National Certificate in Building, Construction and Allied Trades Skills (BCATS)

Teacher Information & Resources

Demonstrate knowledge of and use specified fixed machinery in the construction of BCATS projects

Unit Standard – 24351

Level 2, Credit 6

Teaching and assessment tips

Intent – The intent of the unit standard is that the learner has a good knowledge of the fixed machinery in the range and the ability to:

- describe the safe set up of fixed machines
- safely set up and correctly use 4 fixed machines,
- describe the maintenance of fixed machinery.

Unit standard interpretation

The fixed machines included in this unit standard are: thicknesser (panel planer), band saw, bench grinder, drill press, horizontal borer, compound mitre saw, wood lathe, surface planer (buzzer), bench saw.

Health and Safety note for schools:

> *For the purpose of this unit standard, the knowledge of the surface planer (buzzer), thicknesser, and bench saw are intended to be theoretical only. Candidates who are assessed against this unit standard in a school may set up these machines ready for operation, but are not to use these machines unless the individual school has the appropriate documented permission to do so as specified in Ministry of Education: Safety and Technology Education: A Guidance Manual for New Zealand Schools; Learning Media, Ministry of Education 2014.*

Opportunities to learn about fixed machinery will arise throughout the year's project work. Your specific learning context and planned projects, however, will largely determine how you approach the topic. This unit standard is best assessed over time. We would encourage you to use the practical projects that your student is completing to gather evidence of the use and maintenance of fixed machinery.

An assessment record sheet has been provided for both the learner and yourself, as assessor, to record this evidence. This sheet is in Microsoft Word format so that you can adapt it to suit your programme and to give the students more room to write. Note that the learner has to correctly set up and operate 4 items of fixed machinery over 2 construction projects.

The topic of fixed machinery could be introduced to the learners in a generic way using a range of resources, including the BConstructive resource on the website. The activity sheets in this resource are useful exercises to help prepare students for assessment.

Assessment

Assessment of this unit standard consists of:

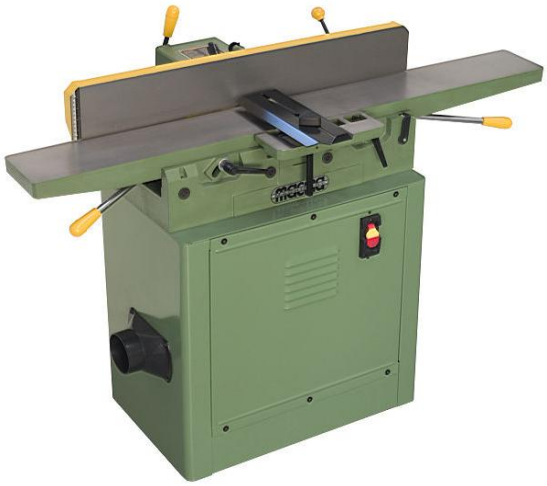
- Completion of the worksheet and
- Completing 2 construction projects
- Student entries on the assessment record sheet, and
- Verification (by you) that the student set up and used the fixed machinery.

Worksheet US 24351

Student Name:

1. Answer the following questions for the machine shown in the picture.

What is it called and what is it used for?



When should it not be used?

Describe how to set up and use the machine for edging.

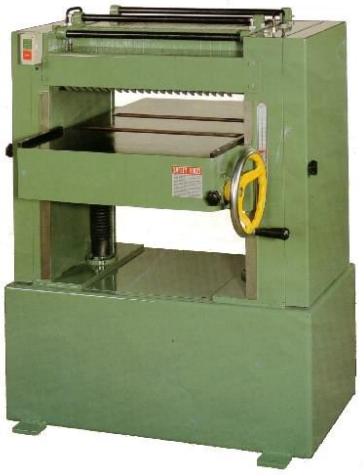
What are 3 important points for using the machine safely?

What PPE should you wear when operating it?

How do you maintain the cutter head?

What regular maintenance does the machine need?

2. Answer the following questions for the machine shown in the picture.



What is it called and what is it used for?

When should it not be used?

Describe how to set up and use the machine.

