasses.
- Ensure the work area is clear of debris.
- Ensure there is adequate lighting in the work area.
- When using a utility knife always concentrate on the job at hand. Never look away or be distracted as you cut.
- Only use a utility knife for its intended purpose.
- Only use a utility knife for cutting through cardboard, opening boxes, cutting ropes, packing straps, sealing tape, shrink wrap, etc.
- Always keep your hand and the rest of your body away from the cutting line.
- Always point the knife away from you when you are exposing the blade.
- Always store a utility knife with the blade closed/retracted.
- Always use a sharp blade. A dull blade requires more force to make a cut, which could lead to tool slippage. Replace the blade as soon as you notice it tearing material instead of cutting.
- The safety features of knives should not be circumvented or removed.

- Dispose of dull or rusty blades in a blade disposal container. Never discard loose blades in the garbage or leave them where they could injure someone.

Prohibited Activities

- Do not pass or toss a utility knife to another worker. Set the knife down and let the other person pick it up.
- Never try to catch a falling utility knife.
- Do not use a knife as a scraper, screwdriver, chisel, etc.
- Do not extend more blade than is necessary for the cutting job.
- Do not leave a utility knife unattended, especially with the blade exposed.
- Do not hammer on a blade to achieve a greater cutting force.
- Do not operate any tool if you feel drowsy or unwell.
- Do not wear loose clothing, jewelry or long loose hair while cutting.
- Do not apply too much pressure on the blade as it may break.
- Do not use a broken or unsafe knife, attach a warning tag, take it out-of- service and advise your supervisor.

Safe Work Procedure

1. Pre-operation selection and inspection
 - a. Wear appropriate personal protective equipment.
 - b. Select a knife with the proper shape and size for the cutting job.
 - c. Inspect the knife for damage prior to each use.
 - d. Ensure the tip of the blade is sharp. If it is dull then expose the blade to the next hatch mark. Grip the exposed blade with a pair of pliers and break the blade off.
 - e. Ensure the blade is securely fastened and seated properly.
 - f. Ensure the blade access door and handle are not loose.
 - g. Ensure the blade is in good condition; no nicks, cracks, rust, etc.
2. Operation
 - a. Place the item you plan to cut on a flat, stable surface. Be sure the object will not slip or wobble.
 - b. Ensure that other people are a safe distance away.
 - c. Only extend the blade the required length for the cutting job.
 - d. Stabilize the item you are cutting with your non-cutting hand. Make a mental note of the line you are going to cut before you start cutting. Ensure your hand and body are away from the cutting line.
 - e. Firmly hold the knife in your hand with your fingers wrapped around the casing. Position your index finger onto the top side of the casing to help guide the blade and allow you to better control the depth of the cut.
 - f. Place the tip of the blade in position on the surface to be cut.

- g. Run the sharp edge of the blade along the area you want to cut. Pull the blade to either side of you and not directly towards you. A pulling motion will give you more power and control over the knife.
- h. Caution should be taken not to damage the contents of a box/container.
- i. If you are cutting thick or hard material then use several shallow cuts instead of one deep one. A number of light passes will reduce the chance of a slip or jump.
- j. If you are using a straight edge to direct the cut then make sure it is clamped to the material. If it is not practical to clamp the straight edge then place your hand well clear of the cut line. A thick straight edge will keep the blade from “jumping the track” as you cut.
- k. When you are finished cutting, retract the blade into the housing.
- l. Store the utility knife in a safe location away from children.

CAUTION: Work slowly and carefully when cutting

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Clean and inspect tools after each use.
- Place all tools in their proper storage areas.
- Leave the tools and work area in a safe, clean and tidy state.
- Ensure that no blades or pieces of blade have been left out. Blades need to be disposed of in an appropriate sharps container.



Required Personal Protective Equipment and Devices

- Long or loose hair must be tied back or contained
- No loose fitting clothing

Potential Hazards

- Electric Shock. Never attempt to repair unless the electrical supply is locked in the off position. Only switch on when all guards and covers have been replaced.
- Burning. Wait until the machine has cooled down before service work commences.
- Injury from compressed air. Pressures up to 100 psi will be present in large volumes. Be extra cautious when dealing with compressed air. Even when main supply is shut off dangerous residual pressure may still be present within the system.
- Toxic Fume Inhalation. When large sheets of plastic are heated fumes will be given off. Ensure that the machine is located in an adequately ventilated location.
- Injury from moving parts. Where pneumatic components are used to power moving parts there is a risk of personal injury. Never remove any panel or attempt any repair unless the compressed air supply has been disconnected.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

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Required Personal Protective Equipment and Devices

- Eye Protection Required
- Approved Dust Mask Required
- No loose fitting clothing
- No jewelry, watches, rings, necklaces etc.
- CSA Approved Safety Footwear Required
- Long or loose hair must be tied back or contained
- Hearing Protection Required

Potential Hazards

- Loose knots or foreign materials in wood
- Cuts, lacerations and amputations
- Dust/debris irritation
- Noise
- Projectile work pieces from improper clamping
- Fingers pinched

Pre-Operational Safety Checks

- Inspect required personal protective equipment and replace if required.
- Ensure no slip/trip hazards are present in workspaces and walkways.
- Make sure guards, if present, are installed and are working properly.
- Faulty equipment must not be used. Immediately report suspect machinery.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Set up work table or mitre gauge at correct angle (up to 45°)
- Ensure that table is no more than 1/8" or 3mm spindle.

Prohibited Activities

- Attempting to sand very small items
- Attempting to sharpen tools

- Attempting to sand metal
- Do not leave this equipment running unattended

Safe Work Procedure

1. Open dust chute and turn on dust collector.
2. Wear appropriate personal protective equipment (PPE).
3. Make all adjustments with POWER OFF.
4. Install appropriate sized spindle for operation. Use appropriate table insert for spindle selected.
5. Turn machine ON.
6. Hold wood flat against tabletop, keeping fingers a minimum of 5 cm (2 inches) away from abrasive surface. Feed wood in direction opposite of spindle rotation.
7. Begin operation: press wood LIGHTLY against spindle.
8. Turn spindle sander OFF and let spindle come to a rest before removing work piece.
9. Clean up dust and debris with POWER OFF.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Switch off the machine and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.
- When servicing equipment (ex. changing a grinding wheel), power must be disconnected.
- Ensure ventilation openings and switch levers are kept clean and free of foreign matter.

Safe Work Procedure

Vinyl Cutter

Revised: September 19, 2018



Required Personal Protective Equipment and Devices

- Long or loose hair must be tied back or contained
- No loose fitting clothing

POTENTIAL HAZARD

- Could cut finger on the blade if really trying hard and not paying attention.
- Heat press plate could burn material

DAMAGE CONCERNS

- No known concerns

Prohibited Activities

- Do not leave this equipment running unattended

Safe Work Procedure

Preparing the file

- Create or load vector graphic into CorelDraw
- Remove fill from the image
- Set all cut lines to hairline thickness

Check over machine

- check correct blade position, length and clean
 - take care not to extend the blade more than necessary
- clean rail (manually move cutting head to access)
- Turn on the cutting plotter
- Allow the cutting plotter to self align

Loading Vinyl

- push back material release lever on right back of machine
- if you are using a roll of material, place the roll on the rollers in the back of the machine
- align material so that
 - the material is square to the machine (use the alignment slots on the front of the cutter to align the media)
 - the left side lines up with the edge of the material and
 - the right side is on the wide roller
- adjust the hold-down feet to line up inside the material edge
 - note that the feet have to line up with the grit rollers and their corresponding markings on the cross bar
 - use 2 feet for narrower material and 3 for wider, see mark on machine
 - for large cuts leave at least 3/4" of material over the edge so that the rollers don't roll off the material at the long end
- pull forward material release lever to lower feet and secure vinyl
- on the control panel on the right of the machine choose [1]Roll-1 Rear Set [2]Roll-2 Rear Set [3]Sheet. Selecting option 2 allows further freedom when establishing job
- The origin point will be set to the bottom left hand corner
- To manually align print head use the guide arrows on the control panel. To reset the origin manually, set the position and push [origin]

