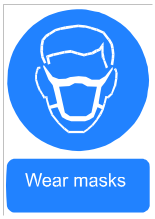
SAFE OPERATING PROCEDURE (SOP) & ACCREDITATION GUIDE	Drill Presses (including Metalworking Machine)	Accreditation Code	W5

Safety Requirements whilst operating the DRILL PRESSES

Compulsory



When hazardous or significant dust likely

If using the machine causes high noise level

Long and loose hair must be contained.

Do not wear gloves

Use dust extractors to which these machines are attached when dust is likely.

- Knowledge of Key features of the DRILL PRESSES must be understood and clearly evident during competency assessment. Safe operation of the DRILL PRESSES must also be demonstrated.
- This document applies to the following four Drill Presses: **Waldown Varispeed Column Drill, Woodman 16 Speed Column Drill, Hafco 16 Speed Bench Drill (Metalwork), Ryobi 12mm Bench Drill.** It must be read in conjunction with the Manuals and appropriate guides. Recognition of the main parts of the DRILL PRESS is necessary in order to understand descriptions below. Reference to diagrams in the DRILL PRESS Manuals and observation of the actual machines may be useful information sources. Web tutorials are also an excellent informer eg the16 minutes of http://www.youtube.com/watch?v=6JyIR5nwRho *(Introduction to Using the Drill Press).*
- Clear knowledge of our Shed's Safety Induction Package should also be evident and practised by aspiring Drill Press operators.
- Persons who are unable to see finer work details should only use these machines if aided by suitable glasses (over which safety glasses can be worn).

Key Features of the DRILL PRESS

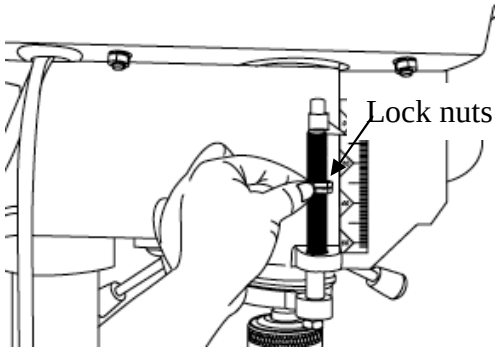
- The primary function of the column and bench drills is to drive various bits and cutting tools in a rotary motion and to provide a vertically downwards force at the same time so as to feed the cutting tool into the work. This allows drilling or cutting of accurate holes in plastics, metal, manufactured boards and timber. The machine is especially suited for the repetitive and/or accurate drilling and boring of holes.
- Accuracy is established by clamping or bolting vices or fences to the table and using these to support the work. The table is a casting with a machined flat surface. A centre opening allows the drill bit to pass through the table if the opening is lined up with the spindle axis of the drill. Slots are machined into the table, which allow a sacrificial table and fence or a machine vice to be bolted to it. The table on the larger machines can be rotated on their vertical axes and they can all be swung around the column on the machines. The tables can also be rotated around their radial axis such that a vertical position is possible. The locking screws or bolts MUST BE used to prevent movement of the table during machining.
- The height of the table on the three bigger machines is adjusted on the column, after unlocking, by means of a rack and pinion mechanism with a crank handle. The small Ryobi table height is adjusted manually after releasing the clamping screw. For accurate depth drilling, a depth stop is used to limit the vertical travel of the chuck. Once correct height is established, the table must be re-locked. NEVER DRILL WITH THE TABLE SUPPORTED ONLY ON THE RACK.
- The chuck is the mechanism with three contracting jaws that hold the drill bit or round cutter shafts. All keyed chucks MUST have the key removed after the drill bit is tightened into the chuck. If it is not removed, a hazard is created for the operator.
- The V-belt and pulleys transfer rotary motion and power from the motor to the drill spindle. Changing the position of the belts on the cone pulleys varies drill speeds. A large pulley driving a small one gives a faster speed and a small pulley driving a large one gives a slower speed.

