NC STATE UNIVERSITY Safety Plan Report

Plan Number	218	**Annual Approval**	4/19/2014
Area	111 Lampe Drive	**Approved**	5/28/2013
Room	118	**Approval Notes**	

Investigators

Ronald Aman

Position		**Home Phone**	593-5777
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Department	Industrials and Syst		

Dan Leonard

Position	Lab Supervisor	**Home Phone**	919-609-0741
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Campus Box			
Department	Industrial & Systems Engineering		

Jason Low

Position	Lecturer	**Home Phone**	919-372-9425
Office Phone	515-1424	**Room**	
Office Building	316 | 111 Lampe Drive	**Email**	jclow@ncsu.edu
Campus Box			
Department	Edward P. Fitts Department of Industrial & Systems Engineering		

Authorized Personnel

Personnel	Position
Yuan-Shin Lee	
Ola Harrysson	
Jason Low	

Emergency Contacts

Contact	Number
Campus Emergencies	(919) 515-3333
Carolinas Poison Center	(800) 848-6946
Environmental Health and Safety Center	(919) 515-7915
Wake Medical Canter Emergency	(919) 350-8000
Daniel Leonard -- Lab Supervisor	(919) 515-2361

INJECTION MOLDING PLASTICS

Description

heated fluid plastic injected under pressure into mold

Categories	Description
Decontamination Procedures	PI RESPONSIBLE FOR ACCIDENT NOTIFICATION TO PROPER AUTHORITIES
Engineering and Ventilation Controls Required	FUME HOODS
Hazardous Chemicals/Chemicals Classes	NYLON PELLETS POLYETHELENE PELLETS POLYPROPLENE PELLETS
Potential Hazards	BURNS FROM HOT FURNACE LIGHT FUMES
Special Animal use Precautions	N/A
Special Animal Use Precautions	
Special Handling and Storage Requirements	SAFETY CHEMICAL CABINETS PROVIDED
Spill and Accident Procedures	SHOP TOWELS OIL ABSORBENT WASTE CONTAINERS

Hazards

Category	Type	Description
Eye	Impact	hot fluid plastic under pressure
Hand	Burn	heated molds and hot plastic can cause severe burns
Hand	Compression	pinch hazard
Foot	Impact	danger of dropped or mishandled tools or molds

PPE

Category	Type	Description
Goggles	Eye	wear eye protection at all times while in the shop
Gloves	Hand	use gloves to handle heated molds
Shoes, Pullovers	Foot	wear closed-toe shoes which cover insteps -- no sandles or soft slippers allowed in lab

Plastic Mold Making using two part curative agents

Description

Silicone rubber poured around master part; resin cast into evacuated cavity

Categories	Description
Decontamination Procedures	PI RESPONSIBLE FOR ACCIDENT NOTIFICATION TO PROPER AUTHORITIES
Engineering and Ventilation Controls Required	FUME HOODS
Hazardous Chemicals/Chemicals Classes	Methylene Diisocyanate Polysiloxanes Petroleum solvent
Potential Hazards	Methylene Diisocyanate: allergen and sensitizer Polysiloxanes: skin and eye irritation Petroleum solvent: irritant, flammable
Special Animal use Precautions	N/A
Special Animal Use Precautions	
Special Handling and Storage Requirements	SAFETY CHEMICAL CABINETS PROVIDED
Spill and Accident Procedures	SHOP TOWELS LIQUID ABSORBENT WASTE CONTAINERS

Hazards

Category	Type	Description
Hand	Chemical Exposure	
Body	Chemical Exposure	
Foot	Chemical Exposure	
Eye	Chemical Splash	

PPE

Category	Type	Description
Safety Glasses	Eye	wear eye protection at all times while in the shop
Gloves	Hand	wear rubber gloves to protect from chemical exposure
Vinyl/Rubber Apron	Body	wear long pant to protect from chemical exposure
Shoes, Pullovers	Foot	wear closed-toe shoes which cover the instep -- no sandals or soft slippers allowed in lab