Send Job

- in Corel Draw, open the print dialog
- choose the "Graphtec FC8000"
- open printer preferences and enter a page size as your material or smaller, click OK
- use the print preview to check location of your graphic on the material; you can drag it here to move it where you want it
- click print; this will open the controller software for the cutter where you will have

additional options

- run a test cut to confirm the blade settings and pressure; if not satisfactory consult manual for adjustment advice
- click cut
- if using a roll, use [crosscut] to remove work and leave the roll in with square edges

after cutting

- "weed" the parts of the vinyl outside your graphic
- apply transfer sheet (we have rollers on the shelf to help)
- if your decal is large, check out a few youtube videos about how to apply it without bubbles etc

Maintenance Procedures

- Never lubricate the mechanisms of the plotter.
- Clean the plotter's casing using a dry cloth that has been moistened in a neutral detergent diluted with water. *Never use thinner, benzene, alcohol, or similar solvents to clean the casings; they will damage the casing's finish.
- Clean the plotter's paper sensors using a cloth moistened in a neutral detergent diluted with water.
- Never use thinner, benzene, alcohol, or similar solvents to clean the sensors; cleaners such as these will damage the sensors.
- Clean the cutting mat strip using a dry cloth. In case of stubborn stains, use a cloth that has been moistened in alcohol or in a neutral detergent diluted with water.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Switch off the machine and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.
- When servicing equipment, power must be disconnected.



Required Personal Protective Equipment and Devices

- Long or loose hair must be tied back or contained
- No loose fitting clothing
- Eye Protection
- Nitrile disposable gloves

Potential Hazards

- Resin needs to be handled with care. It has a Material Safety Data Sheet (MSDS) with warnings. Can cause serious eye irritation and may cause an allergic skin reaction. Wear protective eye protection and avoid breathing vapour.

General Safety Information

Resin

Respect Formlabs resin like any household chemical. Follow standard chemical safety procedures and [Formlabs resin handling instructions](#). Wear gloves whenever handling liquid resin.

In general, Formlabs resin is not approved for use with food, drink, or medical applications on the human body. However, biocompatible resins, such as Dental SG, are biologically safe for specific types and lengths of exposure to the human body. Refer to information about each specific resin for more detail. Never ingest resin in liquid or solid form.

TIP

Always consult the [SDS \(Safety Data Sheet\)](#) as the primary source of information to

understand safety and handling of Formlabs materials.

Isopropyl Alcohol (IPA)



Isopropyl alcohol is a flammable chemical. These are kept in the yellow flammable cabinet located in the 3D Print room.

Carefully follow the safety instructions provided with the isopropyl alcohol that you purchase. Isopropyl alcohol can be flammable, even explosive, and should be kept away from heat, fire, or sparks. Any containers holding isopropyl alcohol should be kept closed or covered when not in use. We also recommend that you wear protective gloves and have good ventilation when working with IPA.

Sharp Tools

The accessories kit includes sharp tools such as: tweezers, flush cutters, a scraper, and a part removal tool. Using these tools on slippery surfaces (such as a resin-coated build platform) can result in sudden movement.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

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Required Personal Protective Equipment and Devices

- Long or loose hair must be tied back or contained
- No loose fitting clothing
- Wear safety gloves and long sleeves when working inside the oven.

Potential Hazards

- Higher degree burns

Specific Safety Practices

Oven.....

Warning: Always wear safety gloves and long sleeves when working inside the oven. Components are hot! The oven temperature is extremely hot. The oven temperature is controlled by a safety thermal breaker that shuts the system off when temperatures reach 260°C (500°F) Note: Opening the oven door shuts the oven heaters off.

Gantry..... Warning: Never wear a tie, loose clothing or dangling jewelry when working around moving components of the system. Beneath the top lid of the system is the XY Gantry. This area houses the mechanical drive components of the X and Y axes. Use extreme caution whenever accessing this area of the system. The servo drive system, including the motors, pulleys and belts are extremely powerful, and care must be taken. Note: The servo motors are disabled when the oven door or top hood is opened. The XY pinch hazard between the timing belts and pulleys is minimized by locking the hood while building and disabling the motors when the top hood is open.

Z Stage..... Warning: Never wear a tie, loose clothing or dangling jewelry when working around moving components of the system. The drive belt, pulleys and Z stage servo motor can cause severe injury. The Z stage crushing hazard is minimized by locking the door during Z stage moves and disabling the Z motor when the door is open. Head temperatures in the system can exceed 450°C (800°F)

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Safe Work Procedure

MakerGear 3D Printer

Created: September 22, 2018



Required Personal Protective Equipment and Devices

- Long or loose hair must be tied back or contained
- No loose fitting clothing

Potential Hazards

- Could burn hand or fingers on plate

General Safety Information

- Wait 30 minutes to allow for the heated bed to cool down before removing any printed parts.
- Unplug power cord from outlet when not in use. To unplug, grasp the plug and firmly pull it from electrical outlet. You should not ever pull the cord.
- Avoid any contact with moving parts.
- Keep hands/hair/clothing away from attachments of printer while the unit is operating to reduce risk of injury to persons, and/or damage to the unit.
- Do not operate your unit if: damaged cord/plug, malfunctioning, dropped or damaged in any way, or not operating properly

If an emergency situation occurs while conducting this task, or there is an

equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Safe Work Procedure

PRUSA 3D Printer

Created: September 22, 2018



Required Personal Protective Equipment and Devices

- Long or loose hair must be tied back or contained
- No loose fitting clothing

Potential Hazards

- Could burn hand or fingers on plate

SAFETY CONCERNS

- Be very cautious during any interaction with the printer. The printer is an electrical device with moving parts and hot temperature area.
- The device is for indoor use only. Do not expose the printer to rain or snow. Always keep the printer in a dry environment at a minimum distance of 30 cm from other objects.
- Always place the printer on a stable surface, where it can not fall or tip over.
- The printer supply is household power outlet 230 VAC, 50 Hz or 110 VAC / 60 Hz. Never connect the printer to a different power supply; it may cause malfunction or damage to the printer.
- Place the power cord so you can not stumble on it or step on it, or otherwise expose it to any potential damage. Also make sure that the power cord is not mechanically or otherwise damaged. If so stop using damaged power cord immediately, and replace it.
- When you disconnect the power cord from the socket, pull the plug rather than the cord to reduce the risk of damage to the plug or to the AC outlet.

- Never disassemble the printer power supply; it does not contain any parts that could be repaired by an unskilled worker. All repairs must be performed by a qualified technician.
- Do not touch the nozzle or heatbed when the printer is printing or warming up. Note that the temperature of the nozzle is 210 - 300 degrees C (410 - 572 degrees F); heatbed temperature can reach over 100 degrees C (212 degrees F). Temperatures above 40 degrees C (104 degrees F) can cause harm to the human body.
- Do not reach inside the printer while it is still operational. An injury may be caused by its moving parts.
- Prevent children from unsupervised access to the printer even when the printer is not printing.
- Plastic is being melted during printing which produces odors. Set up the printer in a well-ventilated place.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Safe Work Procedure

Ultimaker 3D Printer

Created: September 22, 2018



Required Personal Protective Equipment and Devices

- Long or loose hair must be tied back or contained
- No loose fitting clothing

Potential Hazards

- Could burn hand or fingers on plate

General Safety Information

- The Ultimaker 3D Printer generates high temperatures and has hot moving parts that can cause injury. Never reach inside of the Ultimaker while it is in operation. Always control the printer with the button at the front or the power switch at the back. Allow the Ultimaker to cool down for 5 minutes before reaching inside.
- Do not change or adjust anything on the Ultimaker unless the change is authorized by the manufacturer.
- Do not store items in the Ultimaker.
- The Ultimaker is not intended for use by persons with reduced physical and/or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning the use of the appliance by a person responsible for their safety.
- Children should be under constant supervision when using the printer.