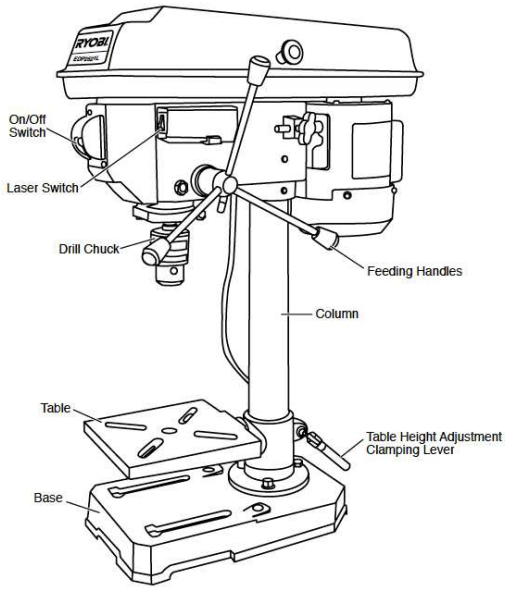
Generally the larger the drill bit the slower the speed required for efficient and safe operation. Different speeds may also be required for different materials.

- The **VARISPEED** drill press uses conical pulleys between which a belt runs. The position of the belt is determined by rotating a hand-wheel on the front of the drill. There is a speed indicator next to this hand-wheel. IT IS VERY IMPORTANT THAT THE VARISPEED IS ONLY ADJUSTED WHEN THE DRILL IS IN MOTION SO AS TO AVOID DAMAGE TO THE BELT

- Depth stop adjustment varies depending on which machine is being used. The larger machines use a collar which can be locked onto the feed spindle at the appropriate depth. Fine adjustment is available for the Varispeed by adjusting the small knurled stop screw.

- The depth stop on the small Ryobi is set by winding the two nuts to stop the drill at the desired depth. "Lock" the nuts together when depth is set. (see right hand diagram)





The diagram above shows the main features of a small Ryobi drill press (NB The Shed machine does not have a laser guide). Many of these features are common with other drill presses.

Safety & Procedural Issues

Before the Drilling

1. SELECT THE APPROPRIATE MACHINE FOR THE TASK. Don't force the drill press or an attachment to do a job for which it was not designed. Damage to the machine, cutting tool and/or injury may result. IF IN DOUBT, CONSULT A COORDINATOR.

2. ALWAYS ENSURE THE MACHINE IS "OFF", AND DISCONNECT THE DRILL PRESS FROM THE POWER SOURCE before installing or removing accessories, before adjusting or changing setups, or when making repairs. An accidental start-up can cause injury.

3. SET RECOMMENDED SPEEDS for all operations.

   Factors which determine the best speed:
   - *Kind of material being worked (metal, acrylic, aluminium, wood, etc.) In soft materials, the speed is usually higher than for hard materials.*
   - *Size of hole (typically, the smaller the drill bit, the greater the required RPM)*
   - *Type of drill bit, ie twist drill, brad point bit, hole saw, spade bit, countersink, fly cutter-blade on arm*
   - *Quality of cut desired*

4. DO NOT USE bits that are dull, bent or damaged. Check condition of drill bits. They should be kept sharp at all times and free of burrs on the shank. Always select the correct drill bit for the material to be bored.

5. Guards should be correctly fitted and secured on the machine.

6. The machine and work area should be clean and free of wood chips, swarf and other obstacles.

7. Insert drill bits a minimum of 20 mm into chuck. MAKE SURE bit is centred in chuck and tightened securely using the chuck key before operating the drill press. *If the machine is not fitted with a keyless chuck, tighten the chuck uniformly at all three positions when the drill is inserted and always use correct size chuck key.* TURN CHUCK BY HAND TO CHECK BIT ON CENTRE.

8. If a perpendicular hole through the work is required, check the table for being square to the bit.

   TIP - Squaring the Table for Accuracy.
   Square the table using an old machinists' trick. Bend a piece of coat hanger rod into an S shape, mount it in the chuck and swing it BY HAND to each side of the table. Use a feeler gauge between the end of the rod and the table top to test the clearance at each end of the table. Adjust the table tilt until there's 1mm or less difference between the two sides.