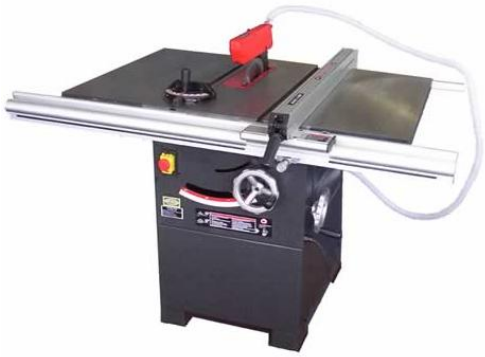
What are 3 important points for using the machine safely?

What PPE should you wear when operating it?

How do you maintain the cutter head?

What regular maintenance does the machine need?

3. Answer the following questions for the machine shown in the picture.



What is it called and what is it used for?

When should it not be used?

Describe how to set up and use the machine for grooving.

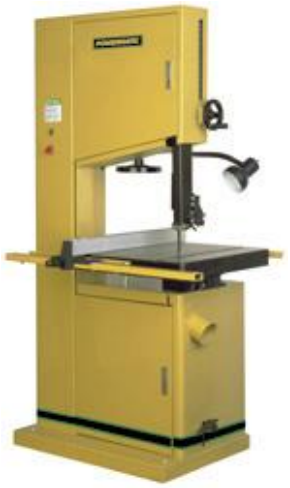
What are 3 important points for using the machine safely?

What PPE should you wear when operating it?

How do you maintain the blade?

What regular maintenance does the machine need?

4. Answer the following questions for the machine shown in the picture.



What is it called and what is it used for?

When should it not be used?

Describe how to set up and use the machine for ripping or re-sawing.

What are 3 important points for using the machine safely?

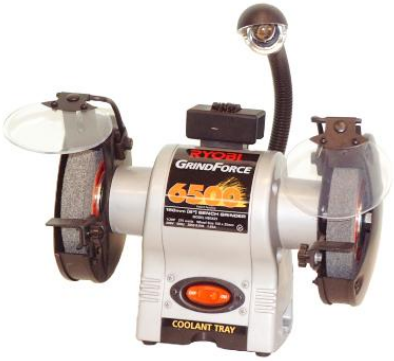
What PPE should you wear when operating it?

How do you maintain the blade?

What regular maintenance does the machine need?

5. Answer the following questions for the machine shown in the picture.

What is it called and what is it used for?



When should it not be used?

Describe how to set up and use the machine.

What are 3 important points for using the machine safely?

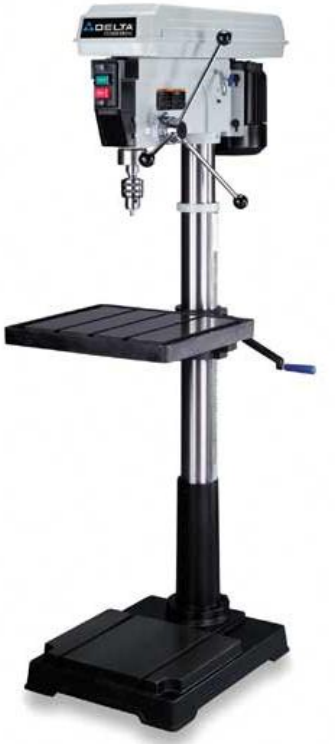
What PPE should you wear when operating it?

How do you maintain the grinder wheel?

What regular maintenance does the machine need?

6. Answer the following questions for the machine shown in the picture.

What is it called and what is it used for?



When should it not be used?

Describe how to set up and prepare material for drilling.

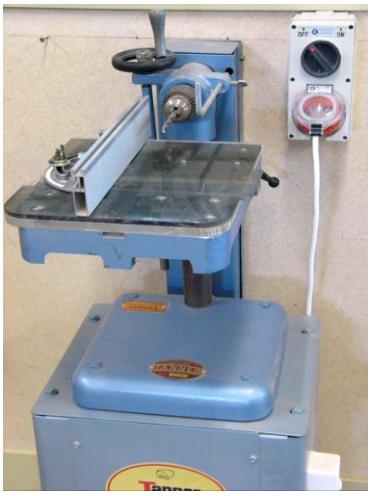
What are 3 important points for using the machine safely?

