
4 TRAINING MODULE 4

Working with Power Tools: Part 1



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Working with power tools at community wood recycling

By using power tools, woodworkers can carry out tasks in a fraction of the time taken by hand tools – and achieve far superior results with the minimum of physical effort. They are undoubtedly a wonderful asset and in community wood recycling we use power tools extensively for various functions – but especially for:

- Cutting all sorts of wood/sheet materials to size/shape
- Smoothing the surface of wood
- Making holes and driving screws

Although they can make things much easier, they can be extremely dangerous and represent a very big risk to our Health & Safety – even to our lives. Consequently, we must ensure that all the issues around using them are very clearly understood – and that the procedures governing their use are strictly followed. There are many different types of power tool but most of the issues are common to all of them.

This module will **not** teach you how to use specific tools; you will receive training for that. Nor will it make you a ‘woodworker’ – that requires time and practice.

The learning outcomes of module 4

This module will not teach you how to use specific tools; you will receive training for that. In it we consider the general issues around using power tools and examine in more detail some of the tools that we use. After successfully completing it, you will be able to:

- Understand what the most popular power tools are used for
- Understand the key hazards of using power tools
- Adopt working practises that will help you use power tools safely

Power tools and the law

Thankfully, there are many laws governing safety at work and one of them that covers power tools is the Provision and Use of Work Equipment Regulations 1998 (PUWER 98). Regulation 4 places duties on employers and requires that hand-held power tools be:

- Used only for purposes for which they are suited
- Used only under conditions for which they are suitable

The Regulations also require that work equipment is maintained in efficient working order and in good repair ('efficient' relates to how it might affect health & safety, not how good a tool it is at its job).

Before allowing anyone to use a particular power tool, the enterprise must carry out a risk assessment on the tool—just like on the areas and activities that we looked at in Modules 1 and 2.

Make sure that you have gone through a Risk Assessment for each of the tools in which you are being trained.

REMEMBER: You will not be authorized to use power tools until you have also successfully completed the next training module – Module 5.

Section 1—The general risks associated with power tools

Like any tools, the Golden Rules for using power tools are simple:

Golden rule 1

Never use a tool that you have not been trained and authorized to use

Golden rule 2

Make sure that you use the right tool in the right way for the right job

Most of the power tools we use have blades, so the biggest risk to health is being cut.

Users must be ultra-careful to keep fingers and other body parts away from blades and bits – most of which will be extremely sharp and rotating at great speed. Many machines have blade guards that must be in place, but some – like jigsaws – do not. So being aware of the dangers and using the tool properly is a must.

In addition to the risk of injury from accidents that result in cuts and lesions, there are several very important general things to consider – regardless of the type of tool.

These are the issues around:

- Electrical safety
- Dust/fragments
- Noise
- Fire
- Hand Arm Vibration (HAV)

Electrical safety

Let's start with a little technical stuff: In the UK, electricity is 'pumped' through the mains at about 230 volts (v) and so all electrical equipment is designed to use the electricity at this rate. However, the actual power consumption of an appliance is measured in watts (w). If you divide the watts of an appliance by the volts you get a measurement in amps (a) which represent the total current flowing through the appliance. Every electrical appliance sold must have a label stating the volts and amps (when safe, check the nearest appliance to you).

To give us a simple understanding of these three variables, let's think of volts as speed, watts as load and amps as a measurement of the both combined. If you are hit by an empty (unloaded) cardboard box travelling at a speed of 10 mph, you will not be as badly hurt as if you were hit by the same cardboard box also travelling at 10 mph, but full (loaded) with concrete.

The point to get is: The higher the wattage, the higher the amps and so the more dangerous an appliance is.

Any electrical appliance can cause severe injury or death.

A low energy light bulb might be just 20 watts, whereas a chop saw for example, will be in the range of 1800 to 2400 watts; a much more powerful tool with much more potential to kill.

As mentioned, to find out the amps of any appliance, just divide the watts by the volts. So the low energy light bulb is: 20 watts divided by 230 volts = 0.087amps.