Metallic Molding, Sand Casting, Die Casting

Description

heated liquid metals poured into molds or injected into dies

Categories	Description
Decontamination Procedures	PI RESPONSIBLE FOR ACCIDENT NOTIFICATION TO PROPER AUTHORITIES
Engineering and Ventilation Controls Required	FUME HOODS
Hazardous Chemicals/Chemicals Classes	Fumes Furnace Heat Silica
Potential Hazards	Fume Inhalation Burns
Special Animal use Precautions	N/A
Special Animal Use Precautions	
Special Handling and Storage Requirements	heat resistant gloves tongs safety glasses face shield leather or fire-resistant covering SAFETY CHEMICAL CABINETS PROVIDED
Spill and Accident Procedures	VACUUM CLEANER LIQUID ABSORBENT WASTE CONTAINERS

Hazards

Category	Type	Description
Body	Burn	danger from molten metals
Hand	Burn	danger from molten metals
Foot	Burn	danger from molten metals
Eye	Burn	danger from molten metals

PPE

Category	Type	Description
Safety Glasses	Eye	wear eye protection at all times while in the shop
Gloves	Hand	use gloves to handle vessels containing molten metal
Lab Coat	Body	wear fire-proof protective clothing
Shoes, Pullovers	Foot	wear closed-toe shoes which cover insteps -- no sandles or soft slippers allowed in lab

Machining Raw Materials / Wood, Plastic and Metallic Alloys

Description

Manual and CNC material removal processes

Categories	Description
Decontamination Procedures	PI RESPONSIBLE FOR ACCIDENT NOTIFICATION TO PROPER AUTHORITIES
Engineering and Ventilation Controls Required	
Hazardous Chemicals/Chemicals Classes	Cuttings oils Coolants
Potential Hazards	Flying metal chips Rotating cutters Rapid automated movement Pinch points
Special Animal Use Precautions	
Special Handling and Storage Requirements	When removing long metal chips from mill or lathe or drill work do not use bare hands. Pliers and/or leather gloves are recommended. If using gloves, be sure machines are completely stopped. Store chips in metal-collection bins. Supervisor will arrange for removal from shop.
Spill and Accident Procedures	VACUUM CLEANER WASTE CONTAINERS

Hazards

Category	Type	Description
Body	Puncture	rotating cutting tools
Eye	Impact	material chips and splinters
Hand	Cuts/Abrasion	machining materials can produce sharp jagged edges
Hand	Compression	pinch hazards present throughout shop
Foot	Impact	danger from mishandled tools or material
Other	Impact	unconstrained hair can be caught in rotating machinery

PPE

Category	Type	Description
Helmet	Head	use a hair tie, hair clip, hair net or cap (or helmet, if necessary) to constrain hair
Safety Glasses	Eye	wear eye protection at all times while in the shop
Shoes, Pullovers	Foot	wear closed-toe shoes which cover insteps -- no sandles or soft slippers allowed in lab
Gloves	Hand	use cotton or leather gloves to handle tools, sheet metal and other materials, but not while operating rotating machinery -- nitrile gloves offer some protection from chips and splinters with reduced risk of being snagged on rotating machines

Electrical Discharge Machining EDM

Description

removing metal with electric spark

Categories	Description
Decontamination Procedures	PI RESPONSIBLE FOR ACCIDENT NOTIFICATION TO PROPER AUTHORITIES
Engineering and Ventilation Controls Required	Fume Hood
Hazardous Chemicals/Chemicals Classes	Dielectric Fluid
Potential Hazards	Fumes
Special Animal use Precautions	N/A
Special Animal Use Precautions	
Special Handling and Storage Requirements	
Spill and Accident Procedures	Liquid Absorbent Drum Waste Disposable

Hazards

Category	Type	Description
Eye	Chemical Splash	dielectric fluid circulating around workpiece
Eye	Impact	
Foot	Impact	danger of dropped or mishandled tools or materials

PPE

Category	Type	Description
Safety Glasses	Eye	wear eye protection at all times while in the shop
Shoes, Pullovers	Foot	wear closed-toe shoes which cover insteps -- no sandles or soft slippers allowed in lab

