Safety Policy

Safe use of the Gorguze Family Laboratories (GFL), Wilson Student Team Project Center (WSTPC), their lab facilities, and equipment is a primary concern of ALL visitors, members, supervisors, and administrators.

I. Personal Protective Equipment

- **a.** Safety glasses are to be worn at all times in all areas. Safety glasses must meet OSHA Z87 standard (should be marked on glasses). Safety Goggles are not safety glasses and are only allowed in the wet lab. Safety Glasses are provided upon successful completion of Basic II project.
- **b.** Prescription eyeglasses are **not** safety glasses unless they are marked Z87 and have fixed side shields.
- **c.** Ear plugs are to be worn when damage to hearing may occur. Ear plugs are located throughout the Center near safety glasses boxes.
- **d.** Dust masks should be worn when performing activities that produce dust particulates. Dust masks are located in containers throughout the Center. Dust masks do not protect you from vapors, use a respirator instead. Respirators are provided with respirator training.

II. Clothing and Attire

Since the GFL and WSTPC can be used for welding, fabrication, grinding, and other potentially dangerous processes, the following articles of clothing will not be permitted:

- Open shoes (i.e. sandals, dress shoes, Crocs)
- Loose garments that might be caught in machines.
- Loose jewelry, rings, watches, necklaces, etc. that could catch in a machine.
- Dresses, skirts, or pants which do not cover the full length of the person's legs.

To prevent attire from becoming a safety hazard, the following measures are required of anyone entering the WSTPC shop:

- Any loose or flowing hair must be tied back in such a way as it will not come loose easily.
- Long sleeve shirts must have the sleeves rolled up above the elbow when working with rotating machinery.
- Drawstrings on hoodies must be tucked in. Better yet take it off.

III. Supervision and Access

Only those who have undergone the Basic I and Basic II, successfully completed the training project, and have been confirmed may enter the shop and welding areas, and then only when a staff member is present. To weld or use any machines in the shop, additional training is required. Speak to a staff member or your team leader about this. If you do not have the appropriate training, you cannot use the machine, even if you think you are competent and have years of experience in another shop. Use the "buddy system" when working in the Center, i.e. make sure someone else is around when using tools.

IV. Injuries and Emergencies

The College of Engineering, WSTPC, and the EHS office should be notified of an accident or injury. In case of an accident, immediately remove the person from danger. Notify the staff member on duty, and/or call 911. After calling for help, assist the injured person. An injury report must be filled out by a staff member at the earliest possible time. For minor injuries, there is a First Aid Kit located above and to the right of the drinking fountain in the Assembly area and another one located next to the bathroom in the G-Wing.

V. IN CASE OF AN EMERGENCY

Chemical Spill

Notify staff, or call (76)3-4568. If a very bad spill or leak, and if it seems appropriate, call 911.

Fire/Fire Alarm

- **All fires must be reported to UM DPSS immediately.** This applies even if the fire was extinguised without damage or injury. If the fire is uncontrolled call 911. If it has been put out call the DPSS non emergency line, (734) 763-1131
- Exit the building in an orderly manner and if necessary, go to the designated meeting area. The primary meeting area is in the Naval Architecture and Marine Engineering (NAME) parking lot on Draper. The secondary meeting place is the grassy area in front M Air, on the other side of Hayward from the GFL. Try and be aware of who was with you, and make sure they have also exited, if you think someone is still inside, notify an authority figure. Become familiar with the fire exits and locations of fire extinguishers.

Updated 10 August 2018

Severe Weather (Tornado, etc)

In case of a tornado or severe weather alarm, go into the hallway of the first floor of the GFL. The bathroom in the back of the WSTPC is not a shelter because of the equipment on the other side of the wall.

VI. Chemicals and compressed gas

When using chemicals, please use caution and wear appropriate safety equipment. All flammable compounds should be stored in the yellow Chemical Cabinets, not in cages. If you put anything in a cabinet, please inform the staff and provide a Material Safety Data Sheet (MSDS) for it.

