

May 15, 2018

Machines & Safety

Tomorrow (Wed) at 1pm: Life 2402

Fabrication Camp, Second Session

Thursday at 2pm: Life 2402

Fabrication Camp, Third Session

Friday at noon: Hennings 201

Intro to Design, Dylan Gunn

- Have you found the [253 website](#)?
-
- Sorting out team details...Midterms and Finals -?
-
- ENPH 253 student machine shop course

10hr Machine Shop Course

We will post names, groups and dates on the 253 website. (“labs & lectures”)

Where: Hennings 224 - Student Machine Shop (SMS):
through this door, then turn left and follow hallway

Time: 1pm to 5pm

10 hr course = two afternoons
on the same days as 257 labs



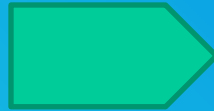
Machines & Safety

- ❑ safety: standard procedures, instructions, behavior
- ❑ know names of machines and equipment
- ❑ basic instructions on some equipment

Machine Shop Rules

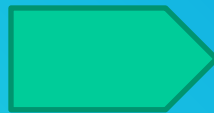
ENPH 253 SMS COURSE

“SMS” = Student Machine Shop



- Users with the 253 SMS course can **only** work under supervision of **machine shop staff** or a qualified **physics 253 instructor**.

40 HOUR COURSE



- Users with the 40 hour course are allowed to work with one additional person present, without staff or a 253 instructor

There is a maximum of ten people in the shop.

Machine Shop Safety

- **Safety first!** Call 911 for emergency and report all injuries to shop supervisor.
- Safety glasses must be worn in shop.
- Tie up/secure long hair and **remove rings, bracelets etc...**
- Do not wear loose fitting clothing.



Long Hair



Bad Hair



No sandals, slippers, flip-flops, open toe shoes or bare feet!

Minimum: sneakers and socks.



If you come in sandals to the lab,
we will send you home.

Machine Shop Safety

- Keep the shop doors closed after hours or when supervisor is not present. Do not leave any unauthorized people in the shop. No key, no admittance.
- Sign out all tools removed from the shop. Write your name, phone number and room number. Return tools promptly.
- If unsure, ask for assistance.
- Report damage to tools and machines to the shop supervisor. After hours, leave a note.
- Clean up! Dust pans brushes and booms are provided

Machine Shop Safety

Do not hesitate to call 911 for emergencies.

If you ever have to call an ambulance,

- 1) make sure the ambulance finds the scene of the accident quickly. Tell a person to go outside the building, wait for the ambulance and fetch paramedics and guide them to the location. Late evening hours will have building doors locked: make sure nobody gets locked out when fetching help.
- 2) make sure the victim receives good basic care. Memorize locations of first aid kits now, so you will find basic supplies quickly when they are needed.

Clean up after yourself.





Machine Shop Organization



- ❑ All tools live in specified locations for easy retrieval.
- ❑ This makes cleanup much easier: just put things back in the proper drawer.

Hebb 42 Organization



your workbench



work areas
in the back
of Hebb 42



- ❑ same here: tools live in specified locations for easy retrieval.
- ❑ always return items where they belong.
- ❑ “leave it nicer than you found it”

Key Hazards

- Cutting Fingers on Sharp Tools
- Burns from hot parts or chips



Key Hazards

One machine – one worker !!!



Tools: Sheet Metal

Shear



Student Machine Shop (SMS)

Bender
(aka brake)



Student Machine Shop (SMS)

Hole Punch



Hebb 48
(waterjet room)

Notcher



Hebb 48
(waterjet room)

Shear

- FOOT PEDAL OPERATION

Large size

Location:

Hebb 48
(waterjet room)



Shear

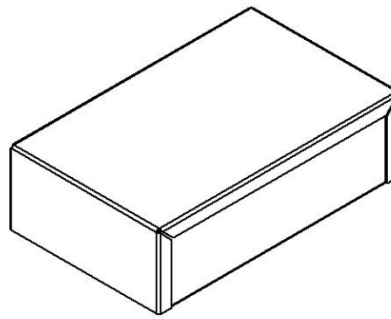
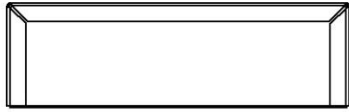
- FOOT PEDAL OPERATION

Medium size

Location:

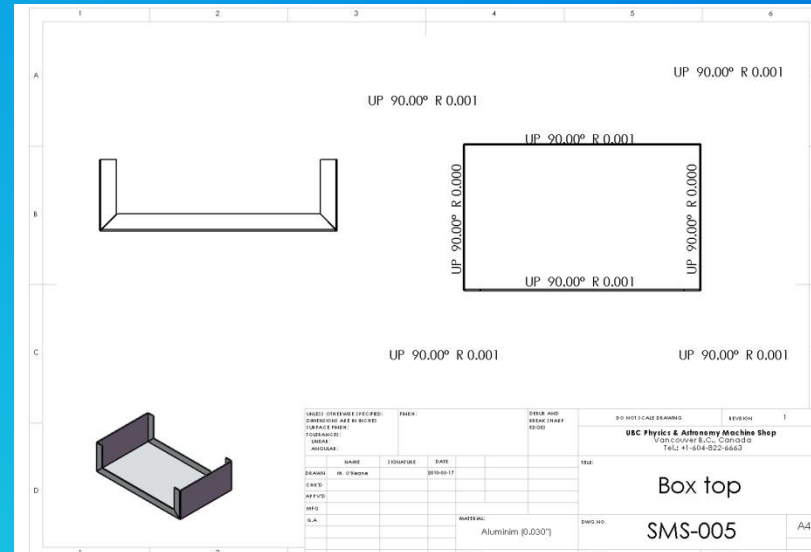
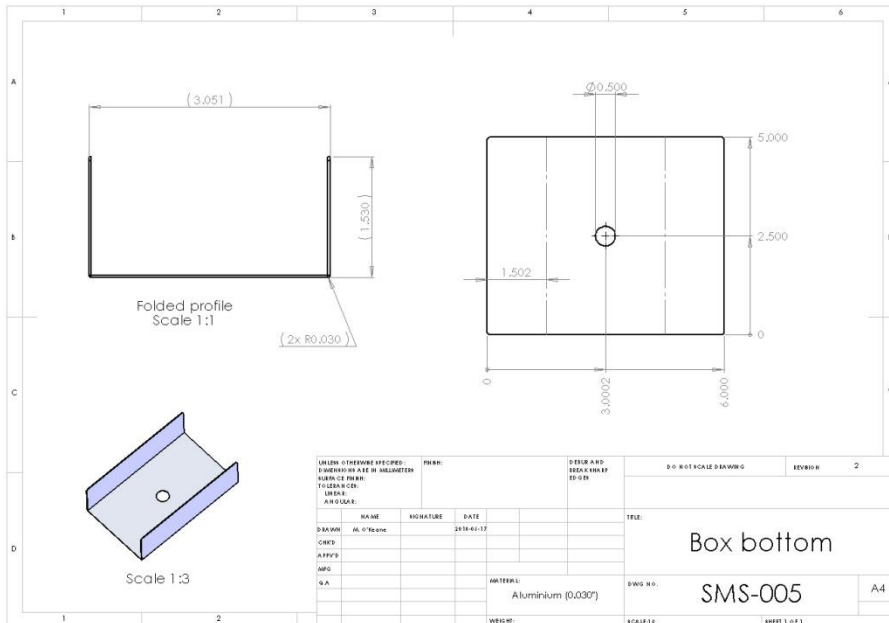
Student Machine
Shop (SMS)