WELDING

Description

joining metals through application of heat

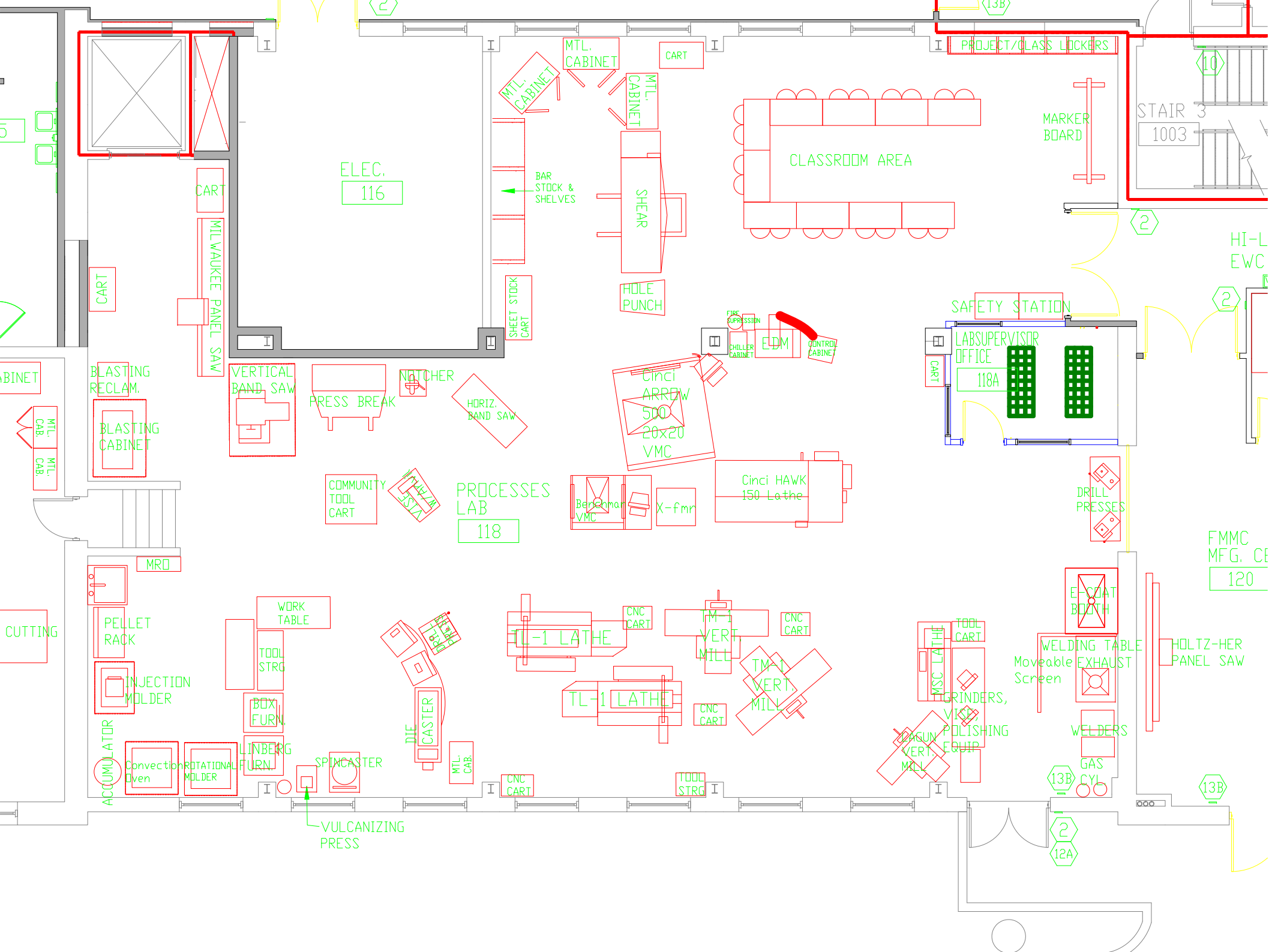
Categories	Description
Decontamination Procedures	PI Responsible FOR ACCIDENT NOTIFICATION TO PROPER AUTHORITIES
Engineering and Ventilation Controls Required	FUME HOOD
Hazardous Chemicals/Chemicals Classes	Gases: Oxygen Acetelyene ARGON CO2 Fumes
Potential Hazards	Fumes Eye Burns Hot sparks Compressed Gas
Special Animal use Precautions	N/A
Special Animal Use Precautions	
Special Handling and Storage Requirements	GAS TANKS CHAINED. Wear heat-resistant gloves to handle hot welded parts.
Spill and Accident Procedures	Liquid Absorbment Drum Waste Disposable