Always secure compressed gas cylinders in upright position and use a hand-truck when moving them. The cylinder restraint should be no lower than 1/3 the distance from the top. Use valve protection caps when the cylinder is not actively in use. Cylinders can become "rockets" if knocked over and the valve breaks off. Always use appropriate regulator. Maintain access to cylinders at all times

Do not store flammable gases near ignition sources or oxidizers. They must be separated by at least 20 feet if in storage. Hoses should not be run throughout the lab. Check for leaks on all connections BEFORE use. Ensure proper labeling of the cylinder:

Name of gas
Type of gas - i.e. Oxidizer, Flammable, etc.
Current status of cylinder - Full, In Use or Empty

VII. Behavior and Cleanliness

Equipment cannot stay in optimal working order if it is abused. Clean up tools and machines after use to avoid scratching, gouging, or otherwise damaging them. Remember that the Center exists for all teams, not just yours. If tools are not put away by one person, they are not available to the others. Put tools away where they belong! Clean up your mess every day, even if you plan to return the next day, or even later on the same day. Anything left outside a team area unlabeled could be assumed to be scrap or trash, bear this in mind. There is a Lost and Found area; anything left there for more than 2 weeks will be thrown out. Be courteous to members of other teams, and do not damage or "acquire" their belongings. Food and drink are absolutely not allowed in the Center at any time.

VIII. Ventilation and Fume Hoods

Snorkels and fume hoods in the Wilson Center are for evacuating vapors and fumes, not for solid material. Do not use snorkels as vacuum cleaners. Fume hoods should not be used as storage bins; they must be cleaned out after use.

IX. Honor Code

Because the Wilson Center and GFL are facilities in the College of Engineering, the Honor code must be followed:

The Honor Code outlines certain standards of ethical conduct for persons associated with the College of Engineering at the University of Michigan. The policies of the Honor Code apply to graduate and undergraduate students, faculty members, and administrators. The Honor Code is based on these tenets:

- Engineers must possess personal integrity both as students and as professionals. They must be honorable people to ensure safety, health, fairness, and the proper use of available resources in their undertakings.
- Students in the College of Engineering community are honorable and trustworthy persons.
- The students, faculty members, and administrators of the College of Engineering trust each other to uphold the principles of the Honor Code. They are jointly responsible for precautions against violations of its policies.
- It is dishonorable for students to receive credit for work that is not the result of their own efforts.

Basic II Training

Wilson Student Team Project Center

Hello! After this training session you must complete the project. For this project, you should follow the guidelines below. Put your name, uniquename, team, and expected graduation year on a label and attach it to your final assembly. If your work is approved you will gain MCard access to the Wilson Center. Remember **the staff is here to help you** – if you're not sure, always ask, don't assume. Best of luck with your project and don't forget to wear safety glasses!

Station 1: Cutting

Band saws (Vertical and Horizontal)

- Do not use band saws to cut sheet metal or composites
    - Note thickness limit signs (for example, "No metal < 0.125 in on large bandsaw, No metal < than 0.042 on small bandsaw)
- 2-3 teeth in material
- With vertical band saw, use wooden block to exert even pressure and protect fingers
- Lower blade guard to the platen when finished
- Horizontal band saw includes a vise for straighter cutting
    - Make sure part is long enough that vice cannot spin! (Place stock of equal width in vise on other side if part is too short)
    - Adjust blade guard
- Don't cut anything with a wall thickness smaller than 0.100"
- Turn on coolant when running horizontal band saw

Abrasive Cut off saw

- For metal tubing
- Can change the angle
- Not for aluminum
- Clean up

Station 2: Sheet Metal

Shear

- No metal thicker than 16-gauge (check silver sticker and Gauge to Thickness Conversion Chart)
- Cuts from right to left
- No guard on back – watch your fingers!
- Keep foot clear of pinch point!

Punch

- Always use lubrication when punching holes
- Check "How to load a die" diagram
- Punches and dies in blue drawers next to Notcher - Only one drawer can be opened at a time

Notcher

- 1/16" capacity
- For making 90° cuts
- Great height for leaning on, but if you like your fingers, DON'T!