   Alternately, use a try square on the table and against the side of a stationary drill bit. Check sideways, and front and back directions (although there is usually little that can be done without more major intervention if there is front to back tilt).

<u>Adjusting the table angle</u> If necessary you can change the table angle by loosing the locking mechanism under the back of the table and adjust the angle. Remember to lock off the table again before drilling.(see diagram)

9. Set the depth of the hole to be drilled by adjusting the plunge depth stop (unless drilling all the way through the work and into a sacrificial support under the work).

10. ENSURE WORKPIECE IS SECURELY HELD WITH VICE, SUITABLE CLAMPS, JIGS OR FASTENINGS.

11. THE WORKPIECE SHOULD BE HELD FIRMLY AGAINST THE TABLE. Do not attempt to drill a work piece that does not have a flat surface against the table, or that is not secured by a vice, clamps, jigs or the supplementary fence. Prevent the work piece from rotating by clamping it to the table or by securing it against the drill press column or against the supplementary table fence. Loss of control of the work piece can cause serious injury.

12. PROPERLY SUPPORT LONG OR WIDE work-pieces. Loss of control of the work piece can cause severe injury. When the work piece is long enough, position it on the table with one end against the left side of the column to prevent the work piece from rotating. If it is not possible to support the work piece against the column, clamp the work piece to the table. Additional length support may be required eg assistant or suitable support stand.

13. TIGHTEN ALL LOCK HANDLES before starting the drill press. Loss of control of the work piece can cause serious injury and drill breakage.

14. REMOVE THE CHUCK KEY BEFORE STARTING THE MACHINE. If not removed, the chuck key can be thrown out at a high speed and cause injury.

15. NEVER turn the drill press "on" before clearing the table of all objects (tools, scrap pieces, etc.)

16. Align the drill bit with the mark indicating where to drill the hole in the work piece. METAL SHOULD BE CENTRE PUNCHED TO START THE DRILL. Centre punching wood can also be useful especially if hard and soft growth rings are present and likely to cause drill wander.

Drilling a hole

17. Double-check all adjustments and settings before commencing boring operations.

18. DO NOT OVER REACH AND AVOID AWKWARD OPERATIONS OR HANDPOSITIONS. A sudden slip could cause a hand to move into the bit.

19. KEEP HAIR, ARMS, HANDS, FINGERS AND CLOTHING away from the bit. A LONG HAIR <u>FRINGE</u> AND LONG SLEEVED CLOTHES MUST BE MUST BE CONTAINED. Serious injury can occur where entanglement is involved.

20. Ensure adequate PPE is worn. <u>Use eye protection in all cases</u> and hearing protection in cases of excessive noise. Dust masks should also be used where dust from drilling is hazardous eg MDF.

21. Adjust dust extraction and use it for hazardous dusts. It is also useful in removal of wood shaving to help maintain clear vision of the work and to minimise clean up after drilling.

22. NEVER START THE DRILL PRESS WITH THE DRILL BIT IN CONTACT WITH THE WORK PIECE. After lining up the drill with the hole location on the work, turn on the press and slowly lower the drill bit into the work piece until the drill reaches the required depth.

23. DON'T FORCE THE DRILL INTO THE WORK PIECE. Damage to the machine and/or injury may result. Allow the bit to cut at its own speed without applying excessive pressure.

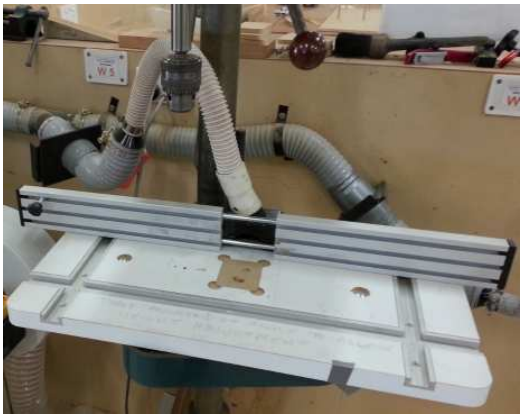
24. If the setting is very deep in the work piece, back the bit up out of the hole periodically to clear the shavings from the hole.