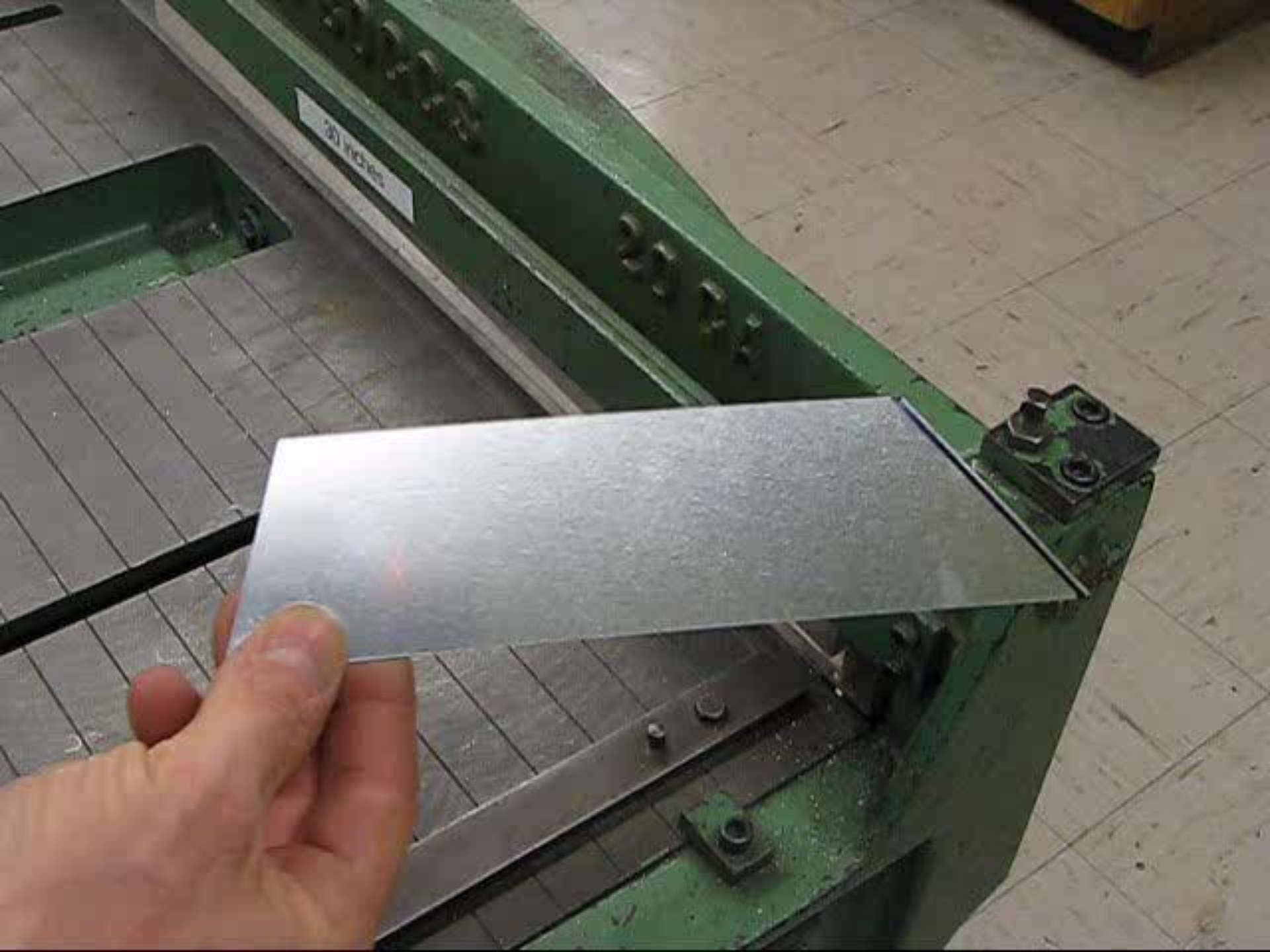


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UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS [DIMENSIONS ARE IN INCHES]		NAME	DATE	BOX ASSEMBLY
TOLERANCES: FRACTIONAL ±		DRAWN		TITLE
ANGULAR: MACH2 BEND ±		CHECKED		UBC PHYS 253
TWO PLACE DECIMAL ±		ENG APPR.		TO HR MACHINE SHOP COURSE
THREE PLACE DECIMAL ±		MFG APPR.		
INTERSECT GEOMETRIC TOLERANCING PER:		Q.A.		SIZE DWG. NO.
NEXT ASSY	USED ON	COMMENTS:		REV
APPLICATION	DO NOT SCALE DRAWING	MATERIAL: ALUMINIUM	0.76mm 0.030"	box
				SCALE 1:1.5 WEIGHT:

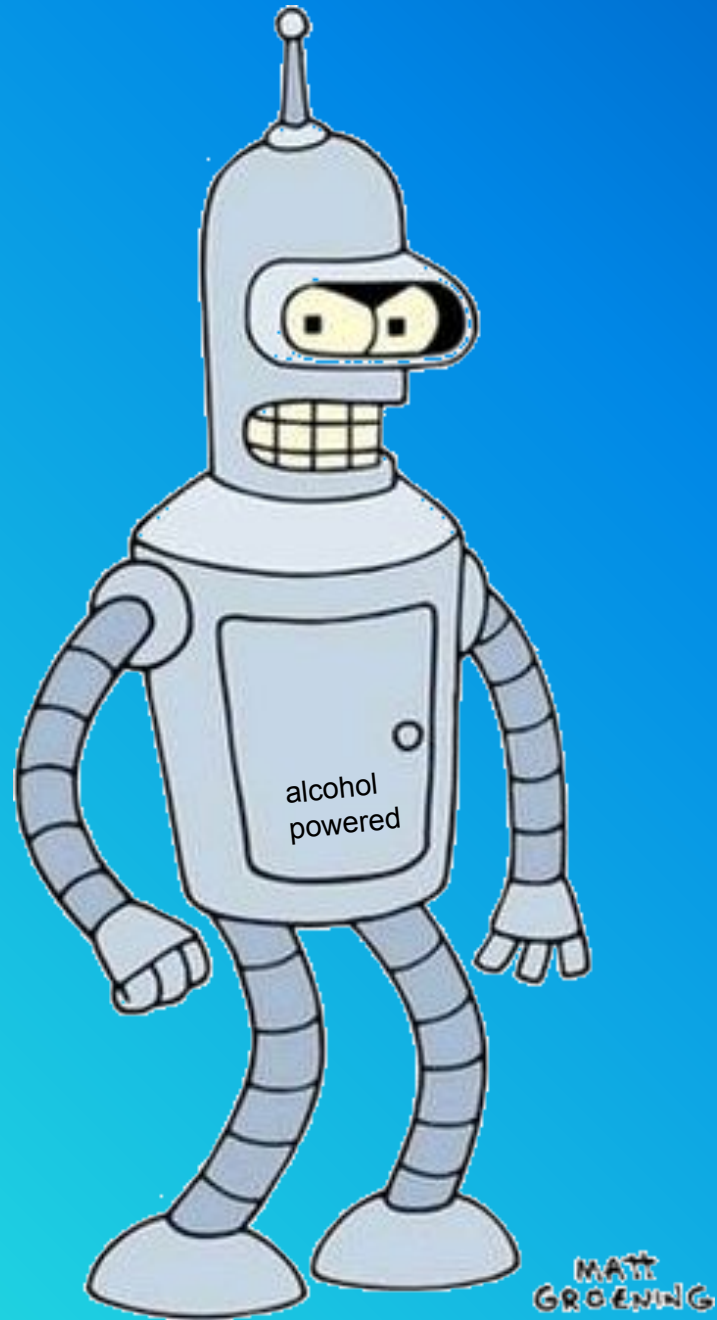


(10 hr machine shop course)



20 MICRONS

Bender



Bender - MANUAL OPERATION



□ Location: Student Machine Shop (SMS)