Hand Brake

- 1/16" capacity
- Bend past 90° to allow for metal springback, eyeballin' is necessary
- Bend radius can be adjusted - ask staff

Station 3: Hand Tools, Measurement, Sanding, Grinding, and Press

Files

- For finishing slightly rough edges
- Cut only in the push direction
- Shouldn't require much pressure
- Make sure file has a handle attached to the pointy end

Deburring tools

- For removing large burrs and finishing holes
- Only cut in one direction

Calipers

- For general measurement (more precise than ruler, less precise than micrometer)
- These tend to wander – <u>be sure to put them back so you and others can find them later</u>!

Center Punch

- For marking center location of a hole to be drilled or punched
- Manual punches only require a light tap

Disc sander
- Note spin direction – sand on downward side to direct projectiles away from face
- No brakes, so it can take up to 30 minutes to coast down
- Do not sand sharp corners, as they will rip the paper (file corners down by hand instead)
- Use vacuum

Grinder
- DO NOT GRIND ALUMINUM (or any other soft metal)!
- Fine and coarse grinding wheels
- Cool part down by dipping in water container
- Use vacuum
- Make sure tool rest is <¼" away from wheel

Press
- Arbor Press
- Hydraulic Press

Station 4: Drilling
- Always use lubrication when drilling holes
- Check chart next to drill press for drilling speed (rpm) – depends on material and drill diameter
- Adjust speed only while spindle is running
    - High and Low switch positions correspond to high and low numbers on blue dial
- Start hole with center drill to create pilot hole which helps locate size drill
- Back bit all the way out of hole regularly to clear chips as you drill
- Place wooden block underneath part or use parallels in vise if drilling a "through hole"
- Get a particular depth using ruler next to handle if drilling a "blind hole"
- Table height and yaw can be adjusted
- Drills larger than ½" can be used with a different process

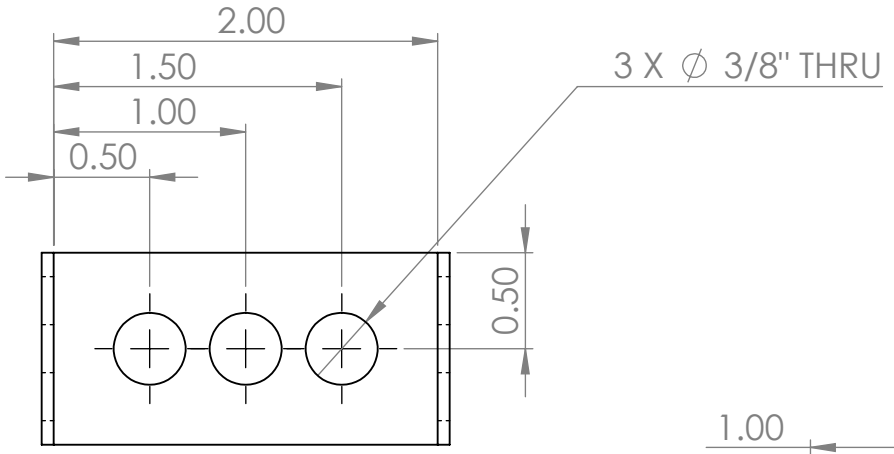
Station 5: Tapping
- Always use lubrication when tapping holes (Tap Magic or Tap-Matic)
- Make sure to use the Tap Wrench, tighten the jaws onto the square section of tap shaft
- See tap & drill chart to find drill size that fits the tap you need
- Generally ½ to 1 reverse rotation for every two rotations to clear chips
- Always tap by hand, do not use a machine.