Mechanical Safety

The Ultimaker contains moving parts. No damage to the user will be expected from the drive belts. The force of the build plate is big enough to give some damage, so keep hands out of the reach of the build plate during operation. Always unplug the printer before doing maintenance or modifications.

Risk of Burns

There is a potential risk of burns: the print head can reach temperatures up to 280 °C, while the heated bed can reach temperatures of 100 °C. Don't touch both with your bare hands.

Always allow the printer to cool down for 30 minutes before performing maintenance or modification.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.



Required Personal Protective Equipment and Devices

- Long or loose hair must be tied back or contained
- No loose fitting clothing
- No jewelry, watches, rings, necklaces etc.

POTENTIAL HAZARDS

- The build chamber is heated to +75C and printed objects and the platter are very hot when printing completes. USE THE LEATHER GLOVES to remove printed objects
- The washing fluid is corrosive, please be careful with it. Wear safety equipment when washing

DAMAGE CONCERNS

- No known concerns

CAPABILITIES

The uPrint Plus is a very capable medium-end commercial extrusion-based 3D printer. Prints 1.75mm ABS filament plastic in one pound 30 cubic inch cartridges. Small objects of arbitrary shapes can be printed in plastic, up to 10cm on a side from 3D models you supply in STL format.

BASIC OPERATIONS

Printing

- Go to the uPrint Plus printer, open the door, remove the build platter. Clean off any objects and replace it inside. If it is excessively worn, use another from the supply underneath
- Ensure the blue tabs are securely holding the platter down. Close the uPrint Plus door
- Power up uPrint Plus with switch on left rear. It will take a long time to warm up
- On a workstation attached to the AssentWorks internal network (wireless or wired) (and NOT AssentWorks_Guest, which is an External network), start up Catalyst software
- Go to Tab PACK and clear the platform of any previously loaded objects
- Go to Tab GENERAL and File/Open your STL 3D model
- Select desired resolution: 0.100 or 0.130 inches. Higher resolution takes much longer to print
- Select desired density. Always choose SPARSE as their default settings use too much material. Use solid only if you are printing a production part that will be used under stress
- Select desired support method. Recommend always using BASIC as the others are overkill unless you have a very pathologically intricate part
- Select the number of copies to print. Multiple copies takes longer to print than printing them serially
- Select millimeters as the measurement, but check your model to ensure this is what you want
- Leave scale to 1.0
- Hit "Add to Pack" and wait for processing to complete
- Go to PACK Tab and ensure things are set up properly on the bed. Note the amount of material (support and object) used and the estimated print time
- If Printer Status is OK, then hit "Print"

- Go to the uPrint Plus and wait for your filename to appear on the control panel
- Hit start to continue
- Wait for the print to complete
- When done use the gloves to remove the platter
- Carefully peel the object off the platter and replace the platter in the uPrint Plus
- Power down the uPrint Plus

Washing

- If you've printed objects with support material that's difficult to remove manually, you can use the washer to chemically remove the embedded support material
- Normally the washer has activated solvent in it already. See below for replacement instructions
- Turn on the washer, switch on the front
- Lift the lid and slowly raise it out of the fluid. It has a platter attached below
- Place items on the platter and lower them in
- Some items may float because there is air captured inside the support material. Use a stick to sink them if possible. Or poke a hole in the support at an appropriate place to compromise the flotation
- Ensure the lid is on centre
- Wait. A very long time. Even small objects seem to take many hours to clean, as long as six-eight hours
- Check periodically to see that progress occurs
- Do not leave the washer running unattended for lengths of time as it is hot (150F) and could potentially leak. It's ok to take items out when you leave and restart washing later
- When finished the objects can be removed. The fluid is slightly corrosive so wear eye protection and don't get it on your clothes, but it is non-toxic

- Wash the items off in water (sink in washroom) until they are no longer "slippery"

Re-Filling The Washer

- If the washer doesn't seem to be cleaning even after a lot of hours, then perhaps the fluid is no longer potent and needs to be replaced
- Turn off the washer
- Empty the tank into the pail with the valve at the rear
- Pour the old fluid down the drain in the washroom sink. It is apparently safe to do so
- Ensure the rear valve is CLOSED
- Refill the tank up to 1-2 inches of the top with clean water
- Open up ONE packet of cleaning goop (EcoWorks) - both "A" and "B" sides, and throw all the "teabags" into the water
- Washer now ready for operation

CONSUMABLES

The uPrint Plus prints only specially made ABS cartridges available from Cimatrix Systems. They are available in several colors, but cost \$155 each for 30 cubic inches of material

BASIC MAINTENANCE

Washer Fluid

- Replace the washing fluid when it is no longer potent (see above)

THINGS TO KNOW

- DO print models requiring support structures
- DO NOT attempt to change material cartridges unless you know what you're doing

- DO NOT frivolously print objects as uPrint material is very expensive, and all prints are logged
- DO leave the uPrint printing overnight unattended as it is capable of doing so safely
- DO NOT attempt to manually remove support material if it is embedded within your object; you must use the CleanStation

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Switch off the machine and reset all guards to a fully closed position.
- Leave the machine in a safe, clean and tidy state.
- When servicing equipment, power must be disconnected.



Required Personal Protective Equipment and Devices

- Long or loose hair must be tied back or contained
- No loose fitting clothing

Potential Hazards

- Inhalation of stray **dust particles**; this however is minimized by the machine's design that tries to enclose dust within sealed chambers.
- The z-bond infiltrate **toxic**. Use the finishing station blower to contain fumes. It is essentially super glue so you cannot let it touch skin or eyes.
- Objects infiltrated by z-bond become **very hot** for a brief period. Try not to touch them after soaking in z-bond

About This Equipment

The **zPrinter 650** is a powder-based commercial-grade 3D printer with a large build chamber, capable of 3D printing arbitrary objects with almost any geometry in full CYMK color. Objects produced are visually representative of your design, but are produced in a **fragile, brittle material**. This machine is **designed to produce visual and tactile prototypes**, not functional prototypes or anything you can use in a machine.

Specifications

- Colours: 390,000
- Resolution: 600 x 540 dpi
- Minimum Feature Size: 0.1 mm (0.004 inches)
- Automation Level: Full
 - Automated setup and monitoring
 - Automated loading
 - Automated powder recycling/removal
- Print speed Vertical: 1.1 inches / hour (28 mm / hour)
- Bucket size: 10 x 15 x 8 inches (254 x 381 x 203 mm)
- Material Options: High Performance Composite
- Layer Thickness: 0.0035 to 0.004 inch (0.089-0.102 mm)
- Number of nozzles: 1520
- File Formats for Printing: STL, VRML, PLY, 3DS, ZPR
- Unit dimensions: 74 x 29 x 57 inches (188 x 74 x 145 cm)
- Equipment weight: 750 lb (340 kg)
- Power requirements: 100-240 V, 15-7.5A

Output Examples



Damage Concerns

- Machine has multiple procedures to be followed during the complex print process.
Follow them all.
- **Do not leave anything in the print chamber** parts or equipment left in the chamber can prevent the axis from moving or worse, damage the axis.

Consumable Details

Members do not typically need to worry about providing consumables as they are billed based on use.

Consumables used from start to finish:

- zp151 composite powder
- z63 clear binder
- z63 black binder
- z63 cyan binder
- z63 magenta binder
- z63 yellow binder
- z-bond 90 infiltrate
- Waste tray
- Wax
- Epsom salt

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, shut the equipment off immediately and follow the lock out procedure.