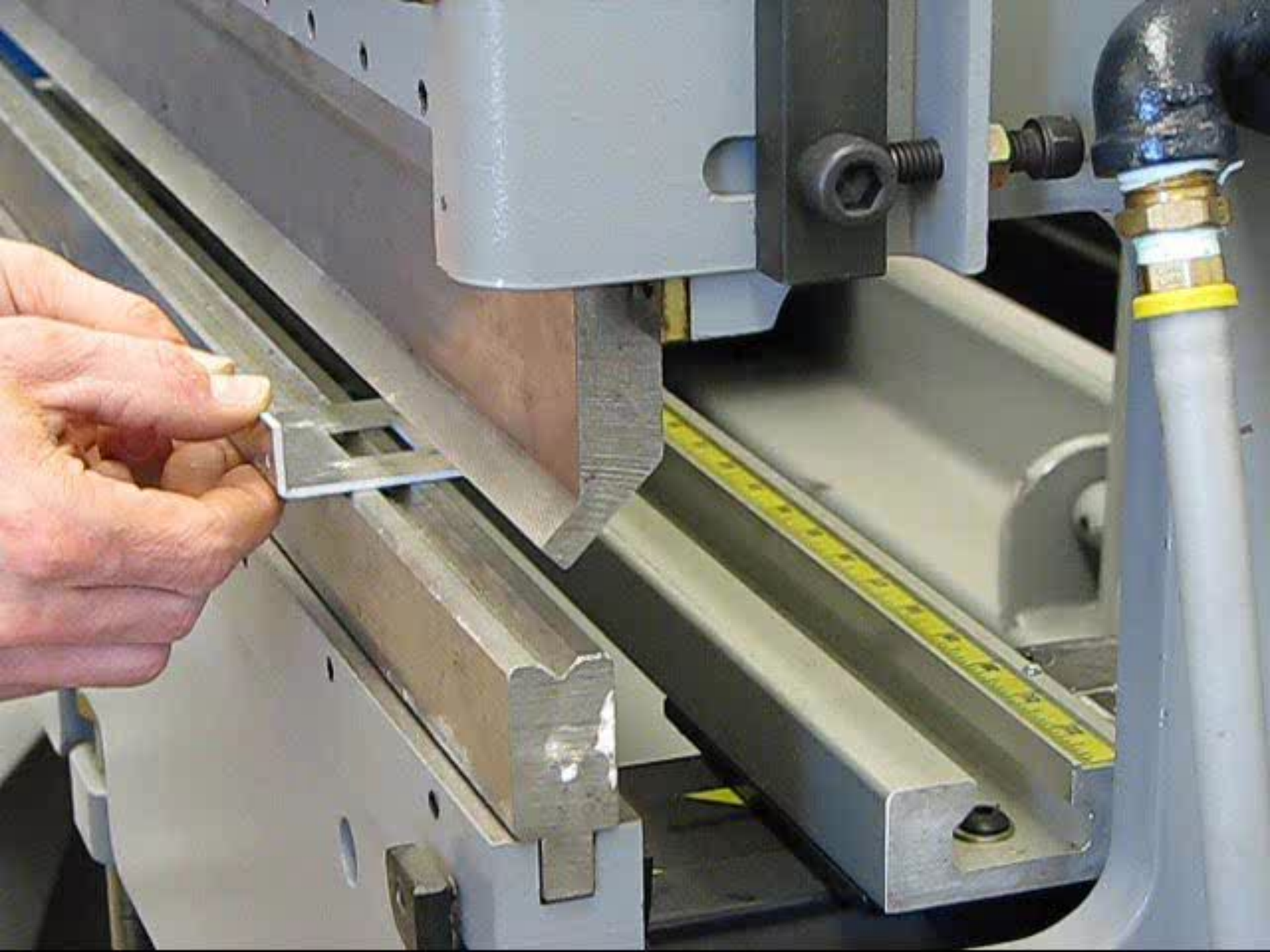
Please Help
REC

diatom

Bender - PNEUMATIC OPERATION

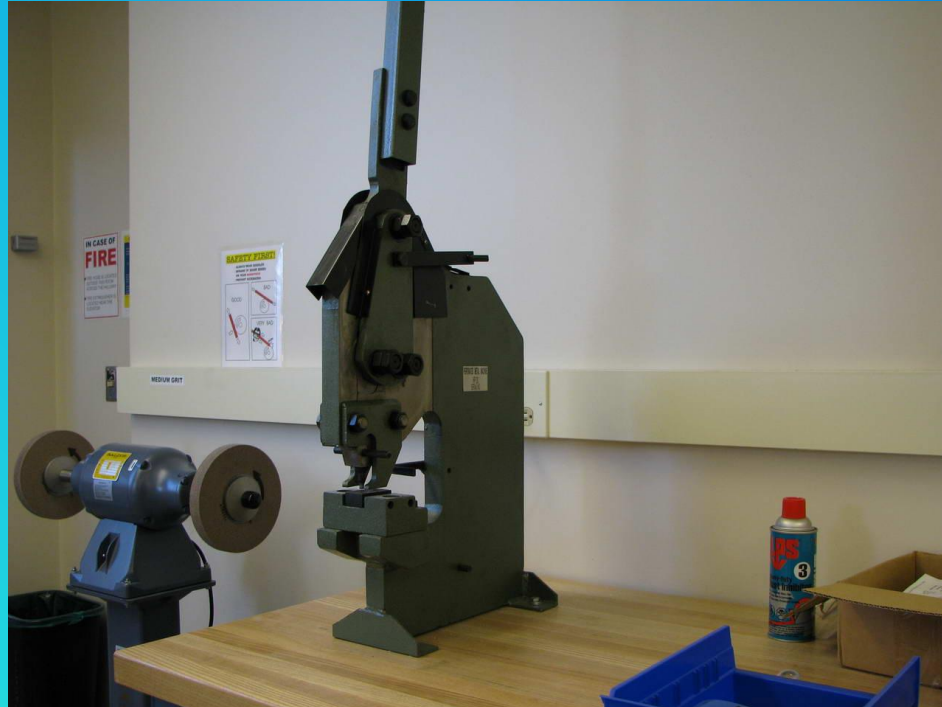


□ Location: Hebb 48 (waterjet room)





Hole Punch



□ Location: Hebb 48 (waterjet room)

IN CASE OF
FIRE
Call 911
Evacuate the building
Do not use elevators
Close doors behind you

SAFETY
Always wear eye protection
Do not touch sharp edges
Do not touch moving parts
Do not touch hot surfaces

Model 100

Model 100

3

Notcher



□ Location: Hebb 48 (waterjet room)



MACHINES



BAND
SAW

SMS



DRILL
PRESS

SMS



LATHE

SMS



MILLING
MACHINE

SMS



SPOT
WELDER

Hebb 48
(waterjet room)

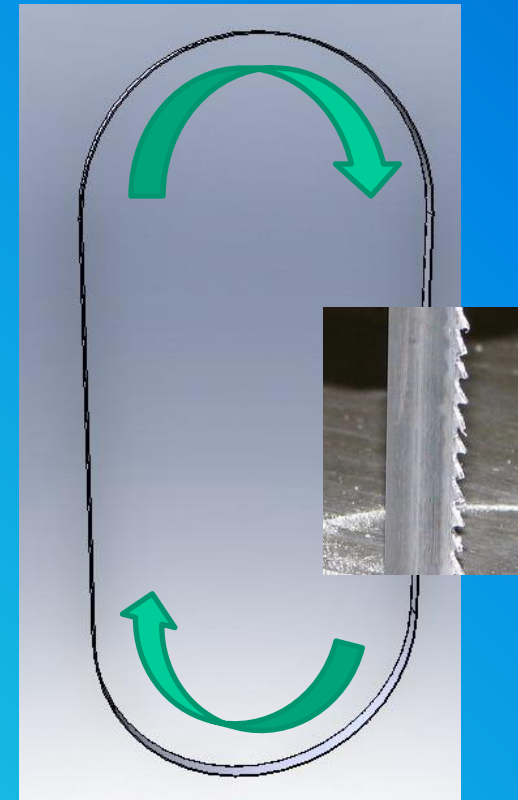


BUFFER

Hebb 48
(waterjet room)

Band Saw

- FLEXIBLE BLADE
- RUNS IN A LOOP



More About Band Saws



- Lubricate blade with wax block
- Fences and Tees do not work very well with sheet stock – cut freehand
- Use wood push block to feed work on the band saw.
- Different band saws for steel and Aluminum
- Blade quality is important for safety



Drill Press



Properly clamp all work
when ever possible.



Careful when changing
speeds on
drills and lathes

Using a Drill Press





Long Hair & a Drill Press

Beautiful -



....but potentially dangerous
(not just on drill presses)



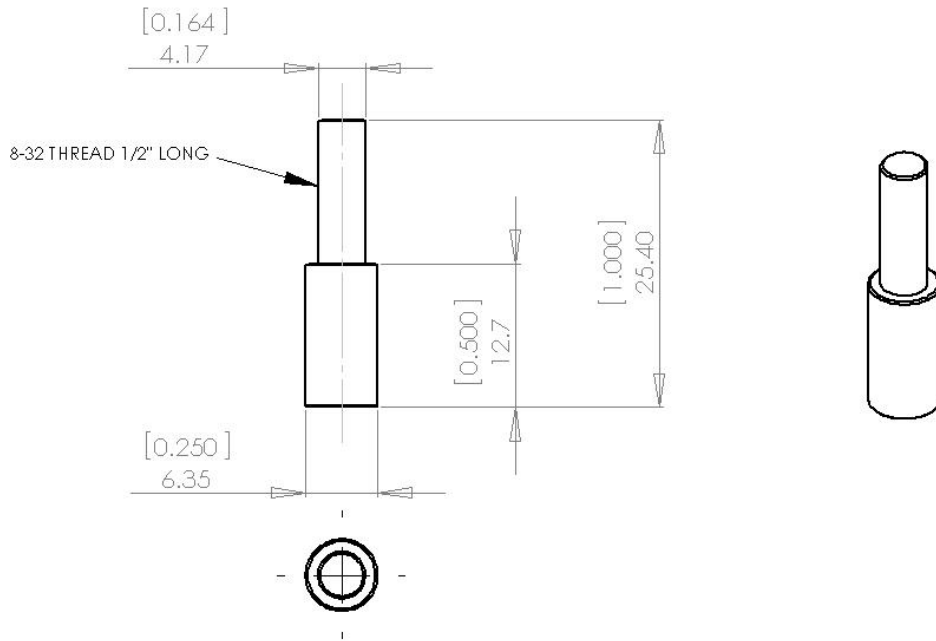
13MM

Item No.	Description	Quantity	Unit	Material
1	DRILL BIT	1	PC	13MM
2	DRILL BIT	1	PC	13MM
3	DRILL BIT	1	PC	13MM
4	DRILL BIT	1	PC	13MM
5	DRILL BIT	1	PC	13MM
6	DRILL BIT	1	PC	13MM
7	DRILL BIT	1	PC	13MM
8	DRILL BIT	1	PC	13MM
9	DRILL BIT	1	PC	13MM
10	DRILL BIT	1	PC	13MM
11	DRILL BIT	1	PC	13MM
12	DRILL BIT	1	PC	13MM
13	DRILL BIT	1	PC	13MM
14	DRILL BIT	1	PC	13MM
15	DRILL BIT	1	PC	13MM
16	DRILL BIT	1	PC	13MM
17	DRILL BIT	1	PC	13MM
18	DRILL BIT	1	PC	13MM
19	DRILL BIT	1	PC	13MM
20	DRILL BIT	1	PC	13MM

DRILL BIT
13MM
1
PC
13MM

Lathe





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		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	
		DIMENSIONS ARE IN MILLIMETERS [DIMENSIONS ARE IN INCHES]	DRAWN			TITLE:
		TOLERANCES:	CHECKED			UBC PHYS 253
		FRACTIONAL ±	ENG APPR.			10 HR MACHINE SHOP COURSE
		ANGULAR: MACH ± BEND ±	MFG APPR.			SIZE DWG. NO.
		TWO PLACE DECIMAL ±	Q.A.			brass shaft
		THREE PLACE DECIMAL ±	COMMENTS:			REV
		INTERPRET GEOMETRIC TOLERANCING PER:				SCALE: 2:1
		MATERIAL				WEIGHT:
		BRASS				
		FINISH				
NEXT ASSY	USED ON	DO NOT SCALE DRAWING				
APPLICATION						