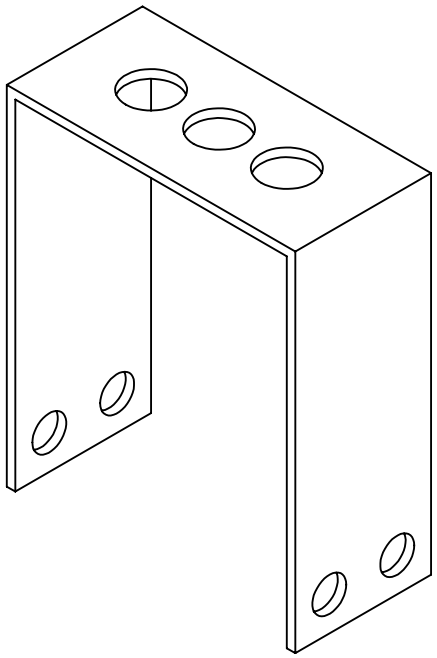
Station 6: Paint Booth, Disposal, and Injuries and Emergencies

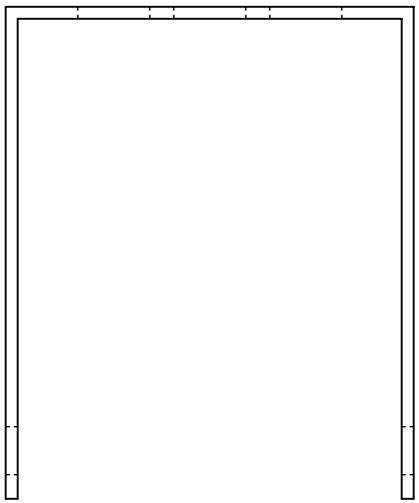
Paint Booth
- Operation: Lights, Paint and Curing settings, delay in starting up
- Paint on paper, not floors or walls
- Paint towards exhaust
- Don't leave paint or other chemicals unattended inside
- No Sanding in the Paint Booth!!

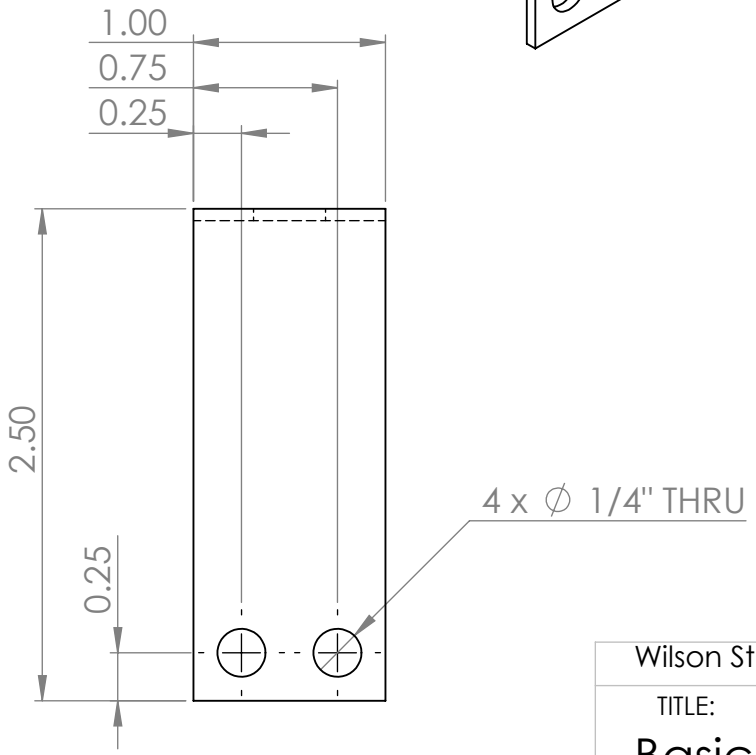
Disposal
- Trash
- Recycling
    - Pizza boxes: yes
    - #3 Plastic: no
    - Glass: no
- Scrap Metal (small bins throughout the Center, main bin in disposal area)
- Chemicals
    - Storage - All secondary containers must be labeled with the full chemical name and hazards
    - Disposal - Waste containers must be labeled with the date of collection and the full chemical name **before** collection begins
- Electronics, Batteries and Sharps