Hazards

Category	Type	Description
Body	Burn	drops of moten metal can be ejected from the weld during the welding process -- welded materials are extremely hot
Head	Burn	
Hand	Burn	
Foot	Burn	
Foot	Impact	danger of dropped or mishandled tools or materials
Eye	Light/Radiation	intense ultraviolet light from weld arc can burn corneas and/or retinas of eyes
Eye	Impact	molten ejecta
Other	Chemical Exposure	fumes from welding process

PPE

Category	Type	Description
Helmet	Eye	welding helmet with darkened eye shield
Gloves	Hand	fire-proof heat resistant gloves
Helmet	Head	fire-proof hat recommended
Lab Coat	Body	fire-proof heat resistant clothing
Shoes, Pullovers	Foot	wear closed-toe shoes which cover insteps -- no sandles or soft slippers allowed in lab
Face Shield	Eye	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MILWAUKEE PANEL SAW
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BAR STOCK & SHELVES
SHEAR
HOLE PUNCH
SHEET STOCK CART
CLASSROOM AREA
MARKER BOARD
PROJECT/CLASS LOCKERS
STAIR 3
1003
10
2
HI-L
EWC
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BLASTING RECLAM.
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HORIZ. BAND SAW
COMMUNITY TOOL CART
PROCESSES LAB
118
Bergmann VMC
X-fmr
Cinci HAWK 150 Lathe
DRILL PRESSES
FMMC
MFG. CE
120
MRO
CUTTING
PELLET RACK
INJECTION MOLDER
WORK TABLE
TOOL STRG
BOX FURN.
LINBERG FURN.
ACCUMULATOR
Convection Oven
ROTATIONAL MOLDER
SPINCASTER
VULCANIZING PRESS
DIE CASTER
TL-1 LATHE
CNC CART
TM-1 VERT. MILL
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CNC CART
MSC LATHE
TOOL CART
GRINDERS, VISE, POLISHING EQUIP.
12"GUN VERT. MILL
TOOL STRG
E-COAT BOOTH
WELDING TABLE
Moveable EXHAUST Screen
HOLTZ-HER PANEL SAW
WELDERS
GAS CYL.
13B
13B
2
12A

LABORATORY PROCEDURES/SAFETY

TRAINING for STUDENTS

Training of students will be done as these individuals are introduced to the laboratory. It will be the responsibility of the principal investigator, whether this is a certified faculty member or laboratory manager who introduces new students, to supply both laboratory safety training in written and/or verbal form. Process-specific training will take place on a "per assignment" basis. The instructor and or lab manager will be responsible for developing safe work habits and guidelines for all laboratory occupants.' A process "walk through" will be performed prior to the day's work in the lab. Key elements of safety, including fire, health, and accident reporting will be addressed prior to involvement in laboratory exercises.