25. Burning is usually the result of too high a speed or a blunt drill.

26. Do not attempt to clear a clogged bit while the machine is running.

27. If the workpiece is seized by the bit and spins, step away immediately and switch machine off.

Drilling wood



28. Use of the supplementary table and fence provides clamping tee grooves, dust extraction through the fence and sacrificial inserts which should be positioned in line with the drill's spindle axis.

29. Twist drills, which are general purpose bits, can be used for boring holes in wood, however, BRAD POINT DRILLS generally provide a cleaner hole in wood. These bits cut a flat bottom hole and are designed for removal of wood chips. DO NOT USE HAND BITS WHICH HAVE A CORKSCREW TYPE SCREW TIP. At drill press speeds, they will lift and rotate the work piece. This can be very dangerous.

30. For through boring, align the work piece so that the bit will go through the centre hole in the table or into a piece of scrap material on which the workpiece can be supported.

31. Feed the drill slowly when the bit is close to cutting through the wood to prevent splintering the bottom face.

32. Use of a scrap piece of wood as a base block under the work helps to reduce splintering and protects the point of the bit and the drill table.

33. If using a spade bit or hole saw, drill until the centre point just breaks through the work. Then turn the work over and finish the hole from the other side so that the surface is not excessively splintered.

Drilling metal

34. ALWAYS use some form of clamps to hold the work when drilling metal. The work piece should NEVER be held in the bare hand. The drill bit may grab the work at any time, especially when breaking through the stock. If the piece is whirled out of the operator's hand, the operator may be injured. The drill bit will be broken if the swinging work piece strikes the column.

35. The work piece must be clamped firmly while drilling. Any tilting, twisting, or shifting results not only in a rough hole, but also increases drill bit breakage. For flat work, lay the work piece on a wooden base and clamp it firmly down against the table to prevent it from turning. If the work piece is of irregular shape and cannot be laid flat on the table, it should be securely blocked and clamped.

The machine vice is designed for holding metal workpieces and it has specially made clamping bolts to clamp it to the table. Ensure not to drill through the work and into the ways of the vice. Also ensure that the clamping Tee bolts are put back in place after use if they have been undone for any reason.

36. When drilling through metal, it is usual to set the drill speed lower than for wood. Because metal is a dense material, drilling through it at high speeds can burn out the drill bit. As an additional preventive, apply a few drops of **cutting fluid** to the metal before drilling and stop the drill periodically to clear the swarf and to apply more cutting fluid if the hole is deep.

Note: Spindle sanding with a drill press.
This is an option which is not available at the Shed because we have a Spindle (Bobbin) Sanding Machine. We do not have the required sanding attachments for the drill presses.

NEVER LEAVE THE DRILL PRESS RUNNING UNATTENDED. TURN THE POWER OFF. Don't leave the machine until it comes to a complete stop.

After drilling

37. TURN THE MACHINE "OFF" AND WAIT FOR THE DRILL SPINDLE TO STOP TURNING prior to cleaning the work area, removing debris, removing the work-piece, or changing the angle of the table. A moving drill bit or cutting tool can cause serious injury.

38. NEVER GRASP THE CHUCK IN AN ATTEMPT TO STOP THE DRILL BIT. It is likely to cause serious hand injury.

39. NEVER PERFORM LAYOUT, ASSEMBLY OR SET-UP WORK on the table/work area when the machine is running. Serious injury can result.

40. TURN THE MACHINE "OFF", disconnect the machine from the power source, and clean the table/work area before leaving the machine. Do not use the hands to clear waste material from the table or from a clogged bit. Use a brush or other suitable tool.