Injuries and Emergencies
- **All fires must be reported to UM DPSS as soon as it is safe to do so!** This applies even if the fire was extinguished without damage or injury.
- Dial 911, if using your cell phone, be sure to tell the operator that you are on the UofM campus
- First Aid Kits
- AED
- Emergency eye wash and shower stations









All Dimensions in Inches
Material is Aluminum
Ignore Bend Radius

Wilson Student Team Project Center

TITLE:

Basic 2 Training Project

SCALE: 1:1 | SHEET 2 OF 2

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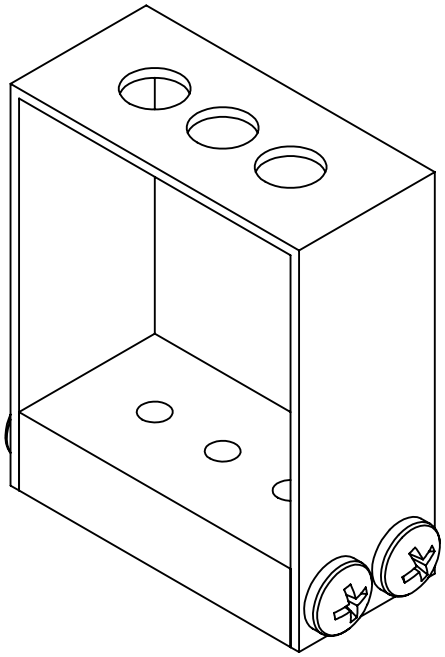
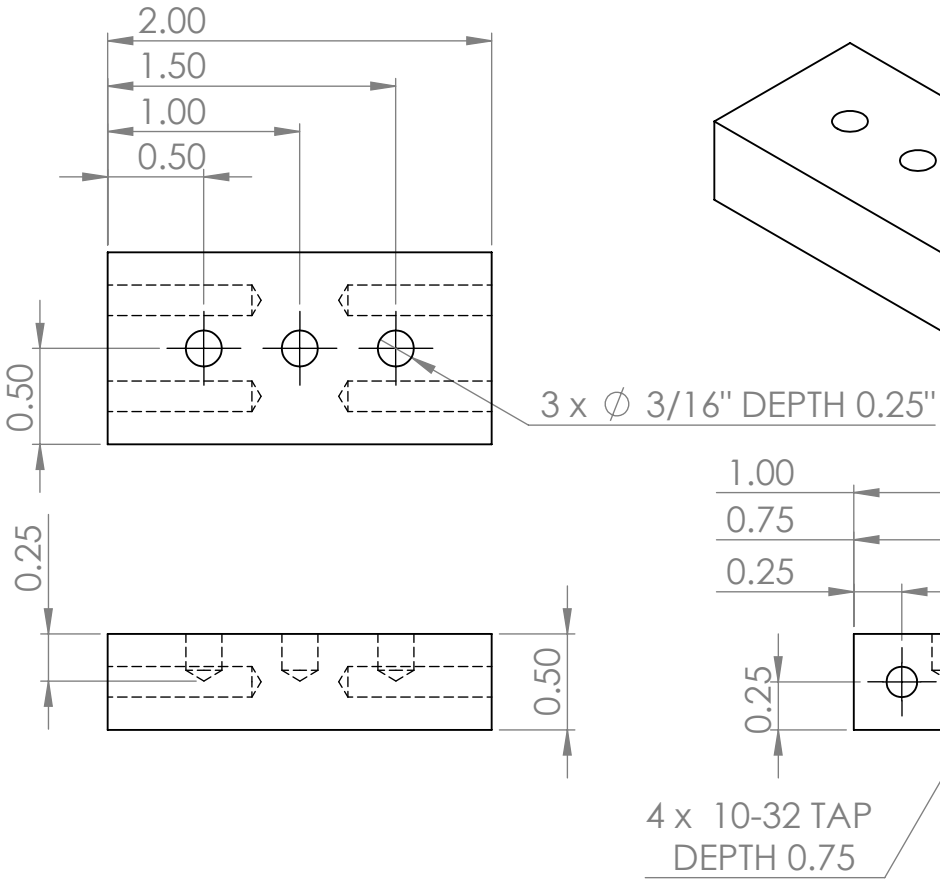