Material Storage Location	Storage Device	Chemical Name	(manufacturer)	Number of Units	Quantity per Unit	Volume Size	Physical State	CAS #	Receipt Date
acid cabinet	metal	sodium hydroxide	Red Devil	1	18.00	oz	S		
		potassium hydroxide	Fisher	1	500.00	g	S		
		ammonium hydroxide	Acros Organics	1	1.00	L	L		
		sulfuric acid		1	5.00	gal	L		
		sulfuric acid	LabChem	1	2.50	L	L		
		sulfuric acid 50%/water 50%		2	1.00	gal	L		
		muriatic acid	Crown	1	1.00	gal	L		
		hydrochloric acid	EMD	1	2.50	L	L		
		phosphoric acid (naval jelly)	Loctite	2	12.00	oz	L		
		sodium hydroxide, 2 oz, in water, 1 qt		1	1.00	qt	L		

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Material Storage Location	Storage Device	Chemical Name	(manufacturer)	Number of Units	Quantity per Unit	Volume Size	Physical State	CAS #	Receipt Date
flammables storage: large	metal	light machine oil	3-in-1	2	3.00	oz	L		
		light machine oil	3-in-1	2	4.00	oz	L		
		Flux-Off flux remover	Chemtronix	2	10.00	oz	L		
		Pow-R-Wash cable/contact cleaner	Chemtronix	2	13.50	oz	L		
		Freon TP-35	Texwipe	3	15.00	oz	L		
		Ease Release 200	Mann	1	12.00	oz	L		
		Ease Release 400	Mann	2	12.00	oz	L		
		Ease Release 500	Mann	1	12.00	oz	L		
		PVA #10	Composite Envisions	1	1.00	qt	L		
		polymer P-767powder [poly(caprolactone)]	Union Carbide	7	3.00	lb	S		
		polymer powder coat, red	Caswell	1	5.00	lb	S		
		propane	Ozark Trail	1	16.40	oz	G		
		Super Shield nickel conductive coating	MG Chemicals	1	12.00	oz	L		
		Cool-Tool II	Monroe	1	4.00	oz	L		
		PTFE release agent	Miller-Stephenson	1	15.00	oz	L		
		mold release	Smooth-On	14	14.00	oz	L		
		wax de-bubbler	Magic Cast Products	1	8.00	oz	L		
		Great Stuff foam sealant	Flexible Products	1	12.00	oz	L		
		silicone lubricant	CRC	1	13.00	oz	L		
		silicone lubricant	LPS	1	13.00	oz	L		
		liquid wrench	Gunk	1	16.00	oz	L		
		pneumatic lube	Aro	1	1.00	qt	L		
		Almo 525 air tool oil	Mobil	1	1.00	qt	L		
		adhesive remover	Auto Tech	1	32.00	oz	L		
		gasket remover	CRC	1	12.00	oz	L		
		stain	Dykem	3	8.00	oz	L		
		spray layout ink	Dykem	4	12.00	oz	L		
		ink remover	Dykem	2	12.00	oz	L		
		Vactra 4	?	2	1.00	qt	L		
		hydraulic jack oil	Snap	1	1.00	qt	L		
		bearing oil	Mobil	1	1.00	qt	L		
		polymer P-787powder [poly(caprolactone)]	Union Carbide	1	5.00	lb	S		
		A isocyanate, Roto-One	Golden West	1	1.00	qt	L		
		B polyol, Roto-One	Golden West	1	1.00	qt	L		
		A isocyanate, #709	Golden West	1	1.00	gal	L		
		B polyol, #709	Golden West	1	1.00	gal	L		
		used acetone with trace amt. paint		1	2.00	oz	L		
		touch-up paint		1	100.00	mL	L		
		lacquer thinner		1	100.00	mL	L		
		pipe thread sealant	Rectoseal	1	2.00	oz	L		
		pvc cement	Oatey	1	8.00	oz	L		
		spray paint	various	29	12.00	oz	L		
		spray paint	various	9	15.00	oz	L		
		epoxy resin 105 part A	West Systems	1	1.00	gal	L		
		epoxy resin 206 part B	West Systems	1	1.00	gal	L		
		Lacquer Thinner	Campbell	1	1.00	gal	L		
		acrylic solvent weld 16	Weld-on	2	1.50	oz	L		
		acrylic solvent weld 3	Weld-on	1	1.00	pt	L		
		dry graphite spray lube	Sprayon	12	10.00	oz	S		
		isopropyl alcohol	Fisher	3	4.00	L	L		
		reagent alcohol	Fisher	1	4.00	L	L		
		acetone	EMD	2	4.00	L	L		
		charcoal lighter	Kingsford	2	64.00	oz	L		
		MB #4 finishing compound	Bel Air	1	1.00	gal	L		
		rubber coating	Permatex	1	1.00	gal	L		
		ethyl alcohol	Pharmco-Aaper	1	1.00	gal	L		