What PPE should you wear when operating it?

How do you maintain the bits?

7. Answer the following questions for the machine shown in the picture.

What is it called and what is it used for?



When should it not be used?

Describe how to set up and use the machine.

What are 3 important points for using the machine safely?

What PPE should you wear when operating it?

How do you maintain the bits?

What regular maintenance does the machine need?

8. Answer the following questions for the machine shown in the picture.

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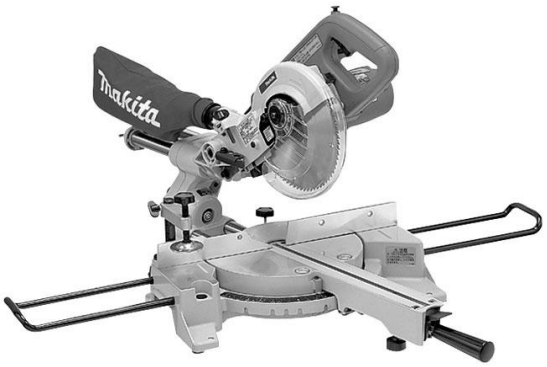

When should it not be used?

Describe how to set up and use this saw.

What are 3 important points for using the machine safely?

What PPE should you wear when operating it?

How do you maintain the blade?

What regular maintenance does the machine need?

9. Answer the following questions for the machine shown in the picture.

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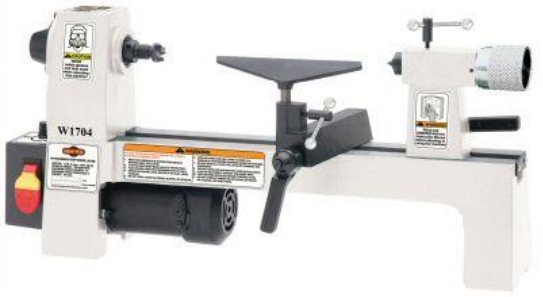


What are 3 important points for using the machine safely?

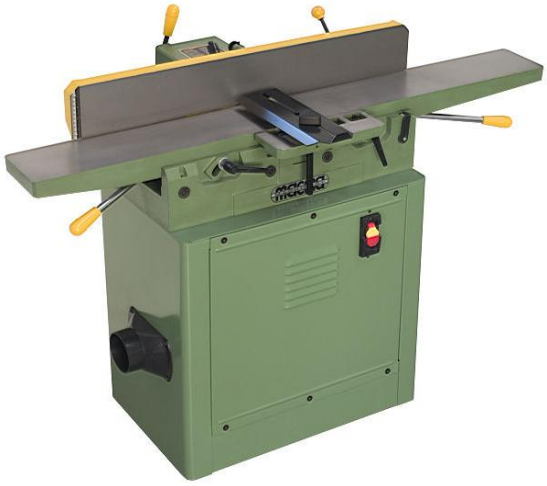
What PPE should you wear when operating it?

How do you maintain the gouges?

What regular maintenance does the machine need?

Worksheet Model Answers

1. Answer the following questions for the machine shown in the picture.



What is it called and what is it used for?

Surface planer or buzzer. Performs the tasks of dressing, squaring and straightening timber

When should it not be used?

Machining short lengths of timber.

Without the bridge guard.

Without the appropriate training.

Without PPE.

Describe how to set up and use the machine for edging.

Set cover guard allowing clearance for the timber to pass between guard and fence.

Keep the flat face of the board firmly against the fence.

Keeping your hands well clear of the cutters, push the board over the cutter head.

What are 3 important points for using the machine safely?

Ensure that all guards are used correctly and adjusted when necessary.

Wear the appropriate Personal Protective Equipment.

Keep your hands clear of the cutter heads.

Do not plane short lengths of timber, less than 300mm.

Do not plane thin timber.

Do not make deep cuts.

Ensure that the timber is free from nails, screws, stones and other hard materials.

Always use a push stick.