Final Assembly



All Dimensions in Inches
Material is Aluminum

Wilson Student Team Project Center	
TITLE: Basic 2 Training Project	
SCALE: 1:1	SHEET 1 OF 2

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WILSON STUDENT TEAM PROJECT CENTER
UNIVERSITY OF MICHIGAN

BASIC II PROJECT FAQ'S

*****The completion of this project is subject to the College of Engineering Honor Code and therefore any Basic II project turned in should be the sole work of the person turning the project in.**

DUE DATE: None

STEP #1: Complete manufacturing plan.

STEP #2: Complete project.

When can I work on my project?

BASIC II Project Work Time is Monday- Friday from 8:00 am to 5:00 pm. Working at any other time is at the discretion of the staff and dependent on how busy the shop is. Check in with staff when working after Basic II Project Work Time.

What should be included on my manufacturing plan?

- Your plan can be typed or handwritten.
- It should include a specific reference anytime you use a machine, workholding or hand tool. If you are touching a tool, it should be on your plan!
- If using a drill bit or tap, you should include the size you will use as well as the RPM you plan to run it on the drill.
- You should note everytime you need to use coolant or cutting fluid/lubrication.
- Don't forget to include the last step of assembly!

How long after I turn in my manufacturing plan can I start working on my project?

Your manufacturing plan can be checked by staff anytime during the BASIC II Project Work Time hours. Checking your plan should only take a few minutes and then you will be able to start working immediately.

How long does it usually take to complete the project?

Usually 2-3 hours but will depend on your skill level and activity in the shop.

Do I need to finish my project all in one session?

No, you can come back multiple times to work on your project but you must take your project with you. We cannot store unfinished projects in the shop.

How will I know if my project has passed inspection?

We regularly grade turned in projects and will let you know by email if you have passed or if you need to come back to the shop to do reworking on your project.

What happens after my project has passed inspection?

You will get an email and your MCard will be activated to allow you access to the Wilson Center on Monday- Friday from 8:00 am until 11:00 pm and Saturday and Sunday from 12:00 pm until 11:00 pm.

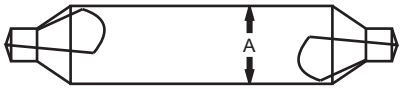
INCH / METRIC TAP DRILL SIZES & DECIMAL EQUIVALENTS

DRILL SIZE	DECIMAL EQUIVALENT	TAP SIZE
80	.0135	
79	.0145	
1/64	.0156	
78	.0160	
77	.0180	
76	.0200	
75	.0210	
74	.0225	
73	.0240	
72	.0250	
71	.0260	
70	.0280	
69	.0292	
68	.0310	
1/32	.0312	
67	.0320	
66	.0330	
65	.0350	
64	.0360	
63	.0370	
62	.0380	
61	.0390	
60	.0400	
59	.0410	
58	.0420	
57	.0430	
56	.0465	
3/64	.0469	0 - 80
55	.0520	
54	.0550	
53	.0595	1 - 64, 72
1/16	.0625	
52	.0635	
51	.0670	
50	.0700	2 - 56, 64
49	.0730	
48	.0760	
5/64	.0781	
47	.0785	3 - 48
46	.0810	
45	.0820	3 - 56
44	.0860	
43	.0890	4 - 40
42	.0935	4 - 48
3/32	.0938	
41	.0960	
40	.0980	
39	.0995	
38	.1015	5 - 40
37	.1040	5 - 44
36	.1065	6 - 32
7/64	.1094	
35	.1100	
34	.1110	
33	.1130	6 - 40
32	.1160	
31	.1200	
1/8	.1250	
30	.1285	
29	.1360	8 - 32, 36
28	.1405	
9/64	.1406	
27	.1440	
26	.1470	
25	.1495	10 - 24
24	.1520	
23	.1540	
5/32	.1562	
22	.1570	
21	.1590	10 - 32
20	.1610	
19	.1660	
18	.1695	
11/64	.1719	
17	.1730	
16	.1770	12 - 24
15	.1800	
14	.1820	12 - 28
13	.1850	
3/16	.1875	
12	.1890	
11	.1910	