5

4

3

2

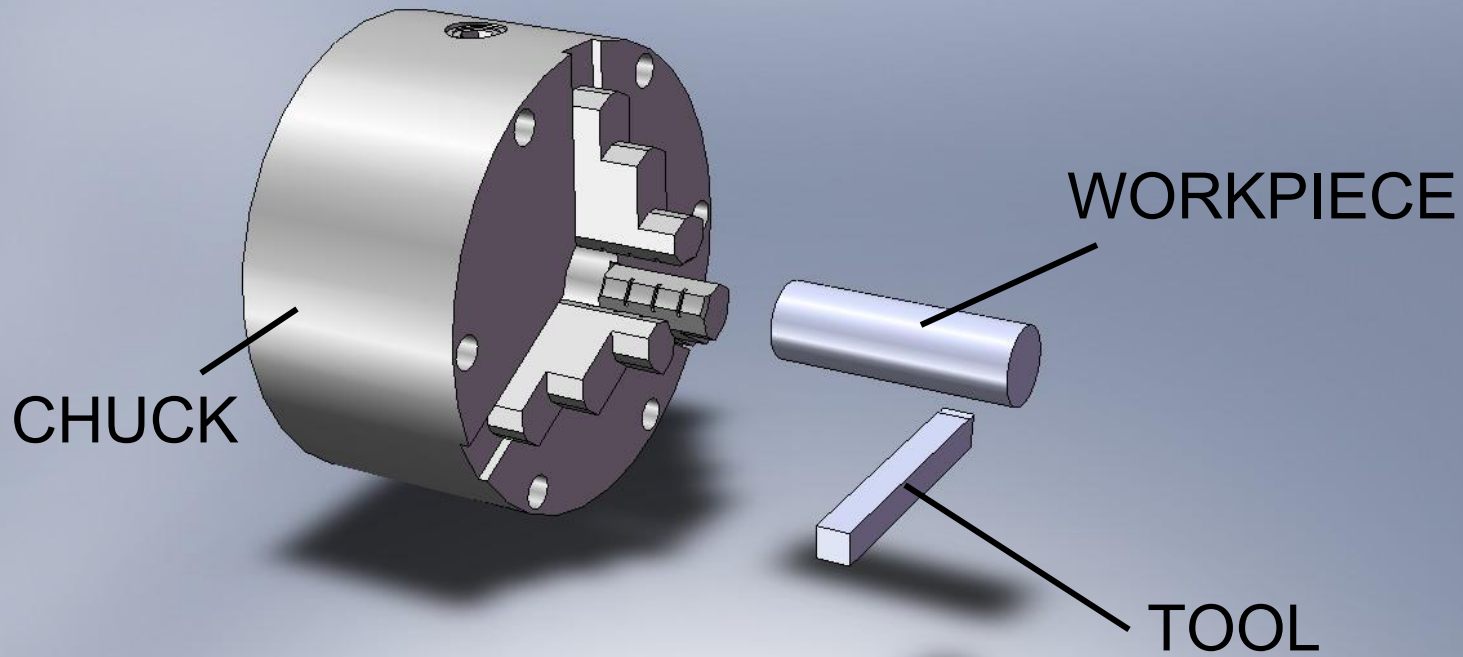
1



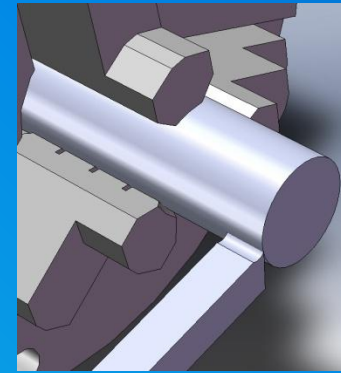
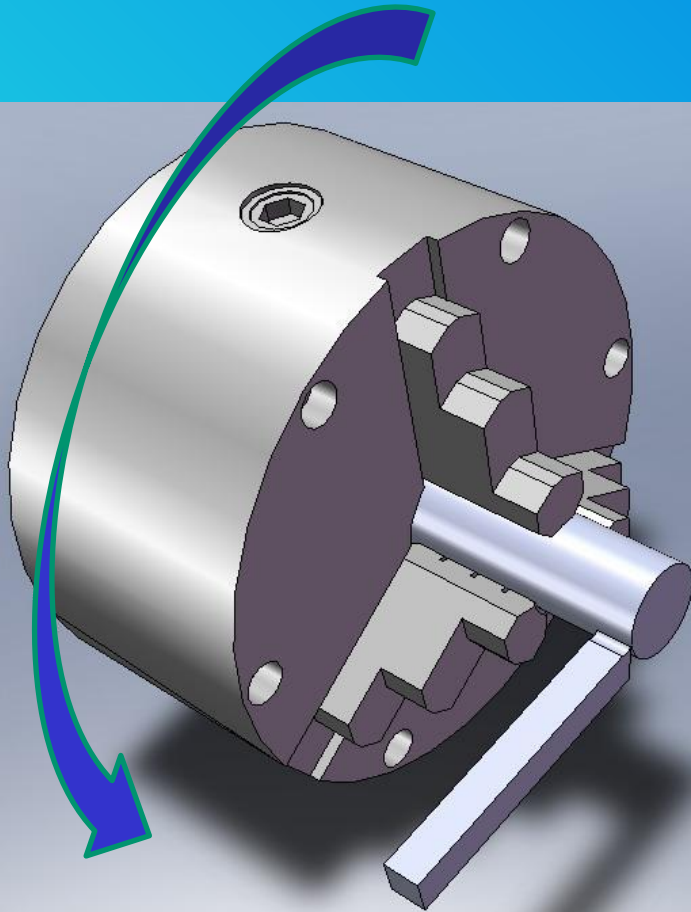
230A

Lathe

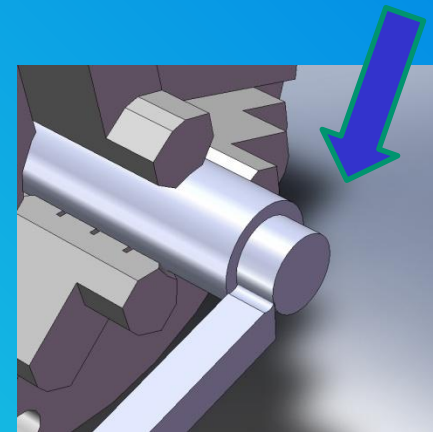
- NAME OF TECHNIQUE:
"TURNING"