What PPE should you wear when operating it?

Hearing protection.

Safety glasses or full-face shield.

Dust mask.

Heavy duty footwear.

How do you maintain the cutter head?

Regular inspections to check that the blades are sharp and secure.

Replace blunt or damaged blades.

What regular maintenance does the machine need?

Clean and lightly oil after each use..

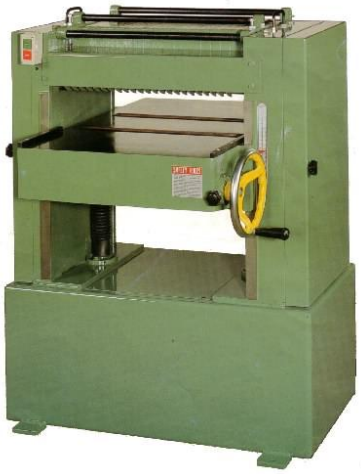
Oil adjusting screws and table slides.

Apply grease to bearings if required.

Check operation of the on/off buttons.

Inspect electric cords and plugs for damage.

2. Answer the following questions for the machine shown in the picture.



What is it called and what is it used for?

Thicknesser (also known as a panel planer). Is used to reduce the thickness of timber and to plane wide panels to a uniform thickness.

When should it not be used?

Machining short lengths of timber.

Without the appropriate training.

Without PPE

Describe how to set up and use the machine.

Set thicknesser to produce a fine cut, (1 - 2 mm less than the thickest portion of the timber).

Avoid thicker cuts that will place undue strain on the motor.

Feed the timber into the machine with the grain facing back towards the operator.

What are 3 important points for using the machine safely?

Wear the appropriate Personal Protective Equipment.

Always keep your hands clear of the in-feed rollers.

Never wear gloves.

Keep your hands to the side of the board - never on top.

Stand to one side of the timber being planed.

Do not feed into the machine timber shorter than the minimum length recommended by the machine's manufacturer.

What PPE should you wear when operating it?

Hearing protection.

Safety glasses or full-face shield.

Dust mask.

Heavy duty footwear.

How do you maintain the cutter head?

Regular inspections to check that the blades are sharp and secure.

Replace blunt or damaged blades.

What regular maintenance does the machine need?

Clean and lightly oil after each use.

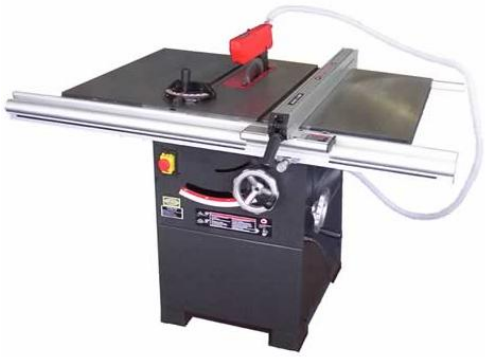
Oil adjusting screws and table slides.

Apply grease to bearings if required.

Check operation of the on/off buttons.

Inspect electric cords and plugs for damage.

3. Answer the following questions for the machine shown in the picture.



What is it called and what is it used for?

Bench saw. It is used to make accurate straight cuts in various materials. It can be used for ripping and crosscutting, or cutting mitres, bevels, chamfers, trenches, grooves, tenons and compound cuts.

When should it not be used?

Machining short lengths of timber.

Without the hood and belt guards.

Without the appropriate training.

Without PPE.

Describe how to set up and use the machine for grooving.

Remove the hood guard from the riving knife.

Lower or remove the riving knife.

Lower the blade to the depth of the groove.

Set the ripping fence at the required position.

Check the size of the groove for accuracy using a piece of scrap timber.

Cut the groove.

What are 3 important points for using the machine safely?

Make sure that all guards are set up in the correct manner.

Make sure that the fence is parallel to the blade and correctly secured in position.

Watch your fingers. Keep them away from the blade.

Keep the saw bench clear of sawdust and off-cuts.

Never attempt free hand cuts on the circular saw.

Make sure that there are no nails, screws or other hard materials in the material to be cut.

Always stand to one side of the saw blade - Never stand in front of it.