Whereas the chop saw is: 2400 watts divided by 230 volts = 10.4 amps.

Modern power tools are designed to be as safe as possible and have all of their electrical parts well insulated with plastic. In addition, they will be 'earthed', which means if they do develop an electrical fault, the fuse in the plug will 'blow' cutting the current to the tool, rendering it safe.

If you are unlucky, have a weak heart or are wet, any electric shock can kill you, so perhaps the first and most important rule to remember is that electricity and water do not mix, so:

Never use a power tool in the wet or anywhere where water could get onto or into the tool or onto the user.

Make sure that the power tool is plugged in to an RCD (Residual Current Device) socket. This is a safety device that will instantly shut off electrical current to a tool if it detects some sort of malfunction.

In addition, to minimise the risk of electrical injury, before using a power tool make sure that you:

- **Never** use a tool for which you have **not been trained**
- **Check the plug** for loose wires poking out
- **Check the tool** for loose wires, cracks, splits or other damage
- **Check the lead** for cuts, scuffs or exposed wires or damp
- **Check any extension leads** for the above faults
- **Never trail the lead** near to any blades, heat sources, wet areas or sharp objects

Dust/fragments

Wood working activities generate a great deal of wood dust. We discuss below the risk of fire, but the biggest problem with dust is the risk to health from inhalation. The HSE (hse.gov.uk) has laid down maximum exposure limits for both hardwood and softwood dust of 5mg/m³ (over an 8 hour average). It is highly unlikely that you'll be exposed to such amounts in community wood recycling, but care must be taken to protect your health at all times and the following health problems are among the effects associated with exposure to wood dust:

- Skin disorders
- Obstructions in the nose
- Asthma and other breathing complaints
- Nasal cancer (very rare)
- Damage to eyes

Noise

Noise is part of everyday life and can't be avoided. But exposure to loud noise could permanently damage your hearing or leave you with ringing in the ears, called tinnitus.

In terms of risk to health, if you don't wear steel-toe boots, you might never actually drop anything on your foot, so you won't be injured. But with noise, it is different! If you are consistently exposed to noise above a certain level for a period of time, it is almost guaranteed that you will damage your hearing – however slightly; and damage to hearing is irreversible.

Noise is measured in decibels (db), and if noise in a workplace is consistently 85 db or more, hearing protection is required. Some examples of noise levels are:

Library	= 20–30 db
Quiet office	= 40–50 db
Primary school classroom	= 60–80 db
Power drill (drilling masonry)	= 80–100 db
Road drill	= 100–110 db
Jet taking off 25m away from you	= 140+ db

You can see that your hearing needs to be protected if you use anything louder than a power drill. The sanders, chop saws and planes all produce more sound than the drill. So if you are using them, you must be provided with suitable hearing protection.

Ear plugs offer a degree of protection but better are the headphone-type ear defenders that completely enclose the ear. Some tips on wearing hearing protection:

Earplugs

- Make sure they are clean and unbroken
- Clean your hands before inserting (to lower the risk of infection)
- Don't share earplugs

- Make sure they are properly inserted into the ear (squeeze them flat before insertion)

Ear defenders

- Clean them before use
- Don't use broken or damaged ear defenders
- Make sure they totally cover the ear
- Don't let glasses, hair or jewellery interfere with the seal around the ear
- Don't stretch the headband too much – keep it tight but comfortable



Fire

Wood is a flammable material and so community wood recycling presents a low but constant risk of fire. In terms of power tools, the risk is mainly through:

- Tools catching fire due to excessive use or malfunction
- Heat generated through friction from blades and sanding discs igniting dust

High concentrations of dust particles in the air, from high volumes of sanding, can explode if ignited and the introduction of a spark from a tool can be sufficient to cause it to catch fire. It can in turn cause secondary fires that might spread fast through the dry wood.

In addition to the risk of wood catching fire, oils, spirits and waxes are used that are combustible. Given sufficient heat, rags soaked in such stuff can spontaneously combust.