Lathe

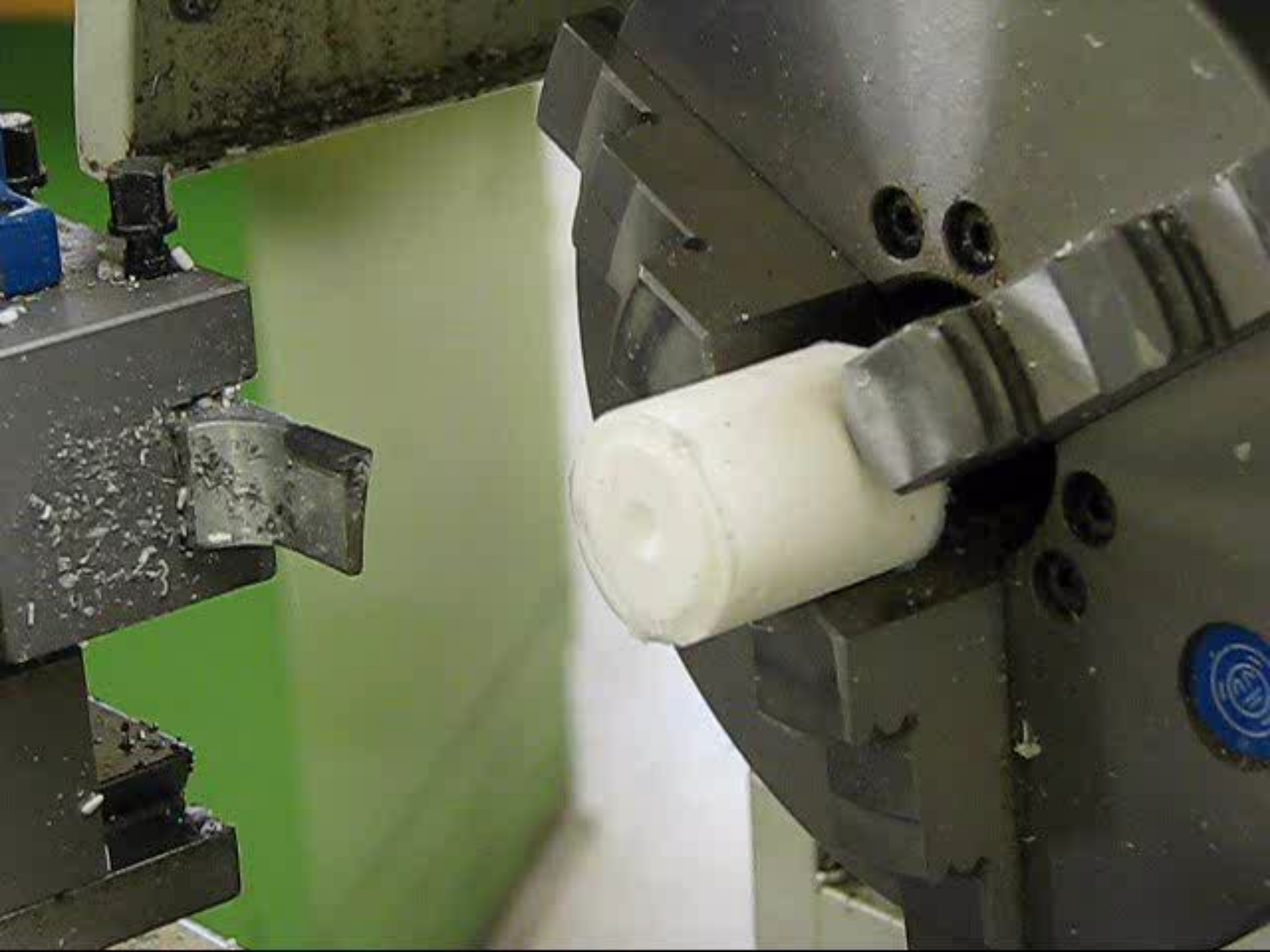


**MATERIAL IS
REMOVED**



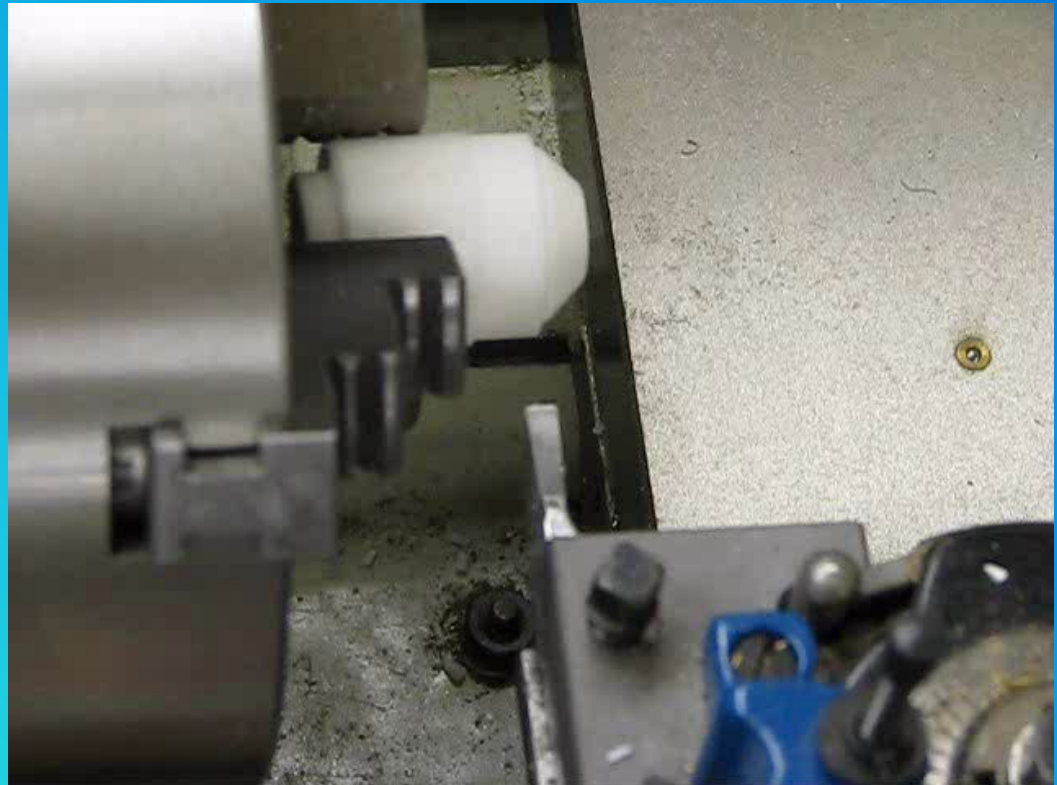
Using a Lathe



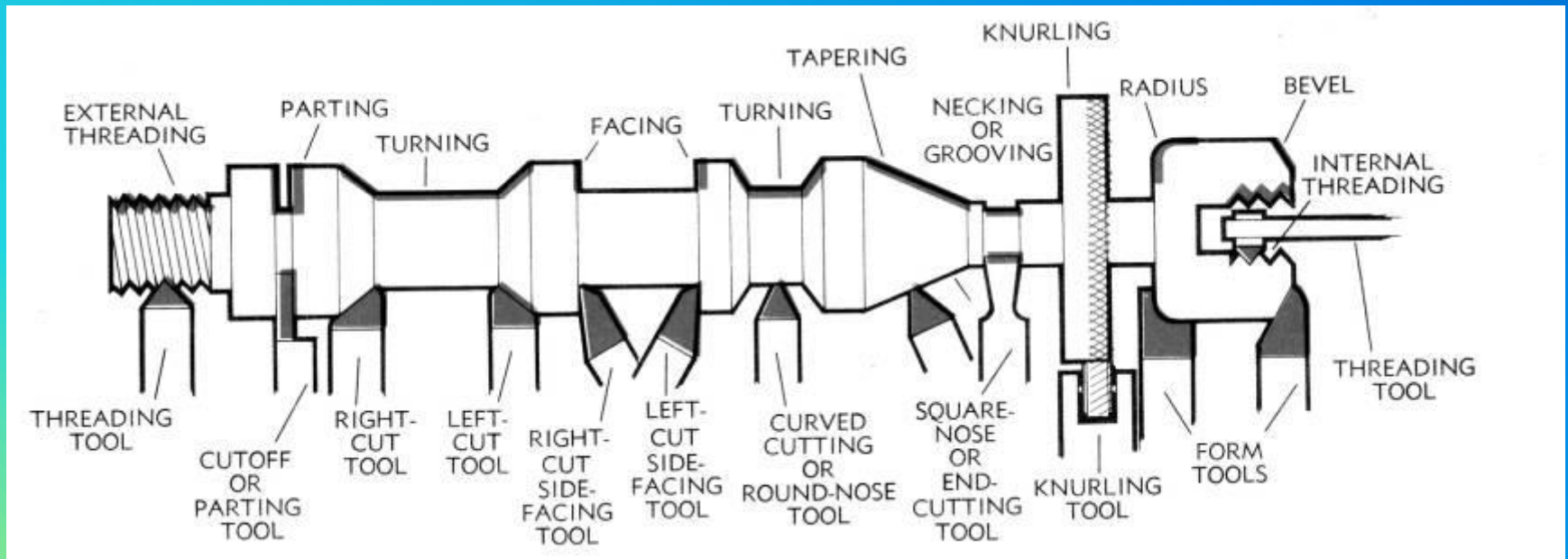


Lathe: Dangers

- TOOL CAN RUN INTO CHUCK
- INJURY FROM ROTATING PARTS
- USING A FILE IS DANGEROUS
- LONG HAIR



Lathe: Capabilities

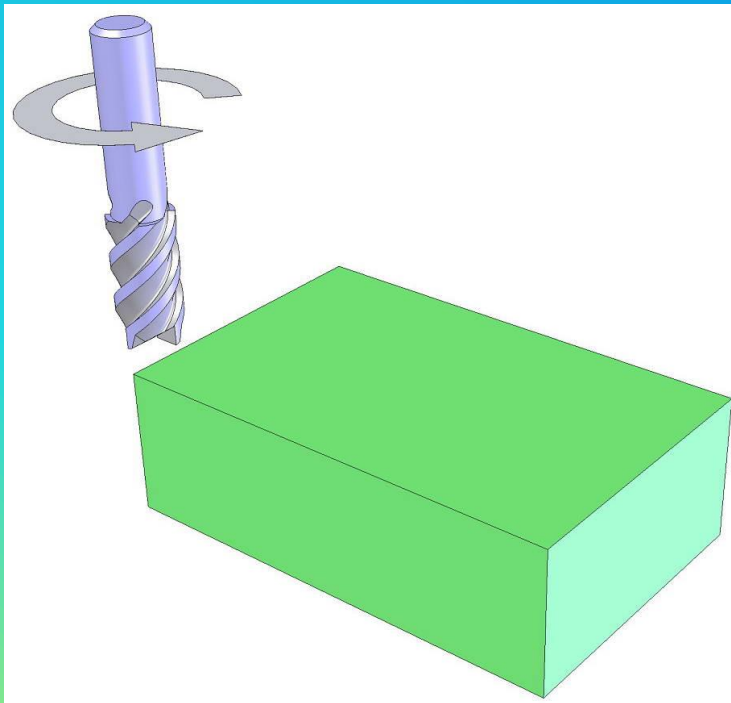


Milling Machine

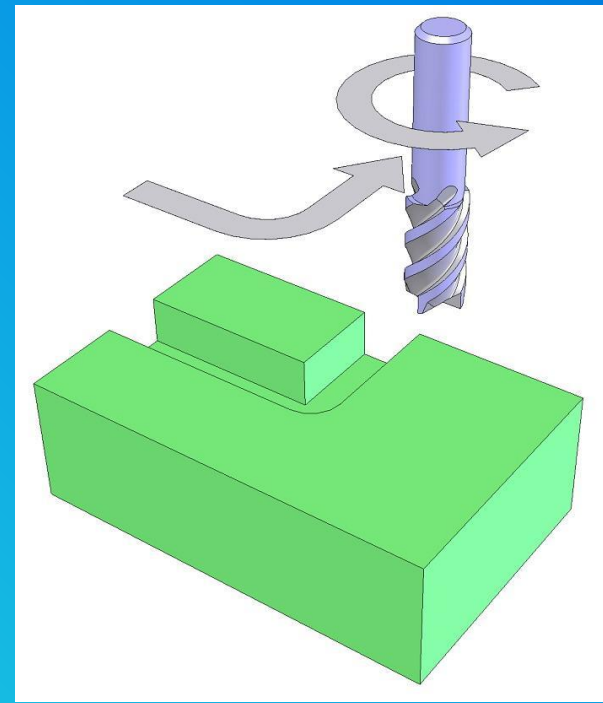


Milling Machine:

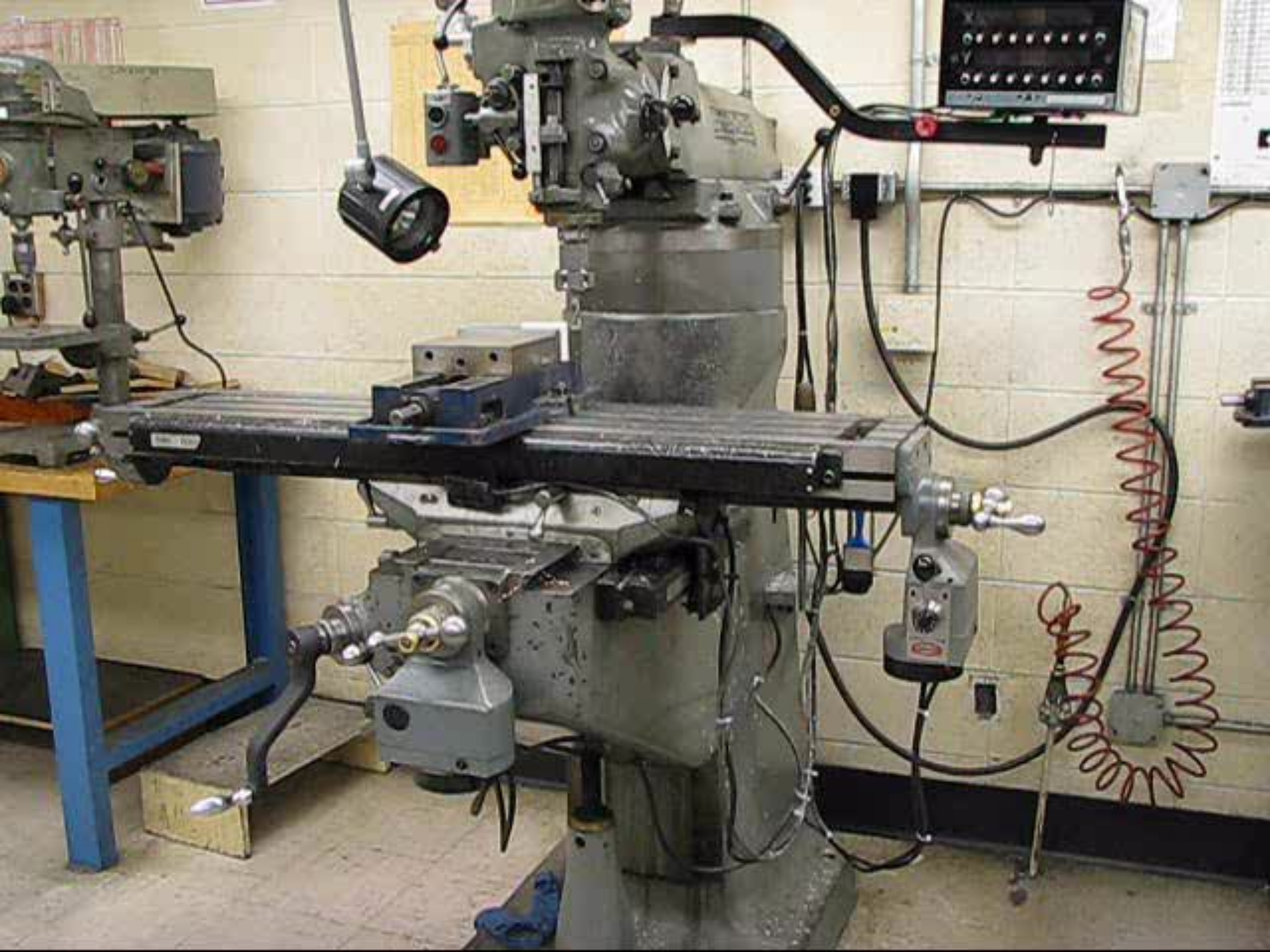
BEFORE:



AFTER



- Particularly useful for accurate layouts
- Can mill and drill



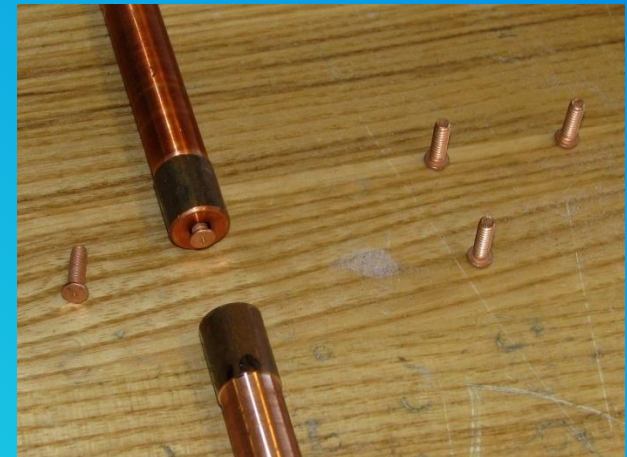
DEBURRING





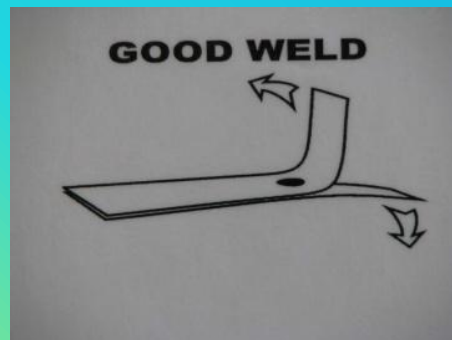
Spot Welder

Hebb 48
(waterjet room)



- Different electrode shapes
- Interesting options like weld bolts and weld nuts are available
- Items can be test-welded at 'low' settings, broken apart if bad, and finalized on 'full' settings if good.
- HEAT !!! ELECTRICITY !!!!

Spot Welder





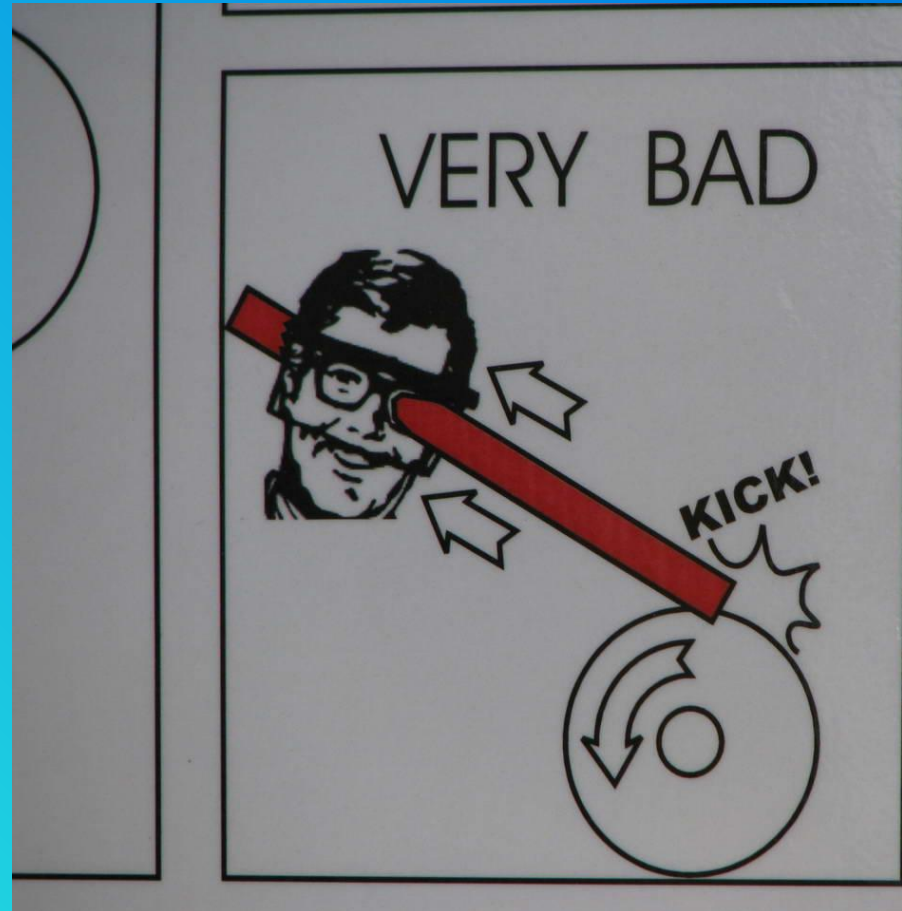
Buffer

OTHER NAMES:

- SCOTCH WHEEL
- BUFFING WHEEL
- DE-BURRING WHEEL



CAREFUL:
ITEMS THAT
CATCH ON
WILL KICK BACK!





BALDOR

Model	
HP	
Volts	
Amperes	
Speed (RPM)	
Frame	
Weight	
Dimensions	
Serial No.	
Manufact. Date	

WARNING

DO NOT OPERATE THIS MOTOR WITHOUT THE PROPERLY TRAINED PERSONNEL. ALWAYS WEAR PROTECTIVE GEAR. ALWAYS USE PROPER LOCKOUT/TAGOUT PROCEDURES. ALWAYS USE PROPER SAFETY PROCEDURES. ALWAYS USE PROPER SAFETY EQUIPMENT. ALWAYS USE PROPER SAFETY PRACTICES. ALWAYS USE PROPER SAFETY ATTITUDE. ALWAYS USE PROPER SAFETY CONSCIOUSNESS. ALWAYS USE PROPER SAFETY RESPONSIBILITY. ALWAYS USE PROPER SAFETY AWARENESS. ALWAYS USE PROPER SAFETY SENSITIVITY. ALWAYS USE PROPER SAFETY EMPATHY. ALWAYS USE PROPER SAFETY COMPASSION. ALWAYS USE PROPER SAFETY RESPECT. ALWAYS USE PROPER SAFETY COURTESY. ALWAYS USE PROPER SAFETY POLITENESS. ALWAYS USE PROPER SAFETY TOLERANCE. ALWAYS USE PROPER SAFETY PATIENCE. ALWAYS USE PROPER SAFETY KINDNESS. ALWAYS USE PROPER SAFETY GENTLENESS. ALWAYS USE PROPER SAFETY MERCY. ALWAYS USE PROPER SAFETY GRACIOUSNESS. ALWAYS USE PROPER SAFETY BENEVOLENCE. ALWAYS USE PROPER SAFETY CHARITABLENESS. ALWAYS USE PROPER SAFETY GENEROSITY. ALWAYS USE PROPER SAFETY GIVINGNESS. ALWAYS USE PROPER SAFETY HELPFULNESS. ALWAYS USE PROPER SAFETY SUPPORTIVENESS. ALWAYS USE PROPER SAFETY ENCOURAGEMENT. ALWAYS USE PROPER SAFETY REASSURANCE. ALWAYS USE PROPER SAFETY CONFIDENCE. ALWAYS USE PROPER SAFETY TRUST. ALWAYS USE PROPER SAFETY FAITH. ALWAYS USE PROPER SAFETY HOPE. ALWAYS USE PROPER SAFETY LOVE. ALWAYS USE PROPER SAFETY PEACE. ALWAYS USE PROPER SAFETY JOY. ALWAYS USE PROPER SAFETY KINDNESS. ALWAYS USE PROPER SAFETY GENTLENESS. ALWAYS USE PROPER SAFETY MERCY. ALWAYS USE PROPER SAFETY GRACIOUSNESS. ALWAYS USE PROPER SAFETY BENEVOLENCE. ALWAYS USE PROPER SAFETY CHARITABLENESS. ALWAYS USE PROPER SAFETY GENEROSITY. ALWAYS USE PROPER SAFETY GIVINGNESS. ALWAYS USE PROPER SAFETY HELPFULNESS. ALWAYS USE PROPER SAFETY SUPPORTIVENESS. ALWAYS USE PROPER SAFETY ENCOURAGEMENT. ALWAYS USE PROPER SAFETY REASSURANCE. ALWAYS USE PROPER SAFETY CONFIDENCE. ALWAYS USE PROPER SAFETY TRUST. ALWAYS USE PROPER SAFETY FAITH. ALWAYS USE PROPER SAFETY HOPE. ALWAYS USE PROPER SAFETY LOVE. ALWAYS USE PROPER SAFETY PEACE. ALWAYS USE PROPER SAFETY JOY.