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22. Refusal to Work Policy

Revised: February 05.19

Manitoba Workplace Safety and Health Act and Regulation. Right to Refuse Dangerous Work. Section 43(1) -

A worker may refuse to work or do particular work where he or she has reason to believe that:

- any equipment, machine, device or thing the worker is to use or operate is likely to endanger himself, herself or another worker;
- the physical condition of the workplace or the part thereof in which he or she works or is to work is likely to endanger himself or herself;
- workplace violence is likely to endanger himself or herself; or
- any equipment, machine, device or thing he or she is to use or operate or the physical condition of the workplace or the part thereof in which he or she works or is to work is in contravention of this Act or the regulations and such contravention is likely to endanger himself, herself or another worker.

Members must report dangerous conditions in the workplace to their employer, supervisor, or other person in charge. Workers have the **right to refuse** work that they reasonably believe constitutes a danger to their safety and health, or to the safety and health of another person. If the employer and the worker(s) are unable to agree on a resolution, and workers are not satisfied that an employer has taken necessary steps to remedy the dangerous condition **Manitoba Workplace Safety and Health (WSH)** may investigate the 'right to refuse.' Right to refuse is a high priority issue for WSH.

Investigating the Right to Refuse:

When WSH is advised of a right to refuse:

- A Safety and Health Officer (SHO) is assigned immediately. Where necessary, the SHO will attend the workplace.
- The assigned SHO meets with the worker, supervisor, workplace safety and health committee co-chairs or representative (if applicable) to resolve the safety and health concern.
- If the employer and the worker(s) are still unable to agree on a resolution, the assigned SHO will make a decision on whether or not the job situation or task that has been refused is dangerous to the safety and health of the worker or any other person at the workplace.
- If the SHO determines there is a danger, the employer may be issued orders to correct the issue.
- If the SHO determines that there is no danger, the SHO will explain their determination to the worker, and advise that the right to refuse exercised for the job task or situation is no longer valid.

WSH Legal Requirements:

See Manitoba Workplace Safety and Health Act, W210:

- Section 5, Duties of Workers;
- Section 7.5, Duty to Provide Required Information
- Section 40, Workplace Safety and Health Committees and Representatives
- Section 43(1), Right to Refuse Dangerous Work

See also, Part 35, Workplace Hazardous Products Information Systems Application of the Manitoba Workplace Safety and Health Regulation (M.R. 217/2006).

23. Accessibility Policy for Customer Service

September 11, 2018

North Forge's accessibility standard focuses on customer service. Introducing this policy addresses training and communication with the goal to achieve respectful, barrier-free customer service in all of our North Forge locations.

To the best of our ability we have addressed the following in the most reasonable manner possible. This policy will be reviewed on an annual basis.

- Meet the communication needs of customers, clients or members.
 - North Forge sends out a newsletter twice a month where we communicate important information. Anyone can subscribe to our newsletter via our website.
 - Phone numbers are listed on our website to make it easy for anyone to contact us.
 - Members utilize Slack as our main communication tool and emails are sent for important information.
- Allow assistive devices, such as wheelchairs, walkers and oxygen tanks.
 - North Forge makes the best effort to accommodate wheelchairs, walkers and oxygen tanks. Our locations are in very old buildings in the exchange district in downtown Winnipeg. We have about 3 - 4 steps to take before an elevator is available.
 - Our location in Smart Park is accessible.
- North Forge welcomes support people, who are there to assist.

- North Forge welcomes people with service animals.
- To the best of our ability North Forge will ensure accessibility is maintained as intended (ramps, wide aisles, removal of clutter).
- When we are notified in advance, North Forge does let customers know when accessible features and services are not available. Example: during Open House Tours.
- Invite customers to provide feedback. North Forge does send out quarterly surveys to our members. All Members is invited to attend our North Forge Fabrication Lab Member Meetings.
- Train staff on accessible customer service, including reasonable accommodations under *The Human Rights Code (Manitoba)*.
 - North Forge will review during our staff days throughout the year.

24. Measuring Success

What does success look like for our North Forge Safety Program

Objectives and Key Performance Indicators

1. Increase our number of submitted near miss reports in an effort to prevent future injuries. This will result in the investigations to take place before a Safety Incident actually occurs. Corrective Action would result from identifying direct, indirect and root causes. Communications back to our members will result in a timely manner. The outcome should also be that members become more comfortable reporting near misses and are more aware of being safe.
 - Communicate positive incentives for reporting a near miss by offering a small gift card.
 - Make it as easy as possible to report through a digital form and paper forms.
 - Communicate results in a timely manner so all members can see we are taking action. Communicate through the Safety channel on SLACK and at Tuesday night member meetings.

Key Performance Indicators:

- Number of near misses (increasing)
 - Number of injuries
2. Members adopting a safety culture.
 - Consistently send out tips and awareness messages on the Safety channel on SLACK.
 - Safety updates at every Tuesday night member meetings.
 - Bring in a Made Safe or Safe Manitoba representative to talk at our member meeting about Safety Culture.
 - Member Council members to lead by example.
 - Member wearing PPE, read Safe Work Procedures and coach one another on being safe. A reduction in the number of times the Vice President and Safety Committee members need to give verbal and written warnings to members for non-compliance of our safety policies.
 - Having a designated North Forge Safety Champion
 - Member engagement - having a safety committee committed to ensuring the standards are met will increase morale within the shop.

- Raising safety awareness at all levels of North Forge from members to the President.
- Having the Safety Program moving forward by members for members.
- Implementing Safety Program promotions at North Forge

Key Performance Indicators:

- Member engagement regarding safety in the Safety channels on slack and in person in the shop.

Measuring the effectiveness of the North Forge Safety and Health Performance -

Leading Indicators - can be a useful tool to help us track, measure and adjust our Safety Program so we can effectively direct our health and safety performance and avoid incidents/harm. Leading indicators reflect positive opportunities for changing health and safety performance.

Leading Indicators can help provide assurance and build confidence where corrective actions are shown to be in place. Leading indicators measure the inputs that people are making to the safety management process. They measure the presence of safety as opposed to the absence of injury. They acknowledge individual efforts and, in so doing, can inspire a positive culture towards improving health and safety performance.

1. Near Miss Reports Increasing
2. Adopting a Safety Culture
3. Safety and Orientation Training

Lagging Indicator (outcomes from the past)

1. Number of injuries decreasing

KPI	Base Line (as of April 24.19)	Actual as of March 25.20
Near Misses Reported	5	
Safety Culture	Good*	
Safety and Orientation Training Completed by Members (% of total members)	41%	
Injuries reported	4	

*Safety Culture -

Poor - No Engagement

Fair - Some engagement and mostly driven by North Forge Staff.

Good - Beginning to have the Safety Program driven by members rather than North Forge staff.

Very Good - Safety Program driven by the members.

Excellent - Safety Program driven by members with recommendations and improvements solicited and implemented.

Safety and Orientation Training Completed by Members

Poor - less than 60% members trained.

Fair - 60 - 69% of members trained

Good - 70 - 79% of members trained

Very Good - 80 - 99% of members trained.

Excellent - 100% of members trained.

Process to Review (and applied consistently at all locations) -

The online form is communicated and available at all North Forge Locations.

25. Vulnerable Members Policy

Vulnerable members are those members who have greater exposure than most to injury and illness due to their lack of experience, reluctance to ask questions, communication barriers and lack of mobility.