To reduce the risk of fire, be sure to:

- Check the electrical safety of tools (see above)
- Clear up dust regularly (vacuuming, not sweeping) and keep the workplace clean
- Replace the lids on cans/bottles of oil, wax or spirit immediately after use
- Do not leave rags soaked with oil, wax or spirits lying around – open them out and leave to dry away from the work area
- Never, ever smoke in the work area, or allow others to do so
- Let power tools cool down regularly during extended use

In the event of a fire make sure you know where the fire exits and assembly points are. Do not attempt to use the fire extinguishers unless you have been trained to use them. Evacuate the building immediately and go to the assembly point. For reference, the following extinguishers can be used on certain fires:

Fire Extinguisher panel colour	Contents	Uses
Clear	Water	Wood and other fires, but not oil or electrical fires.
Blue	Dry powder	For all fires – particularly good for oil fires.
Cream	Foam	Good for oil and other fires, but not for electrical fires.
Black	CO2	Can use on all fires, good for electrical fires and on clothing.

Breathing Care

To reduce the risk to health, a CE marked (European Union-approved) dust mask (also known as respiratory protective equipment or RPE) must be worn at all times when carrying out any sanding, planing or sawing. The basic 'nuisance' type dust masks do not provide reliable protection and should only be used for light-dust producing activities such as drilling holes. When wearing a mask make sure that:

- It fits properly and feels comfortable
- Both straps are in use and sufficiently tight
- The mask is not kept away from the face by glasses, jewellery or facial hair
- Change every day – or more often if high volumes of sanding are carried out
- Don't share masks or use one that is damaged or dirty

Floor-mounted wood working machinery can easily be equipped with dust extraction units that will remove most of the dust at the work point.

To help avoid skin irritations, wear long sleeves and after you have finished using power tools, wash hands, face, arms and neck with soap and water – especially after sanding.

Eye Care

In addition to the potential respiratory problems, wood dust and wood fragments that fly off during sanding, planing or sawing can cause significant damage to eyes and even blindness. At the very least, dust will irritate the eyes and impair vision. So to help prevent injury and discomfort:

- Always wear eye protection whilst doing work with any power tools

For light drilling, safety glasses are sufficient, but for any planing or sanding activities or work on the chop saw or bench saw it is recommended that protective goggles be worn. Before use, make sure they are clean and that the straps are adjusted to provide the most comfortable fit.

Large piles of dust are also a trip, slip and hygiene hazard, so keep the work area clean by clearing up as you go along.

Hand-arm vibration syndrome (HAVS)

This is a condition caused by the regular, continual or long-term use of hand-guided power tools, such as road breakers and lawnmowers or by holding materials being processed by machines, such as bench grinders.

Using power tools in such a way can lead to conditions like hand-arm vibration syndrome (HAVS) and carpal tunnel syndrome.

The symptoms include:

- Tingling or numbness in fingers
- Not being able to feel things properly
- Loss of strength in hands
- Fingers becoming white and painful on recovery, especially in the cold or wet



▲ HAVS—causing fingers to turn white and lose feeling

The symptoms can be painful and distressing and affect the ability to do everyday tasks (e.g. fastening buttons) because it can reduce grip strength and manual dexterity. Symptoms might appear after months or years – or not at all.

As the tools used in community wood recycling are relatively low-power they carry little risk. But continued, long-term use of even a small angle grinder might be enough to trigger the condition, so always follow some basic precautions:

- Ensure that you use modern, well-serviced tools in good condition
- Make sure cutting tools are kept sharp so that they remain efficient
- Always use the right tool for each job (so you can do the job more quickly)
- Reduce the amount of time you use a tool in one go, do other jobs in between
- Avoid gripping or forcing a tool or workpiece more than you have to
- Store tools so that they do not have very cold handles when next used
- Encourage good blood circulation in your hands and arms by keeping warm and dry (especially hands), so when necessary, wear gloves, hat and warm clothes.
- Massage and exercise your fingers during work breaks.
- If possible give up or cut down on smoking, because it reduces blood flow to the fingers.

The tools used in community wood recycling that carry the highest risk of HAVS are those with which we do the highest volume of work and include the hand-held grinder, sponge or belt sander and chop saw. Tools that are used occasionally, like the jigsaw, present minimal risk of HAVS.