Sander



- Useful for quick material removal on outside surfaces
- Parts heat up very quickly and can burn
- Use a water bath to cool the part, then dry machine after use.

Grinder



Grinder for tool steel only!!!!!!

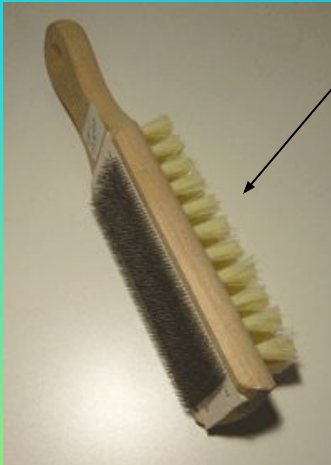
No Aluminum !!!!!!!

- The scotch wheel is your finishing friend.
- Can semi-polish and deburr rapidly and safely
- Much safer than a polishing wheel



Hand Tools

- Often faster than machines
- Many different shapes of files are available
- Use a file card



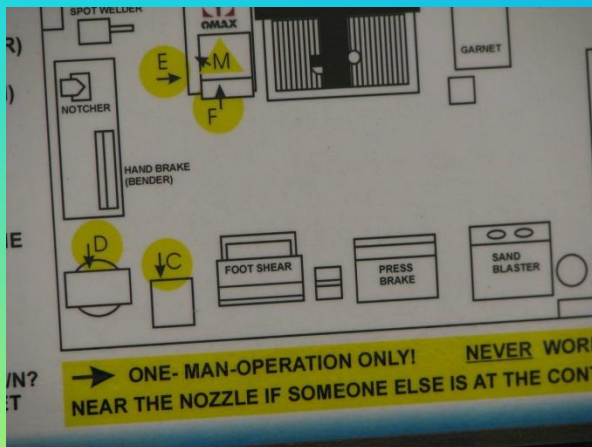
Working with Aviation Snips

EASY & FAST, BUT:

- SHARP EDGES
- DANGER OF
PINCHING
INJURIES



Omax Waterjet Dangers



Machine Shop Safety



- Keep your work area free and clear of excessive chips and clutter.
- Be careful when using compressed air hoses. Do not blow chips/ debris towards yourself or others.
- Never touch chips or rotating tooling with your bare hands or fingers when a machine is running.
- Never leave chuck key or wrenches unattended in machines.





Electrical Safety - Battery Safety

LiPo (Lithium-Polymer) Batteries

2 x small batteries

500 mAh

7.4V

(2 cells 3.7V in series)



1 x large battery

1300 mAh

14.8V

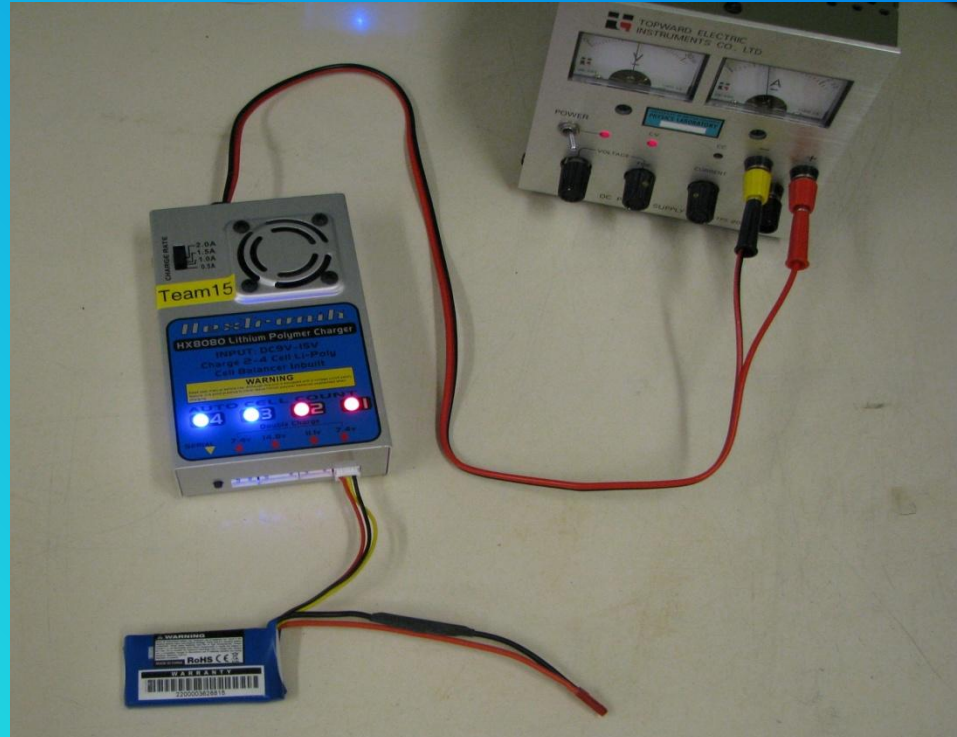
(4 cells 3.7V in series)



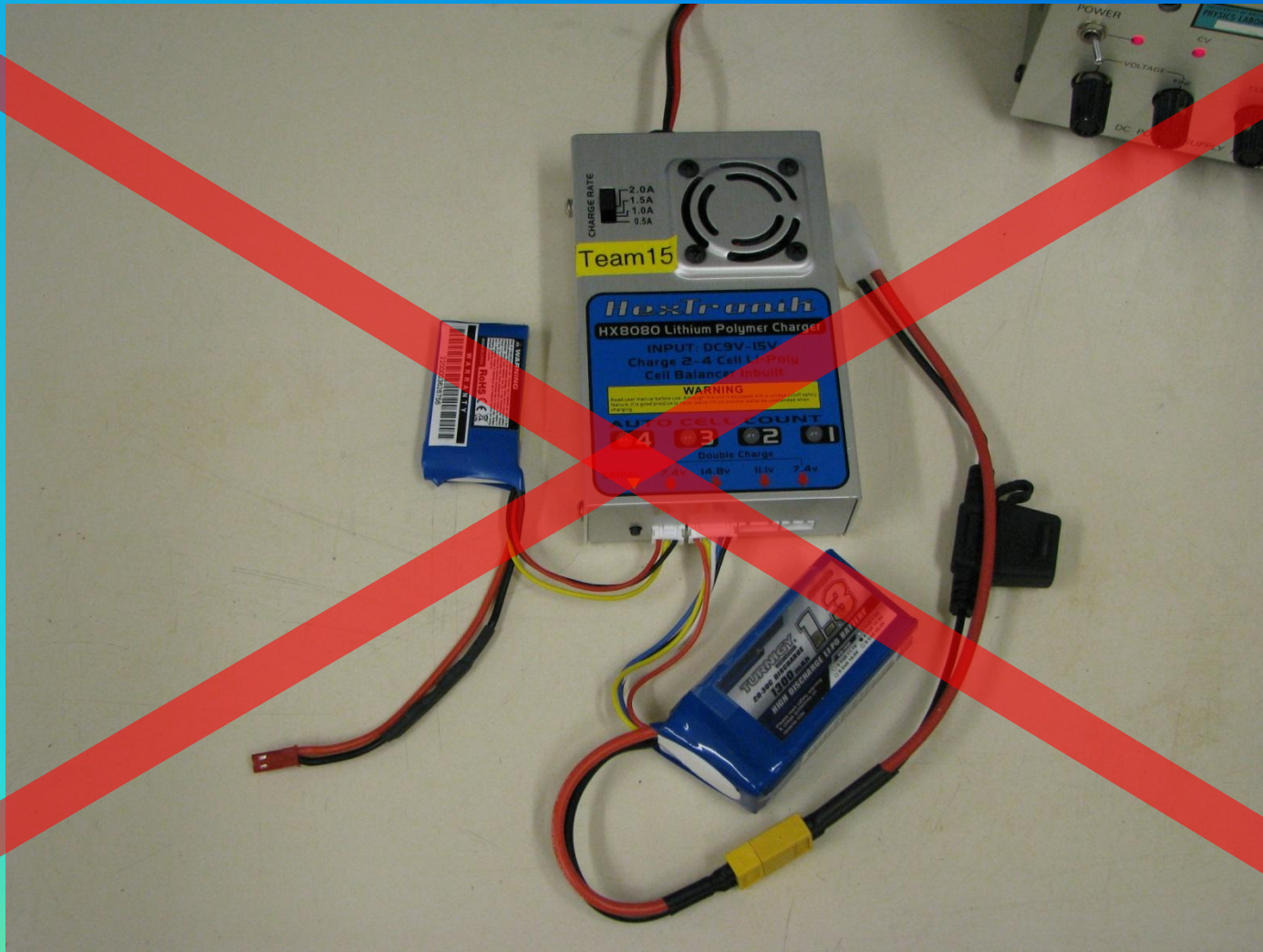
1 x charger



Charging Batteries:



- use your benchtop power supply
- set it to 15 V, and set current limiter to maximum



Don't charge big and small batteries at the same time.