DRILL SIZE	DECIMAL EQUIVALENT	TAP SIZE
10	.1935	
9	.1960	
8	.1990	
7	.2010	1/4 - 20
13/64	.2031	
6	.2040	
5	.2055	
4	.2090	
3	.2130	1/4 - 28
7/32	.2188	
2	.2210	
1	.2280	
A	.2340	
15/64	.2344	
B	.2380	
C	.2420	
D	.2460	
1/4	.2500	
E	.2570	5/16 - 18
F	.2610	
G	.2656	
17/64	.2660	
H	.2720	5/16 - 24
I	.2770	
J	.2810	
K	.2812	
9/32	.2900	
L	.2950	
M	.2969	
19/64	.3020	
N	.3125	3/8 - 16
5/16	.3160	
O	.3230	
P	.3281	
21/64	.3320	3/8 - 24
Q	.3390	
R	.3438	
11/32	.3480	
S	.3580	
T	.3594	
23/64	.3680	7/16 - 14
U	.3750	
3/8	.3770	
V	.3860	
W	.3906	7/16 - 20
25/64	.3970	
X	.4040	
Y	.4062	
13/32	.4130	
Z	.4219	1/2 - 13
27/64	.4375	
7/16	.4531	1/2 - 20
29/64	.4688	
15/32	.4844	9/16 - 12
31/64	.5000	
1/2	.5156	9/16 - 18
33/64	.5312	5/8 - 1
17/32	.5469	
35/64	.5625	
9/16	.5781	5/8 - 18
37/64	.5938	
19/32	.6094	
39/64	.6250	
5/8	.6406	
41/64	.6562	3/4 - 10
21/32	.6719	
43/64	.6875	3/4 - 16
11/16	.7031	
45/64	.7188	
23/32	.7344	
47/64	.7500	
3/4	.7656	7/8 - 9
49/64	.7812	
25/32	.7969	
51/64	.8125	7/8 - 14
13/16	.8281	
53/64	.8438	
27/32	.8594	
55/64	.8750	1 - 8
7/8	.8906	
57/64	.9062	
29/32		

DRILL SIZE	DECIMAL EQUIVALENT	TAP SIZE
59/64	.9219	1 - 12
15/16	.9375	1 - 14
61/64	.9531	
31/32	.9688	
63/64	.9844	1 1/8 - 7
1	1.0000	
1 3/64	1.0469	1 1/8 - 12
1 7/64	1.1094	1 1/4 - 7
1 1/8	1.1250	
1 11/64	1.1719	1 1/4 - 12
1 17/32	1.2188	1 3/8 - 6
1 1/4	1.2500	
1 19/64	1.2969	1 3/8 - 12
1 11/32	1.3438	1 1/2 - 6
1 3/8	1.3750	
1 27/64	1.4219	1 1/2 - 12
1 1/2	1.5000	

CENTER DRILL INFORMATION



A = Center Drill Body Diameter

***Use center drill diameter to determine what RPM to spin center drill at in drill press.

Center Drill	A/Body Diameter
#1	.125”
#2	.1875”
#3	.250”
#4	.313”

WILSON STUDENT TEAM PROJECT CENTER
UNIVERSITY OF MICHIGAN

WILSON STUDENT TEAM PROJECT CENTER
UNIVERSITY OF MICHIGAN

Drill Press RPM Chart

Tool Size	Steel	Aluminum
1/16”	700	800
⅛”	650	800
3/16”	600	750
¼”	500	750
5/16”	450	500
⅜”	400	500
7/16”	350	375
½”	300	375
9/16”	250	300
⅝”	200	300
11/16”	175	250
¾”	150	250
13/16”	150	200
⅞”	150	200
15/16”	150	200
1”	150	175