The term vulnerable worker does not just apply to one group. Some workers are more vulnerable to injury, either due to language barriers or because they are new or young workers. There are many kinds of vulnerable workers, including those who:

- Recently moved to Manitoba from another province/country
- Attempting a return to work program after a long absence
- Do not have adequate English language skills

New Members

- All new members receive a link to a digital Welcome Kit with information to help them become familiar with the Fabrication Lab.
- North Forge has a Entrepreneur in Residence who is a mentor for all members requiring more direction at the Fabrication Lab.
- All new members have their picture taken (with permission) and is posted in the Member Introduction channel on Slack. This gives them visibility among all other members that they may need extra assistance to become familiar with the Fabrication Lab.

Language Barriers

- Icons, pictures and color are used as much as reasonably possible to indicate safety warnings.
- To the best of our knowledge, currently, we have no member who has come forward or who is known to have English as a second language.

Lack of Mobility

- North Forge Fabrication Lab has two freight elevators to transport anyone who could not get down the stairs. All members currently are mobile enough to take the stairs.

Resources Available	Type of Resource
Made Safe	Consultant
World Trade Centre Winnipeg	Information Sessions for New Immigrants

Siloam Mission	Food and Shelter
Access Winnipeg	Social Services
St. John Ambulance	Courses and Training
Society for Manitobans with Disabilities	Disability Services and Support
Crisis Response Centre	Mental Health Services



26. CLEAN WORK TABLE POLICY

We all would like to have an empty work table at the Fabrication Lab when we need one. We also strive for a tidy work area which will increase safety for all members.

What's New -

Nothing is to be left on or under work tables overnight unless technically required to do so (eg gluing, drying etc, as indicated with official label & contact info).

Where to store materials -

- Shelf / Locker
- Take home
- Vehicle

We have available shelves to rent for \$100 for the year. Contact Marney if you need a shelf.

Monitoring -

We will be monitoring work tables periodically. Any work tables occupied with no member active in the shop and not labeled as indicated above will be removed.

Duration -

The materials removed will be kept in storage and you'll need to contact Marney Stapley, Randy Merritt or Jeff Stobbe via Slack to have them back. A new CleanWorkTable Channel will be created in Slack. Items will be released at next opportunity. After 7 days, Material not requested out of the cage will be declared abandoned and we will dispose of it at our discretion.

Fine -

A \$20 invoice will be sent to the offending members. The fee is only a way to start and encourage culture change.

Every member is eligible for one "Free Ride".

27. Contractor Safety Policy

Manitoba Workplace Safety and Health Act and Regulation. Duties of Contractors. 7.1

Duties of Prime Contractors: Workplace Safety and Health Act W210 – Section 7 o Committee for Construction Project Site: Workplace Safety and Health Act W210 – Section 40(3)

PURPOSE

So that Contractors and Subcontractors are compliant to all Company Health & Safety requirements and/or Government Health & Safety standards while performing work on North Forge property.

SCOPE

This applies to all North Forge property, facilities, equipment, and contractors/subcontractors retained by us.

IMPLEMENTATION

The VP, or designate, is responsible for the implementation and compliance to this policy.

DEFINITIONS

Prime Contractor: Any contractor coming in to the Fabrication Lab to work with the Maintenance Manager at North Forge, two companies are therefore working on the same site and therefore, one must be the Prime Contractor. By default, in this scenario, North Forge would be the Prime Contractor and will be held accountable for fulfilling the responsibilities of the prime.

Contractor: Any person or company who supplies services or equipment, and whose activities on Company property includes installation, loading and unloading or performance of trades specific activities or work at Company request.

Contract personnel: The employees and/or subcontractors engaged by the Contractor in performance of his work.

Project Coordinator: The Company employee designated to supervise the project for which the Contractor has been engaged, to ensure compliance with all applicable regulations, and to resolve situations that would delay or prohibit completion of the project.

PRIME CONTRACTOR RESPONSIBILITIES

In the absence of a Prime Contractor agreement, North Forge will assume the responsibilities of the prime contractor, and will:

- (a) ensure, so far as is reasonably practicable, that every person involved in work on the project complies with this Act and the regulations;
- (b) co-ordinate, organize and oversee the performance of all work at the construction project site and conduct his or her own activities in such a way as to ensure, so far as is reasonably practicable, that no person is exposed to risks to his or her safety or health arising out of, or in connection with activities at the construction project site;
- (c) co-operate with any other person exercising a duty imposed by this Act or the regulations; and
- (d) comply with this Act and the regulations.

To facilitate the identification, control, and communication of hazards, all contracted projects will require that the "Plant Level Hazard Assessment" form be completed on a daily basis, and approved by a member of the North Forge Management team. See attached Plant Level Hazard Assessment.

The prime contractor is legally responsible for:

- Setting up an effective system to ensure that everyone involved in work at the project meets their legal safety and health obligations
- Co-ordinating, organizing, and monitoring work on the project to ensure reasonable and practical precautions are in place to effectively control safety and health hazards
- Co-ordinating the safety and health programs of contracted employers.

CONTRACTOR RESPONSIBILITIES

- a) Contractors are required, without limitation, to observe all Health & Safety policies and complete our mandatory safety orientation and utilize all Personal Protective Equipment (PPE) required in the shop. Prior to commencing work, all contractor personnel must sign off on this Contractor Safety Policy.
- b) Contractors working on Company property, assume complete responsibility for the safe performance of the work. This responsibility extends to all North Forge employees and property, the contractor's employees, subcontractor's employees, and all other persons exposed to the contracted work. These Health & Safety rules shall be considered the minimum requirements. The performance of all work, materials, and equipment must adhere to all federal, provincial, and local laws, as well as any other applicable codes, acts, and ordinances.
- c) All contractors, subcontractors, and their employees and visitors must adhere to these Health & Safety rules. Failure to adhere may be considered a breach of contract conditions, and may result in immediate removal from the premises and become cause for exclusion from any future bidding considerations.

- d) Contractors shall provide, prior to performing services on site:
 - 1) Certificates of comprehensive general liability insurance.
 - 2) A signed declaration agreeing to the conditions of this policy
 - 3) A completed Hazard Assessment for approval and posting.

North Forge RESPONSIBILITIES

The Workplace Safety and Health Act, Duties of Contractors. 7.1

- To ensure prior to initiation of contracted services, that approved Health & Safety documentation has been completed and filed by the Vice President on behalf of the Safety Committee.
- Annually conduct a contractor Health & Safety meeting for those contractors who **regularly** perform work on Company premises. As part of this meeting, ensure that all participants review and receive a copy of the Corporate Safety policy, COMPANY policy (see above), as well as any other applicable Company policies.
- Contracted services of a one time nature will have the same contractor Health & Safety meeting conducted on a one on one basis, by the Safety Lead or the Vice President of North Forge.

SAFETY RULES

1) Alcohol, Explosives, Drugs, Etc.:

- a. Alcohol, regulated/unregulated drugs, explosives, and firearms or ammunition are not permitted on North Forge property.

2) Security: All entrances and exits from the buildings are to be kept clear and passable.

3) Vehicles: No vehicle may be parked where access to shipping doors/docks, man doors, or an emergency exit is restricted.

4) General Facilities: No contractor is to operate any facility's controls to shut down, start, isolate, or adjust operating systems without prior approval from the Maintenance Manager. Any such operation must be coordinated with plant personnel and the departments involved.

5) Injury and Incident Reporting: In order to properly discover the causes of accidents and injuries, and take steps to prevent further accidents, contractors are required to investigate and report all accidents occurring on North Forge property. This includes accidents solely involving contractor employees and property. The Safety Lead or the Vice President of North Forge will assist in investigating injuries and incidents where necessary.

6) Fire Procedures: Contractor personnel should be aware of the location of the nearest fire extinguisher. All contractors, subcontractors, and their employees are required to be familiar with our emergency preparedness plan, including evacuation maps and designated meeting areas. In the event of an emergency, the contractors, subcontractors, and their employees must not leave the property without informing the Maintenance Manager.