LiPo Explosion

by **Foxxs Warren** • 8 months ago • 139,324 views

(Eng.) Someone heard something like a "far" inside the plane while it was charging their LiPo batteries, a bit of smoke went of the ...



LiPo Explosion Montage

by **bayareaflyers** • 3 years ago • 27,231 views

LiPos can be dangerous. Please Take care of them Thanks to these videos:
[http://www.youtube.com/watch?v=-DcpANRFrl4 ...](http://www.youtube.com/watch?v=-DcpANRFrl4...)

HD



Lithium Polymer Battery Explosion's (liposack)

by **tkdan** • 6 years ago • 531,541 views

A demonstration of lithium polymer batteries and how violent they are when charging goes wrong. The sack used is a liposack ...



Lipo explode

by **rydinhi** • 2 years ago • 108,844 views

HD



E-Savage Can Jump High! + Lipo Explosion!!!!

by **fer martin** • 1 year ago • 3,261 views

Getting addicted to jump my rc vehicles. This time I had a few Bad Landings...the last one caused one of my LiPo Batteries to ...

HD



Lipo Anti-Explosion bag

by **benleo888** • 5 years ago • 85,125 views

This is the testing video of Polysafe lipo storage bag.



lipo explosion

by **carlof626** • 5 years ago • 153,732 views

lipo.



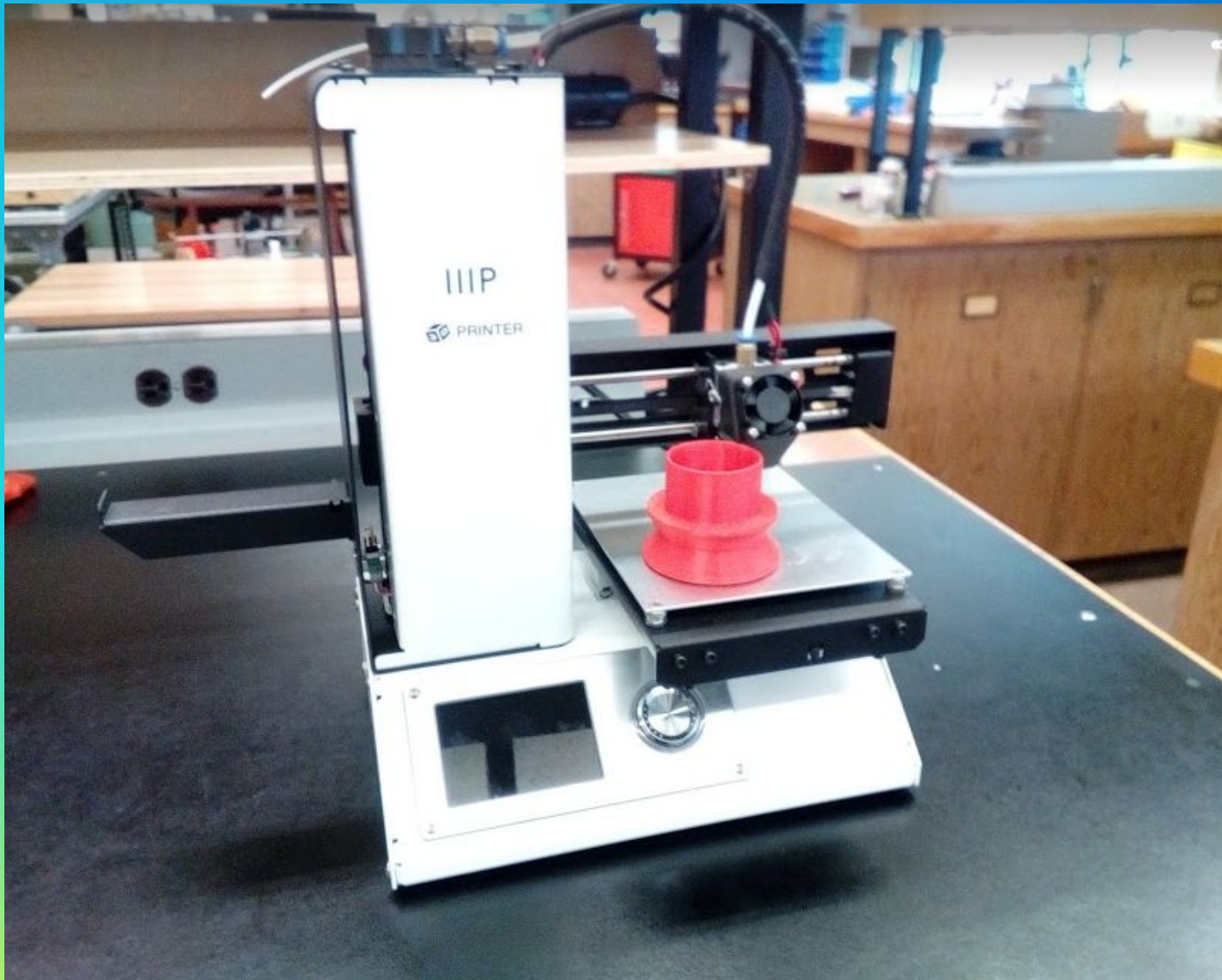
Lipo explosion - aka: idots with batteries!

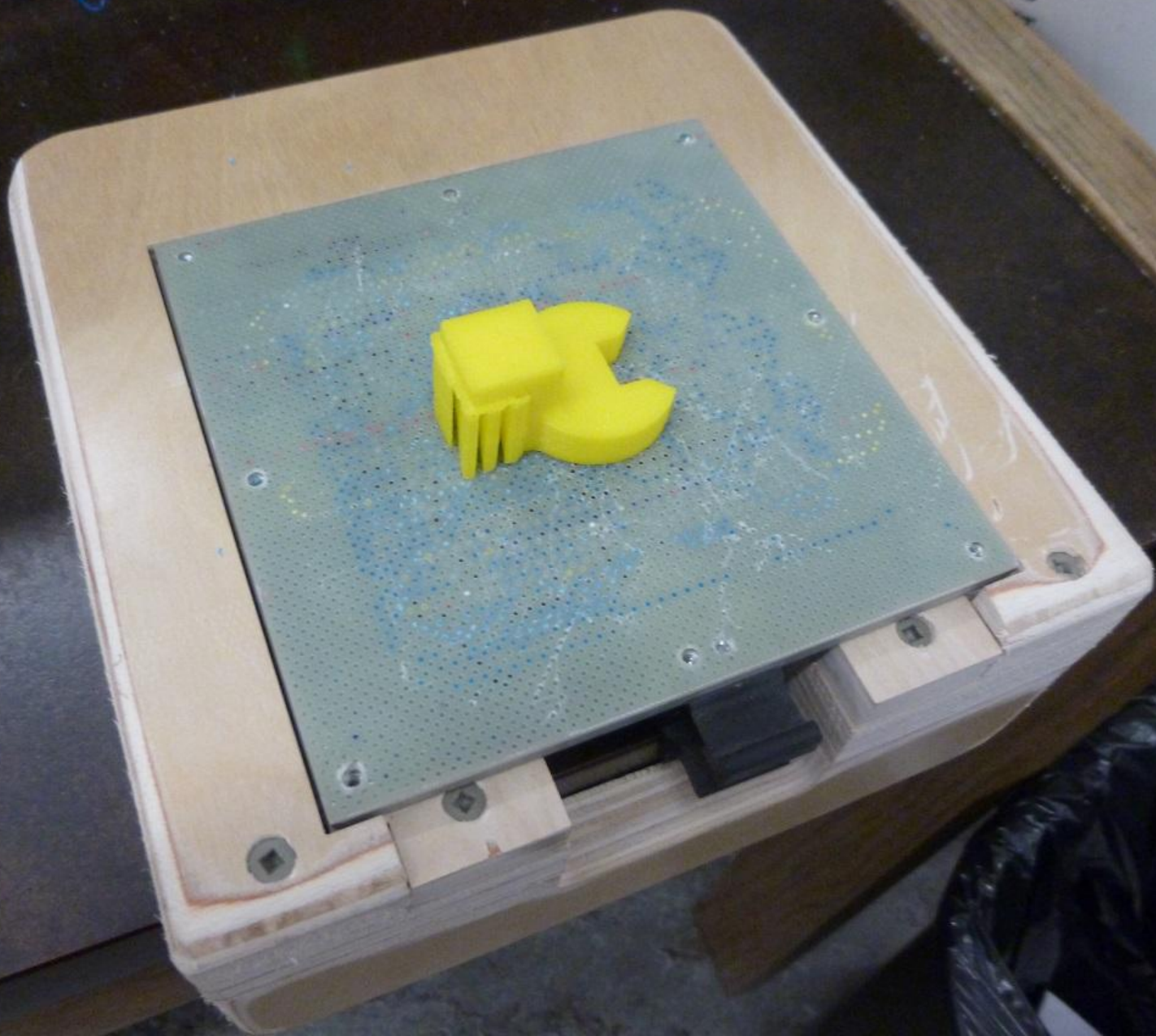
by **xjet** • 2 years ago • 41,493 views



Sodium Thiosulfate

3D printer







Remember:

Your three priorities in a machine shop are
safety, accuracy and speed.

Never sacrifice safety.

Tomorrow (Wed) at 1pm: Life 2402

Fabrication Camp, Second Session

Thursday at 2pm: Life 2402

Fabrication Camp, Third Session

Friday at noon: Hennings 201

Intro to Design, Dylan Gunn