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Material Storage Location	Storage Device	Chemical Name	(manufacturer)	Number of Units	Quantity per Unit	Volume Size	Physical State	CAS #	Receipt Date
flammables storage: smal	metal	Smooth Cast 326 A	Smooth-On	3	8.00	lb	L		
		Smooth Cast 326 B	Smooth-On	3	7.00	lb	L		
		fiberglass resin & hardener	Elmer's	1	7.00	lb	L		
		Task 9 urethane plastic	Smooth-On	1	16.00	lb	L		
		Mold Max 27T part B	Smooth-On	1	1.00	lb	L		
		Mold Max 27T part B	Smooth-On	1	1.60	oz	L		
		Sorta-Clear 40 A	Smooth-On	1	9.00	lb	L		
		Sorta-Clear 40 B	Smooth-On	1	14.40	oz	L		
		2-part plastic adhesive	3M	1	567.00	mg	L		
		Sylgard 184	Dow Corning	3	250.00	mL	L		
		wood filler	Elmer's	1	8.00	oz	L		
		Multipurpose RTV Sealant 732	Dow Corning	3	3.00	oz	L		
		Xtendit dry gas blanket	Smooth-On	1	10.00	oz	G		
		Mold Max 30 part A	Smooth-On	1	10.00	lb	L		
		Mold Max 30 part B	Smooth-On	1	1.00	lb	L		
		Mold Max 30 part B	Smooth-On	2	5.00	lb	L		
		EpoxAcast 670 HT	Smooth-On	1	10.00	lb	L		
		Clear Flex 50 part B	Smooth On	1	1.00	gal	L		
		HT Hardener	Smooth-On	1	1.60	lb	L		

Laboratory Safety

- **Cell phone use is prohibited during ALL class/lab activities.**
- **Your professor or lab instructor must be present to supervise all lab activities.**
- **Unauthorized lab work is prohibited.**
- **Lab students must know the location of and become familiar with:**

  Lab Safety Plan, Fire Exits, Fire Extinguishers, MSDS Info, and First Aid.

- **Safety glasses must be worn while in the presence of machinery operated by oneself or by others.**
  Rotating cutters, drill bits and saw blades generate flying metal chips. Lubricants, coolants, chuck keys, and misplaced hand tools can become flying objects. **EYE PROTECTION IS A MUST.**
- **Dress correctly.**

  Shorts, tank tops, and any clothing with large openings are not allowed during machining operations. Flying chips and debris will enter any small openings. *Hoodies must be removed before entering the shop floor.*

  Closed toe shoes which cover the instep are required. Sandals and soft slippers are expressly forbidden. Fashion is generally incompatible with safety in a machine shop -- get over it.

  Welding labs require non-flammable outerwear.

  Jewelry must be removed prior to using the machinery. This includes items such as chains/necklaces, watches, bracelets and rings.

- **Hair over 6 inches long must be constrained.**
- **Follow instructions closely.** Don't guess at the correct way to complete your assignment. Ask your instructor for help, not another student.
- **Know the equipment.** Be careful with sharp cutters. Wear gloves when handling all tooling. Keep hands away from moving blades and cutters. Make sure all work holding devices are tight. Remove all chuck keys and tools before starting a machine.

  KNOW THE EXACT LOCATION OF THE **ON/OFF** SWITCH.