- 7) Emergency Equipment:** All firefighting and first aid equipment whether North Forge's or the contractor's shall be kept clear and accessible at all times. Removal of any firefighting or first aid equipment must be approved by the Maintenance Manager.
- 8) Compressed Gases:** All compressed gases used by a contractor shall be stored in an upright position, with approved caps in place and properly secured against falling. Compressed gas bottles shall be handled with care and never dropped or rolled. Oxygen and acetylene shall be stored separately, except when paired for immediate use. **Under no circumstances will compressed gases be stored in an unventilated room.**
- 9) Hazardous Materials, Solvents, and Paints:** All contractors must adhere to the requirements of federal and provincial laws on Workplace Hazardous Materials Information System (WHMIS) and Transportation of Dangerous Goods (TDG), and all other applicable regulations for handling hazardous materials or controlled products. Upon request contractor must provide to either the Health & Safety Coordinator or the Maintenance Manager, Safety Data Sheets (SDS) for any products listed under the WHMIS laws used on North Forge property in the performance of contracted work.
- 10) Electrical Safety:** The contractor must adhere to our Lockout policy when performing any work on electrical systems. Contractors must have the approval of the Maintenance Manager prior to de-energizing any circuit, subsystem, or feeder. All changes in a breaker panel must be reported to the Maintenance Manager during the job if possible or upon completion of the job.
- 11) Lockout:** All outside contractors working for North Forge shall follow our lockout procedures. The project coordinator hiring the contractor or designate is responsible for ensuring that the contractor/s are trained to the North Forge policy and that they abide by it.
- 12) Confined Space:** All outside contractors working for North Forge shall follow their Confined Space Procedures. All outside contractors shall provide for prevention of injury or illness as a result of working in confined space and provide safe work procedures for entering and working in confined space.
- 13) Ladders:** All ladders used by the contractor shall be in good repair and suitable for the use intended.
- 14) Personal Protective Equipment:** Contractors, subcontractors, and their employees must adhere to all of North Forge's policies regarding the use of (PPE). No contractor, subcontractor, or their employee shall enter the North Forge Fabrication Lab without proper PPE. All contractor supplied PPE will subject to the approval of the Project Coordinator and/or the Health & Safety Coordinator. North Forge mandatory PPE consists of: safety glasses and safety footwear. The contractor shall ensure that his employees use PPE properly and when required.
- 15) Storage of Materials and Housekeeping:** Locations for material storage on North Forge property is to be approved by the Safety Committee, Maintenance Manager or the Vice President. All hazardous or controlled substances must be identified to the Maintenance Manager prior to use or storage on site. The contractor shall ensure that the work site is kept orderly at all times. Waste materials shall be removed from the work site at reasonable intervals. The contractor, unless previous arrangements have been made with the Maintenance Manager, is responsible for the

proper disposal of rubbish. North Forge garbage bins and dumpsters shall not be used for contractor generated refuse unless prior permission is received from the Maintenance Manager. Specialized work, such as hazardous waste handling, rigging operations, and so on may require more specific proofs of insurance.

Criteria Selection for Contractors or other self employed persons

		Contractor's abilities								
		Work experience	Technology and equipment	Management	Experience and knowledge of the technical staff	Financial stability	Quality	Being familiar with the area or being domestic	Reputation	Creativity and innovation
		20	15	10	10	15	5	5	15	5
Project owner's requirements	Respecting the schedule and in-time delivery	0.6	0.6	1.0	0.4	0.6	0.8	0.2	0.6	0.4
	Conformity with the planned expenditures	0.4	0.6	0.8	0.4	1.0	0.6	0.6	0.6	0.6
	Conformity with technical specifications	0.8	0.6	0.4	0.8	0.4	1.0	0.4	0.8	0.2
	Accountability and providing necessary guarantees	0.2	0.4	0.6	0.2	0.8	0.4	0.2	0.6	0.0
	Good faith and appropriate communications	0.2	0.0	0.6	0.4	0.2	0.6	0.8	0.6	0.0
	Health and safety procedures	0.4	0.4	0.6	0.8	0.4	0.6	0.0	0.6	0.2

2. Insurance Requirements

Insurance Requirements	Not Required	Required	Expiry Date	Policy Number
Workers Compensation Coverage				
Professional Indemnity				
Liability Insurance				

3. Contractor Supplied PPE Requirements

Minimum PPE Requirements as per the PPE for Contractors Policy-- for Fabrication Lab

- Safety Glasses
- Safety Boots

Additional PPE Requirements – as required for the task

- Respirators as required
- Hearing protection
- Clothing suitable for conditions or task (i.e. welding gloves, etc.)
- Goggles or face shields (i.e. for handling chemicals or protection from flying debris, etc)
- Welding Gear (i.e. welding helmet, gloves, sleeves, etc.) as required
- Locks and lockout devices as necessary to lockout machines and equipment

Contractor Safety Checklist

4. Contractor Safety Rules

- No smoking is allowed anywhere in the shop – smoking is permitted in designated outside areas only.
- No contractor shall bring onto the property any controlled product unless accompanied by a current MSDS for the product.
- When the evacuation horn sounds, the contractor and all his employees must exit the building through the nearest exit and report to the designated rally point.
- Contractors must clean up spills and debris that accumulate as a result of their activities.
- Contractors must adhere to the lockout procedure when working on equipment. Contractors must provide their own locks per the equipment lockout procedure.
- Contractors engaged in confined entry work must ensure that workers are properly trained in confined entry procedures regulations and guidelines.

Contractor Safety Checklist

Contractors who fail to follow this Safety Checklist will have their facility privileges revoked and may be asked to leave the property immediately.

5. Signatures

Contractor Signature:

Date:

Vice President, North Forge Fabrication Lab Signature:

Date:



28. Confined Space Policy

The regulations require that safe work procedures for working in confined spaces have an emergency response plan and rescue procedures that will be used in the event of an emergency [Section 15.2(2)(e)]. The regulations also require that you identify what equipment is necessary to perform a rescue [Section 15.3(e)], that the rescue equipment is readily available, and that the rescue procedures have been implemented [Section 15.13(a) + (b)].

Risk assessment

Confined space in the North Forge Fabrication Lab are the Paint Room, Electrical Room and Freight Elevators.

Paint Room -

The door to the paint room should be left open with the air exhaust fan on while painting or staining. The door swings open and shut and does not have a lock or handle. A member can not be locked in the room.

Electrical Room -

The door is locked and can only be opened by a key accessible by the Vice President or Maintenance Manager. From the inside of the room, the door can not be locked. When someone is working in the electrical room, the door is always to be kept open.

Freight Elevators -

The freight elevators receive regular (monthly) scheduled inspections and maintenance from Allied Elevator. Remco, Property Manager is responsible for maintaining the freight elevators.



29. Air Assessment

Part 4 of General Workplace Requirement, 4.1 Air Quality and ventilation, North Forge must, as much as is reasonably practicable, ensure that the Fabrication Lab has appropriate air quality and is adequately ventilated. Also that contaminants and impurities are prevented from accumulating in the air at a workplace.

Bi-annual preventative maintenance is conducted on our rooftop furnace units by ALCOR Mechanical. Furnace filters are changed in the shop and office on a monthly basis.

The following air assessment took place as of December 17, 2018:

The names of the 3 most commonly used chemicals in the shop area - Lens Cleaner ([Ultra Clarity](#)), Windex, and IPO (Isopropyl Alcohol 99% USP).

The most commonly used 3D printer material: PLA (Thermoplastic)

How much of it is used per day - 1.5 KG a month. 1 KG spool = 330 meters / 30 days = 11 meters a day.

The most commonly used type of wood - Baltic Birch

How much cutting happens per day - 1.5 hours a day.

Every room in the Fabrication Lab is ventilated with Air Assist and Fresh Air Venting.