Section 2—Some of the power tools we use

Extension leads

Extension leads can be considered ‘electrical tools’ and they carry health & safety risks that have to be identified and managed. The cable is only able to carry a certain amount of electricity before the risk of fire or electrical failure occurs. Like power tools, their carrying capacity is measured in amps.

If the tools you are using total 10 amps, you will need an extension lead that can safely carry that amount of power. As a rule of thumb, if an extension lead is rated at 13 amps (most are), it can carry (230 volts x 13 amps =) 2990 watts (enough to run a 2400w chop saw but not much left over!). Extension leads should always be completely unwound when in use. This is because as electricity travels through wires, it creates friction slowing the flow and generating heat. The loss of power might damage the tool or the lead might catch fire.

Extension leads should always be plugged into an RCD (residual current device). Some already have RCDs built in to them, so are safer.

Drill, cordless drill/driver

The cordless drill has now replaced the set of screwdrivers in most workers’ toolbox. They take the strain out of screwing- in long screws and enable us to drill holes without the need to be adjacent to a plug socket. They can both drive and remove screws and, although not as powerful as a mains-operated drill, these days are gutsy enough to drill holes in most materials. Being battery operated, they do not carry an electrical risk but screw bits can spin off and injure fingers and drill bits can snap in use, so care needs to be taken and safety glasses worn. Corded drills range from around 320w to 800w. Cordless drills are rated by their voltage; the greater the volts, the more powerful the tool. Popular sizes are 12v, 18v and 24v. Battery charge capacity is measured in amp-hours (AH); the greater the Ah, the longer the battery will last before needing to be recharged.

Chop saw

The power tool at the heart of community wood recycling is the chop saw (mitre saw). It is used frequently for cutting customers' wood orders to length or for making products. It can be used to cut mitres and other angled cuts and is indispensable for producing firewood quickly and safely.

They come in various sizes (measured by the blade size) of between 216mm and 305mm. Usually, the larger the blade, the more powerful the tool. To help ensure that they can cut through the toughest wood, chop saws are usually high-wattage; between 1400w and 2400w. The blades revolve at around 5000 revolutions (revs) per minute. Because they are bench-mounted and the blade is guarded they are relatively safe, with perhaps the biggest risk to health being from dust/fragments and noise. But life-threatening cuts can be sustained so they always need to be used with extreme care.

Sanders: belt, orbital, sponge

A cheap and highly effective way we add value to timber is to sand it. We use various kinds of sanding tools, depending on the type of item we are sanding and the finish required. If a very flat surface is needed, the belt sander is the tool of choice because it is much easier to keep it flat to the workpiece, whereas an orbital, disc or sponge wheel, can dig into the surface much more easily. On many products, this "rougher" finish is sought after as customers might like its more natural recycled look and feel. Sanders are generally safe tools, being relatively low wattage and as they have no blades, the worst they can do is give friction burns.

Grinder

Grinders are principally metal and ceramic cutting tools that can be used with a wood sanding disc for the aggressive removal of material. There are three sizes (based on disc size): 115mm, 125mm and 230mm. They are very powerful tools for their size – ranging from 600w to 2300w. The disc travels at more than 10,000 revs' a minute. Because of this power, they are more dangerous to use than some other power tools and need extra caution – especially when cutting/grinding metal, as they produce hot metal fragments that can burn and/or ignite nearby material.

Power planer

Hand-held planers are for the very fast removal of a few millimetres to smooth the surface of rough wood, often in readiness for sanding. They are powerful and dangerous tools – as the cutting blades are unguarded and revolve at around 10,000 revs per minute. In less than one second, they could take 166 slices of your finger off! They range between 320w and 810w; the higher the wattage, the greater the depth of cut – which is typically between 2mm and 4mm.

Jigsaw

Jigsaws are mainly used for cutting shapes in sheet material or other thin wood. They are dangerous because the blade is unguarded and sticks out quite a way below the tool. They are usually between 320w to 720w; the greater the power, the thicker the depth of cut. They can 'jump' if used incorrectly – causing injury to the user and damage to the tool and workpiece.