Never clear scraps of timber off the saw table with your fingers, use a stick.

What PPE should you wear when operating it?

Hearing protection.

Safety glasses or full-face shield.

Dust mask.

Heavy duty footwear

How do you maintain the blade?

Keep blade sharp and free from rust.

Lightly oil after use.

What regular maintenance does the machine need?

Clean and lightly oil after each use.

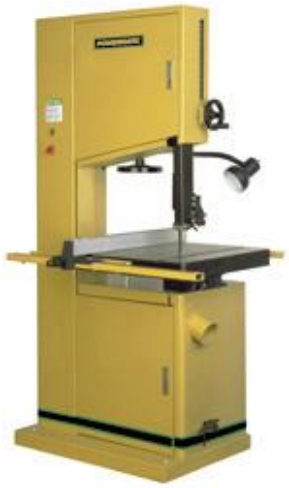
Oil adjusting screws and table slides.

Apply grease to bearings if required.

Check operation of the on/off buttons.

Inspect electric cords and plugs for damage.

4. Answer the following questions for the machine shown in the picture.
What is it called and what is it used for?



Band saw. Used for a wide range of cutting operations including straight or curved cuts in timber, plywood, hardboard, plastics or other similar materials. Band saws can cut timber of considerable thicknesses with minimal waste.

When should it not be used?

Without the blade side guard.

Without the appropriate training.

Without PPE.

Describe how to set up and use the machine for ripping or re-sawing.

Clean the machine of all wood scraps and sawdust.

Check that the blade is suitable for the job.

Ensure that all guards are in place.

Check that the blade is tensioned correctly.

Use the ripping fence as a guide.

To maintain a straight cut, use a wide blade, with large teeth, that is in perfect order and tracking properly over the wheels.

Be aware of the drift when ripping, as few band saws cut perfectly straight.

What are 3 important points for using the machine safely?

Clear the floor area around the band saw of all obstructions.

Ensure that all guards are in position and that guides are correctly set up.

Check that the blade is suitable for the job.

Check that the blade is tensioned correctly and the guides are correctly set up.

Wear your personal protective equipment.

Do not wear loose clothing or rings when using the saw.

Keep fingers clear of line of cut and use a push stick whenever possible.

Do not force the timber into the blade.

Do not twist the blade by forcing the saw to cut tight curves.

Wait until the blade reaches operational speed before starting the cut.

Do not cut timber when the machine is slowing down or stopping.

What PPE should you wear when operating it?

Hearing protection.

Safety glasses or full-face shield.

Dust mask.

Heavy duty footwear.

How do you maintain the blade

Keep clean.

Maintain the correct tension.

Ensure that all the guides and thrust wheel are correctly adjusted.

Sharpen when dull or blunt.

What regular maintenance does the machine need?

Clean and lightly oil after each use.

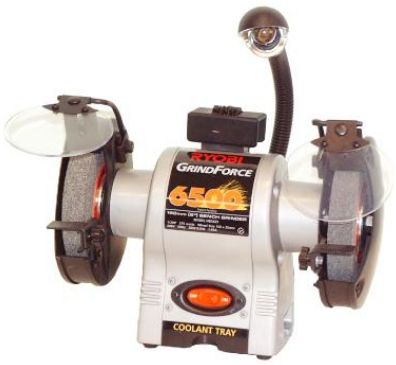
Oil adjusting screws and table slides.

Apply grease to bearings if required.

Check operation of the on/off buttons.

Inspect electrical cords and plugs for damage.

5. Answer the following questions for the machine shown in the picture.
What is it called and what is it used for?



Bench grinder. Is used for grinding steel cutting tools, e.g. to repair a cutting edge that has been damaged.

When should it not be used?

Without the appropriate training.

Without PPE.

When starting up or slowing down.

Describe how to set up and use the machine.

Check that it is firmly fixed to the bench.

Check that all guards are in place.

Check that the transparent safety shields are in place.

Set the adjustable rest to within 2mm of the wheel.

Stand to one side when first starting the machine until it has reached its full operating speed.

Do not use once the power has been switched off.