The results -



Search Topics... 🔍

DUST EXPOSURE CALCULATOR

Process Name: Baltic Birch Cutting

Duration: Exposure occurs 1 – 2 hours / day
Proximity: Worker is directly in emission
Dustiness: Crystalline granular solids. Some dust is seen but dust settles quickly, E.G, detergent, TIG welding, sawing wood.
OEL: 5-15
Controls: Moderately effective local exhaust with partial capture

WELCOME DANI

Questions? Please contact us!

DASHBOARD

TOPICS

CALCULATORS

LOGOUT

Estimated exposure is	Action to take
<1 % of the OEL	No Action Recommended
1 - 10% of OEL	General WHMIS Training
10 - 20% of OEL	plus specific training on hazards of products
20 - 100% of OEL	plus periodic exposure monitoring
> 100% of OEL	plus respiratory, engineering or other controls
100 times of OEL	general respiratory protection, improved controls or process shutdown



Search Topics... 🔍

LIQUID EXPOSURE CALCULATOR

Process Name: Isopropanol use

Duration: Exposure occurs 2 – 4 hours / day
Proximity: Worker is consistently nearby
Vapour Hazard Ratio: 200 - 500
Nature of Process: Default
Controls: Open system with effective general ventilation controls in place to contain and/or remove airborne contaminants from work area (e.g. 6 - 12 air changes per hour of general ventilation)

WELCOME DANI

Questions? Please contact us!

DASHBOARD

TOPICS

CALCULATORS

LOGOUT

Estimated exposure is	Action to take
<1 % of the OEL	No Action Recommended
1 - 10% of OEL	General WHMIS Training
10 - 20% of OEL	plus specific training on hazards of products
20 - 100% of OEL	plus periodic exposure monitoring
> 100% of OEL	plus respiratory, engineering or other controls
100 times of OEL	general respiratory protection, improved controls or process shutdown



DUST EXPOSURE CALCULATOR

Process Name: PLA 3D printing filament

Duration: Exposure occurs 4 - 8 hours / day

Proximity: Worker is consistently nearby

Dustiness: Solids that don't break up easily. Very little dust is seen during use. E.G pellets, MIG welding on aluminum

OEL: 5-15

Controls: Open system with no administrative or engineering controls in place (basically no controls in place)

Estimated exposure is Action to take

Estimated exposure is	Action to take
<1 % of the OEL	No Action Recommended
1 - 10% of OEL	General WHMIS Training
10 - 20% of OEL	plus specific training on hazards of products
20 - 100% of OEL	plus periodic exposure monitoring
> 100% of OEL	plus respiratory, engineering or other controls
Multiples of OEL	greater respiratory protection, (plus other controls if advised) required

WELCOME DANI

Questions? Please contact us!

- DASHBOARD
- TOPICS
- CALCULATORS
- LOGOUT

30. Asbestos Assessment and Asbestos Management Policy

Updated: February 17, 2021

Part 37 Asbestos, 37.2(1) Inventory of asbestos-containing material.

Asbestos Inventory -

A Fabrication Lab inspection took place in 2018 with the Safety Committee, including members who are competent in identifying asbestos-containing material.

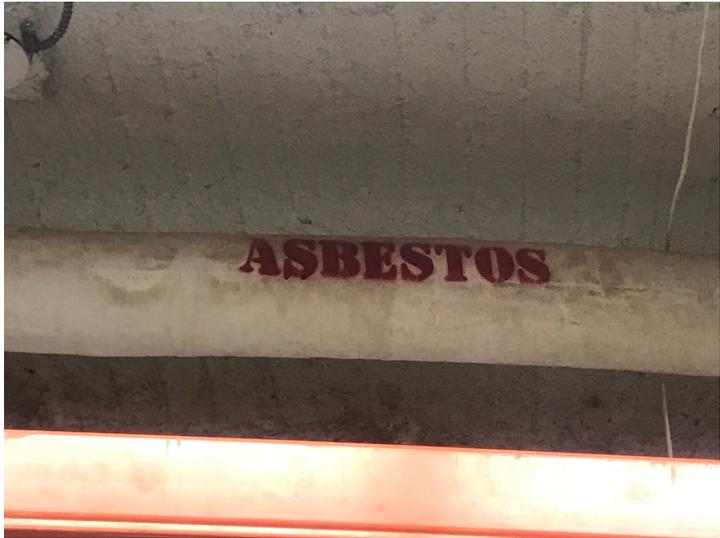
One area of the shop was identified as having asbestos in the 3D Printing room on the roof. This area is the responsibility of the property manager, Remco and they are aware that we have labeled it as containing asbestos. The area has been clearly identified so it is not disturbed without the proper training and equipment procedures.

Annual inspection is scheduled in the Fabrication Lab for any asbestos containing material. Inspections in 2019 and 2020 were completed before every Safety Committee meeting without identifying it as a concern or problem. Inspection on February 17, 2021 now is a concern or problem. The re-wrapping of the pipe labeled asbestos was completed on February 23rd, 2021.

Table 1: Risk matrix

Probability	High			
	Med.			
	Low			
		Low	Med.	High
		Severity		

Hazard	How is the Risk Controlled	What further action is required to control the risk	Risk Rating
Pipe on the roof that is labeled asbestos is open and pieces of debris are falling onto our shelves.	If possible, move equipment away from the area.	Contact the Property Manager to patch / wrap the pipe.	Med probability and low severity



Marney Stapley
 Vice President, North Forge Fabrication Lab



31. Code of Conduct

2.14 Clean and Sanitary workplace, Manitoba Regulation, Workplace Safety and Health Regulation.

CODE OF CONDUCT

North Forge is dedicated to providing an ethical, safe, peaceful, and enjoyable working environment for everyone. Therefore, North Forge has adopted the following codes of conduct to address harassment, respect of workspace cleanliness and noise level in workspaces.

Harassment includes, but is not limited to, reasonably offensive verbal comments related to gender, gender identity and expression, sexual orientation, disability, physical appearance, body size, race, ethnicity or religion; sexual images in public spaces; deliberate intimidation; stalking; following; harassing photography or recording; sustained disruption of talks or other events; inappropriate physical contact; and unwelcome sexual attention.

Keeping the premises tidy is a requirement in maintaining a quality workspace. Work areas, as well as food and lobby areas, are expected to be kept clean and presentable. North Forge's "rule of thumb" is to clean an additional few meters of space around the Licensee. This means cleaning up after yourself in the Space and Equipment area and any additional space around the Space and Equipment area, in the fabrication lab space as well as the lobby area. Also, any food stored in a fridge in the Premises should be labeled with your name and date.

Members shelves must be kept orderly as much as reasonably practicable. The shelves must be kept in a clean and sanitary state and kept free from any condition that may create a risk to a member's safety or health. If you can not follow this, you risk having your self contents removed (thrown in the garbage or basement). Warnings will always be given via General SLACK Channel.

Proper etiquette is required when using the Premises as they are public places of business and should be treated as such. Therefore, the Licensee and its guests should be treated by others with respect and refrain from activities that disturb others in any way.

The Licensee must be mindful not to disturb the noise environment, or any specific person in the environment. The Premises is a co-working space. We expect the Licensee to make efforts to recognize the needs of others, and a balance should always be sought to recognize the needs of one, while not hindering the needs of another.

If you believe any of the conduct codes outlined above are not being met, please contact Marney Stapley at mstapley@northforge.ca. North Forge may take any action it deems appropriate, including warning the offender or terminating their membership. North Forge values all users of the premises. North Forge expects participants to follow the above rules at all event venues and event-related social events.

32. Working Alone Policy

Updated: July 10, 2019

9. Working Alone or in Isolation, Manitoba Regulation, Workplace Safety and Health Regulation.

The working alone policy was developed with the Safety Committee and modified after the Risk Assessment was completed.