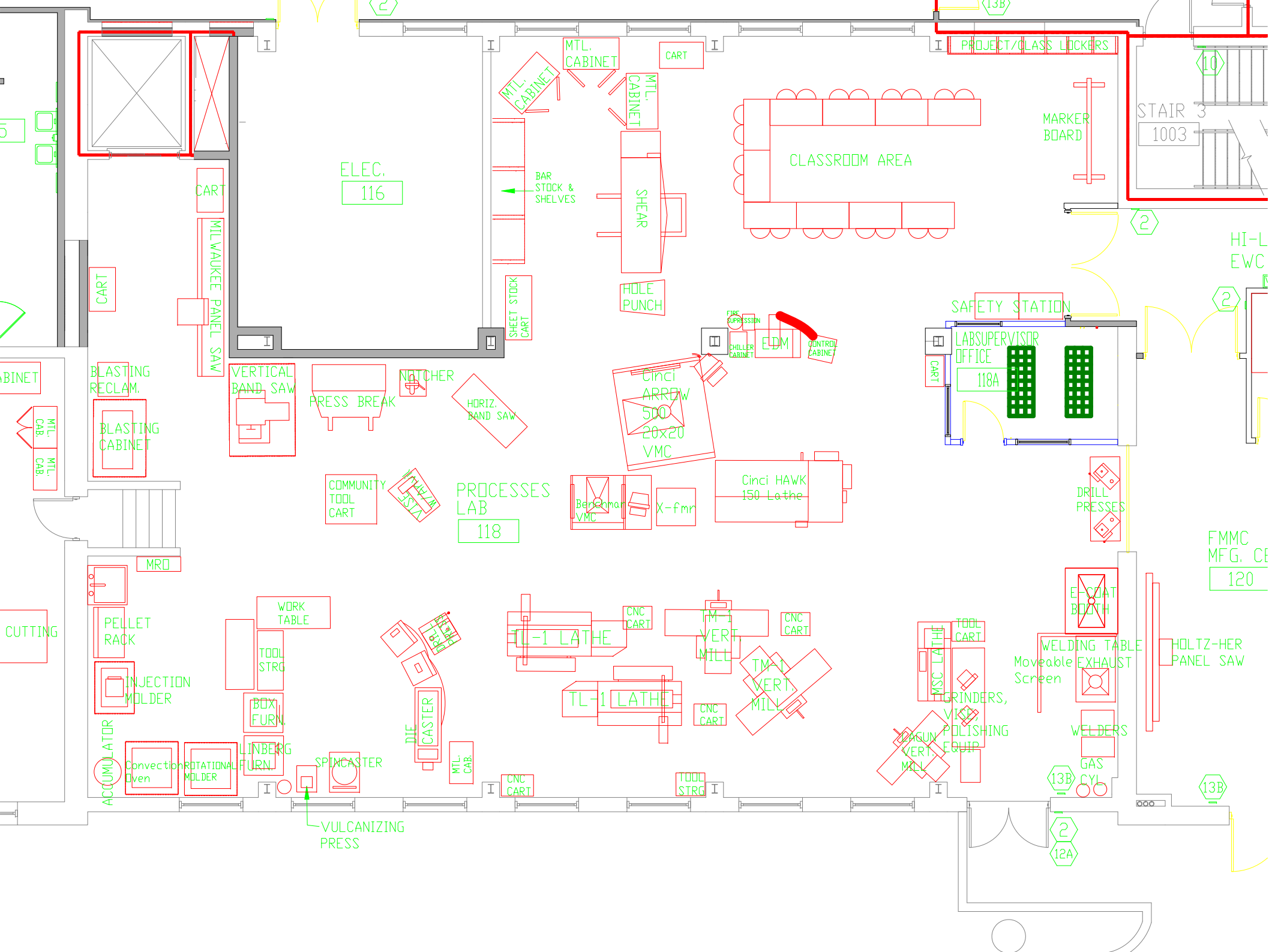
- **Cleanliness:** Regardless of how clean or dirty a machine is when you arrive, make sure it is clean when you are finished using it. Put all tools away, cleaned, in their proper location, and sweep/brush up &/or vacuum all chips on and around the machinery when you are done. Keep the machinery and the floor around you clear of metal chips and debris.

  DO NOT remove metal chips with your bare hands.

I understand and accept these rules as a necessary part of my work.

Printed name_____

SIGNATURE_____**DATE**_____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