41. Remove the drill bit when the work is completed.

42. Return bits to drill stand or storage places when you are done and clean work area of all dust and or swarf and leave machine ready for next user.

43. Clean the area around the drill press.

Various Bits used at The Shed

AUGER BIT
Use with hand drill only

Do not use on metal

WOOD-BORING BIT
Use with hand drill only

Do not use on metal

PADDLE/SPADE BIT

Easier to use larger diameter spade bits on drill press but hand drills can be used and drilling from both sides is recommended for smoother hole.

Do not use on metal

BRAD POINT BIT (also known as Dowel Drill or Lip & Spur Bit)

Twist Bit with pilot tip. Use with drill press or hand drill.

Do not use on metal

TWIST DRILL BIT
Use with drill press or hand drill as general purpose drill bit.

Used for metal and wood

PILOT HOLE COUNTERSINK BIT
Use with drill press or hand drill to drill for screw pilot hole, shank hole and countersink at the same time. Some variants do not have shank hole.

Do not use on metal

FORSTNER BIT
Use with drill press or hand drill for large or flat bottom holes.

Do not use on metal

MASONRY BIT
Used with "hammer drill" to drill brick, concrete, roof tiles and other masonry. Has a very hard tungsten carbide insert in the tip.

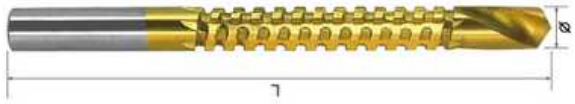
Do not use in wood or metal

COUNTERSINKS (DEBURRING BITS)
Used to remove burrs on the edge of drilled holes or to countersink the hole to provide for a screw head to be set level or below the surface.

Used on metal and wood

HOLE SAW
Requires a slower speed to avoid burning and holes usually drilled part way until pilot hole is through and then work is turned over to complete hole from other side. This reduces split out and makes removal of the waste circle easier.

Can be used on thin, softer metals but usually used on wood only.



RASP DRILL BIT (also known as Drill Saw)
Used to enlarge holes and make slots. Should be moved up and down during use as work pushed sideways into cutting teeth on bit. Best used with supportive fence which is set to counteract rotational forces which tend to move the work sideways.

Used on metal and wood

STEP DRILL
Used to enlarge holes to chosen diameter in metal sheet and plate.

Used on thinner metal

PLUG CUTTER
Used to cut wooden plugs to cover screw heads with grain direction to match workpiece Plugs are inserted into counter-bored holes.

Used on wood only

HOLE CUTTER
Used to cut holes for downlights. Can be used in drill press to cut hole in wood.

Use in plaster sheet and wood

Ku-ring-gai Community Workshop "The Shed"

COORDINATORS' OPTIONAL CHECK LIST AND NOTES	INITIAL	DATE
1. Select appropriate drill bit and insert bit for medium hole in hardwood board or small hole in metal		
2. Set appropriate drill press speed		
3. Set stops for 1 cm deep hole		
4. Option – adjust table for 5 degree angle hole		
5. Set up a break through board below the work		
6. Centre punch a hole location		
7. Secure the wood/metal appropriately		
8. Drill hole clearing chips as required		
9. Carry out normal procedures at completion of work		
10. Set up and drill hole using hole saw		
11. Set up and drill hole using spade bit		
12.		
13.		
14.		

Version Date:	22/10/13	**Version Prepared by:**	K Callinan, M Swithenbank & M Bailey	**Version Authorised by:**	K Jeffress

Please tick ONLY ONE of the boxes:
New Accreditation to be added to records ☐ **Confirmation of existing accreditation** ☐

Accreditation seekers signature:	**Date:**	**Accred Code:**	**1st Assessor's signature:**	**2nd Assessor's signature:**
……..	……..	**W5**	……..	……..
Print Name: ……..			**Print Name:** ……..	**Print Name:** ……..

NB A copy of this document is to be completed and filed in the member's personal file at the Shed. Additional copies are available through email or hard copy by if requested. The member's Shed computer records and name tag will be amended when Accreditation is finalised.