North Forge recommends all members to have another person with them at the shop during hours of about 10 pm - 7 am. If this is not possible, North Forge does not recommend using any of our high risk equipment. Our high risk equipment is identified with this sticker:



Have a buddy system process in place. Example: Call home every 20 minutes.

Emergency contact information is in the middle of the assembly area in the shop by the landline telephone.

Safe Work Procedures have been developed and are accessible. An employee must follow Safe Work Procedures to eliminate or reduce the risks to members working alone.

All members of the North Forge Fabrication Lab are mandated to complete Safety and Orientation Training.

33. Violence Policy

This policy was developed in consultation with North Forge Safety Committee members.

Violence Policy is not required for North Forge.

WSH Regulation Part 11 – Violence in the Workplace

11.1 A workplace is subject to this part if:

- a) the workplace is used to provide healthcare services, which for certainty includes the workplaces described in section 11.8
- b) the workplace is used to provide the following services:
 - 1. Pharmaceutical dispensing services
 - 2. Education services
 - 3. Financial services
 - 4. Police, corrections or other law enforcement services
 - 5. Security services
 - 6. Crises, counselling and intervention services
 - 7. Public transportation, if the workplace is a taxi cab or a transit bus
- c) the workplace is open to the public for the purpose of retail sales between the hours of 11 pm and 6 am.
- d) the workplace is a licensed premise within the meaning of the Liquor Control Act or

11.2 An employer of a workplace that is not described above must assess the risk of violence to a worker in the workplace. The assessment must be carried out in conjunction with

- a) the committee at the workplace
- b) the representative at the workplace or
- c) when there is no committee or representative, the workers at the workplace.

Risk Assessment and Hazard Identification

Lobby Area	People and interactions. Low risk.
Co-Working Space	People and interactions. Low risk.
Assembly Area	People and interactions. Low risk.
Equipment Rooms	Working Alone or in isolation – hours of work

Mitigating the Risk -

Our policy is not to work alone at night. Every member is told to have a “buddy” with them or not to use any high-risk equipment (as labeled). Late at night, members may be using low risk equipment. No member is to open the door bell if not expecting anyone. The door remains locked at all times. Only members can access the shop with a key fob.

Priority Level

Green = unlikely frequency and severity is negligible to marginal

Yellow = unlikely or possible frequency and severity is marginal

34. Safety Rules

North Forge will make members aware of the rules that pertain to them working in the Fabrication Lab. North Forge has also developed a set of company rules. Most company rules can be found in the member agreement, code of conduct and in the clean work table policy and onboarding package for new members - however there are a few more that pertain to safety:

- Do not operate any equipment if you are unsure about the operation of it or have not been trained in its safe operation.
- Never remove or disable any safeguards.
- Keep all work areas and walkways clean. Never leave a work area without cleaning it (refer to Clean Work Table Policy).
- Proper use of Personal Protective Equipment (PPE) is mandatory.
- No one will be allowed to work at North Forge while under the influence of alcohol.
- No one is allowed in the shop under the age 18 unless supervised by an adult.
- Keep extension cords, if possible, from crossing designated walkways.
- Never block fire exits or safety equipment such as first aid kits and fire extinguishers.
- Ensure all ladders are properly set-up and secured before use.
- Do not let anyone onto the 3rd floor unless you are expecting them.
- Accidents, injuries, unsafe conditions and “near misses”, regardless of their nature, are encouraged to be reported on the sheets by the Safety Manual or through the online form: northforge.ca/safety
- CSA approved footwear and safety glasses must be worn at all times.
- Appropriate protective gloves shall be worn by all North Forge Fabrication Lab members when performing work where gloves provide specific hazard protection. Example: wearing the blue nitrile gloves when handling the Form 2 resin post-processing.
- Clothing must also be appropriate for duties being performed. Example: Long jewelry should not be worn around moving machinery or other sources of entanglement.
- No tool shall be used for any purpose other than that intended. All damaged or worn parts shall be promptly repaired or replaced.
- Smoking (including e-cigarettes) is not permitted in the Fabrication Lab.
- Running is not permitted anywhere, except in the case of extreme emergency.
- Possession or use at the Fabrication Lab of intoxicating beverages or unauthorized drugs - or to be under their influence - is strictly forbidden.

- Horseplay, fighting, vandalism, improper activity or behaviour, and possession of firearms are strictly forbidden on the job.
- Housekeeping must be maintained at all times.
- Workers must adhere to appropriate Safe Work Practices and Procedures for the work being performed.

35. North Forge Procurement Policy

North Forge has established a process to evaluate purchased products, supplies, equipment, raw materials and other goods so that they will not pose a significant risk to the members who must work with them. This process shall:

- Identify and assess the hazards and risks associated with the use of these goods.
- Establish requirements to eliminate or control these hazards and risks and
- Ensure that purchased goods conform to the North Forge safety management requirements, applicable standards and minimum legislative requirements.
- Include training for our purchasers on how to meet the requirements of our policy.

During procurement process North Forge will take into account:

- Documentation on safe use and handling of machinery and equipment, such as manufacturer's safe use instructions.
- WHMIS supplier labels and material data sheets (MDS).
- Manufacturer's technical specifications (i.e. noise levels, guards or voltage).
- North Forge legislative requirements.
- Ergonomic and human factors.
- Required PPE. (example: CSA approved).
- Training associated with the use of purchased products, supplies and equipment after use.
- Any requirements in law, codes, or industry standards
- Any special needs for commissioning and / or decommissioning new equipment.



Required Training

- WHMIS

Required Personal Protective Equipment and Devices

- Review the Materials Safety Data Sheet (MSDS) for the controlled product to identify the required Personal Protective Equipment.

Potential Hazards

- Review the Material Safety Data Sheet and Supplier Label for the controlled product to identify any potential hazards associated with each product used.
- Chemical exposure through inhalation, injection, ingestion, absorption

Pre-Operational Safety Checks

- Confirm all equipment required to work with the controlled product is functioning properly such as a fume hood etc.
- Confirm MSDS is less than 3 years old

Prohibited Activities

- Do not use unidentified or unlabelled controlled products
- Do not use a controlled product for something other than its intended use identified on the MSDS
- Improper disposal of controlled products
- Do not use a controlled product without a current MSDS
- Accepting a controlled product without a supplier label on it
- Do not leave a unlabelled controlled product unattended

Safe Work Procedure

1. Confirm the Materials Safety Data Sheet for the controlled product is less than three years old.
2. Replace the MSDS if it is greater than three years old.

3. Review MSDS and Supplier Label to identify personal protective equipment required and potential hazards.
4. Inspect required personal protective equipment and replace if required.
5. If required to use a respirator, confirm respirator has the correct cartridge for the controlled product used and the cartridge is not expired.
6. Put on all of the required personal protective equipment.
7. Use the controlled product for its intended use following instructions on the supplier label and identified by safe work procedure for the task.
8. If the controlled product is transferred to another container ensure a Workplace Label is placed on the container identifying the product name, precautionary statements and reference to the MSDS.
9. Ensure controlled product does not come into contact with any substances listed under the incompatible substances section of the MSDS.
10. If applicable, clean up and dispose of contaminated materials as described in the MSDS.

If an emergency situation occurs while conducting this task, or there is an equipment malfunction, contact Security Services Immediately.

REPORT ANY HAZARDOUS SITUATION TO THE MAINTENANCE MANAGER OR VICE PRESIDENT AT THE FABRICATION LAB, ON THE BROKEN CHANNEL OR SAFETY CHANNEL ON SLACK.

Housekeeping

- Place all controlled products in their proper storage area.
- Ensure the all equipment and the area is safe, clean and tidy before you leave it.
- Ensure workplace labels are created and in place where required.