Saw bench (table saw)

The blade is mounted in a table with a flat, level surface and they are used for ripping down longer lengths of wood or sheet materials. They are heavy, so they are stable and should be relatively safe to use. A push stick must be used to push the wood through the blade once the user is within touching distance of the blade. When cutting long lengths, they require two people to operate safely. There are hundreds of different types on the market - ranging from portable site saws of around 400mm square,

to large, floor-mounted saws capable of ripping very large section timber. They can be between 800w to 4000w (4kw), and beyond, and can cost from £60 to £6000.

Planer-thicknesser

These are usually bench or floor-mounted tools that (like a power planer) remove the rough surface of timber. But they also can get them 'square' and ready for joining or other processes. Because they are bench or floor mounted, they are much more powerful than hand-held models and long lengths of wood can be machined quickly with great accuracy. They range from 1300w upwards and cost from £180 to £5000. The big risk to health is from getting fingers on the blades that revolve at high speed.

Hand-held circular saw ('Skil' saw)

These are portable and versatile tools that can be used to rip down long lengths of timber, cross-cut or cut up sheet materials quickly and accurately. They are generally between 1050w and 1700w and come in sizes (based on blade size) of between 140mm and 235mm; the larger the blade, the greater the depth of cut. Cordless circular saws are available, getting more powerful and are much safer and convenient.

Router

Routers are used to put an angled or decorative edge to a piece of wood or for the removal of sections that cannot be taken away with a power planer or a drill – such as mortise joints. They are potentially very dangerous and have an exposed head that rotates at up to 24000 revs per minute. They are between 800w and 1500w. When in use, the stability of both the router and workpiece is paramount for accurate cutting and the safety of the operator. A difficult tool that should not be used by anyone but experienced woodworkers.

Reciprocating saw

These saws have a relatively thin blade mounted in the front that travels back and forward (it reciprocates) at around 2000–3000 times per minute. They are popular with the window fitting industry, because the thin blades can get between the frames and wall and cut through metal as well as wood. They are relatively safe but the unguarded blades can 'bounce' back if used incorrectly. They range from 800 to 1200 watts.

Section 3—Trainee exercises and questions

There are questions for you to answer on the following pages.

Remember: don't hesitate to ask for help from your Trainer.

1. Amongst other things, Regulation 4 of PUWER 98 requires that hand held power tools are:	1.
	2.
2. State the 2 Golden Rules of power tool usage:	1.
	2.
3. How is the power consumption of an electrical appliance measured?	
4. In general what tool will be the highest wattage? (please circle one)	Chop saw Cordless drill Hand-held planer
5. If a tool is 10 amps, how many watts is it? (please circle one)	230w 2300w 1200w 800w
6. What is the cause of hand-arm vibration syndrome (HAVS)?	
7. How can the risk of HAVS be reduced?	
8. At what decibel level must hearing protection measures be introduced?	
9. Please match the decibel level with the activity (insert the correct number, 1 to 5):	1. 40–50db 2. 60–80db 3. 80–100db 4. 100–110db 5. 140+db Quiet office _____ Power drill _____ Road drill _____ Jet taking off at 25m _____
10. What is the best way of protecting your hearing whilst working with tools?	
11. State 4 ways of reducing the risk of fire.	1. 2. 3. 4.
12. What is the content of an extinguisher with a clear panel?	
13. What 2 types of fire must not be tackled with a fire extinguisher containing water?	1. 2.
14. What health problems can be associated with wood dust?	
15. What kind of dust mask should be used?	

16. How can you protect your eyes from potential injury/discomfort?	
17. Why do extension leads need to be unwound before use?	
18. What 4 items of PPE would you wear when using a chop saw?	1.
	2.
	3.
	4.
19. State 3 things you would do before using a power tool	1.
	2.
	3.
20. What power tool should you never use?	

Office use only		Number of correct answers required to pass Module 4: 12			
Passed:		Retake:		Date:	
Trainer's signature:					