What are 3 important points for using the machine safely?

Always wear eye protection when working on or near a grinder.

Always allow the bench grinder to reach full operating speed before starting the grinding process.

Always use this machine as its manufacturer intended - with the power turned on.

Do not wear gloves, loose clothing or items that could catch on the wheel and cause injury to the operator.

Before starting work, check that the grinder is firmly fixed to the bench, there are no chips or cracks in the wheels and they are securely attached to the grinder.

Ensure that all guards and guides are in place and the transparent safety shield is set in the correct position.

Grind only steel. Other materials will clog up the wheel potentially causing it to explode.

Do not use the side of the wheel. It could shatter.

Keep the adjustable work rest within 2mm of the wheel.

Make a habit of standing to one side of the grinder when starting the machine and until it has reached its full operating speed.

What PPE should you wear when operating it?

Safety glasses or full-face shield.

Hearing protection.

Heavy duty footwear.

Leather apron.

How do you maintain the grinder wheel?

Regularly check for chips and cracks. Replace if damaged.

Use a wheel dresser if the wheel becomes clogged or smooth.

What regular maintenance does the machine need?

Check operation of the on/off buttons.

Inspect electric cords and plugs for damage.

6. Answer the following questions for the machine shown in the picture.
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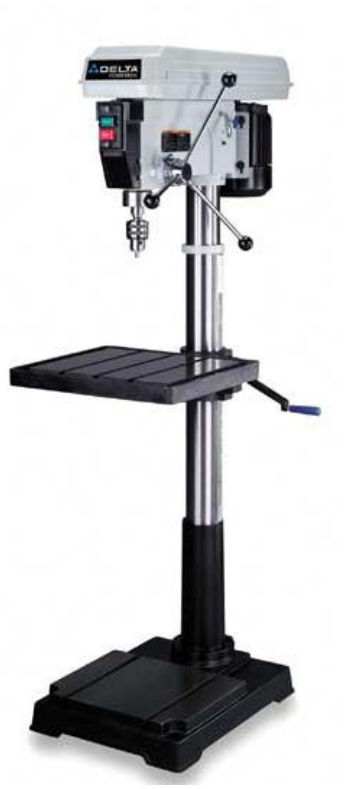


Vertical drill press. Ts used to accurately drill holes.

When should it not be used?

Without the appropriate training.

Without PPE.

When starting up or slowing down.

Describe how to set up and prepare material for drilling.

Always locate the hole to be drilled directly under the bit.

Place a piece of waste wood under the piece being bored to prevent the timber breaking out at the back.

The depth stop can be set to regulate the depth of the hole.

Smaller objects and materials should be clamped to a stable platform.

Select and use the correct type of drill for the task.

What are 3 important points for using the machine safely?

Always wear eye protection when operating the machine.

If they are fitted, ensure that all guards are in place and that no pulley belts are exposed.

Isolate the machine from the power supply before making any adjustments.

Never try to stop the machine by grabbing the spinning chuck.

On deep holes, back out often to clean out the hole.

Never use a hand auger bit in a drill press - use round shank drill bits.

Hold small pieces of work with a clamp.

Make sure the bit is tight in the chuck.

Always remove the chuck key before switching the drill on.

What PPE should you wear when operating it?

Wear safety glasses or full face shield.

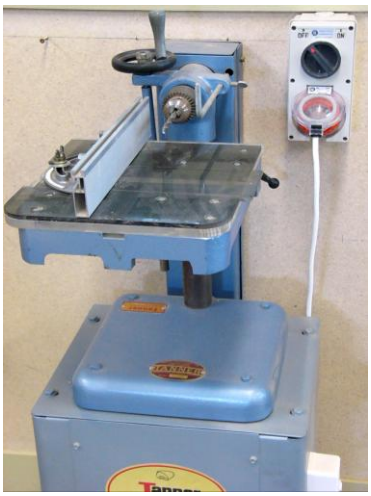
Do not wear loose clothing.

How do you maintain the bits?

Keep sharp and free from rust.

Store separately in a rack or container.

7. Answer the following questions for the machine shown in the picture.
What is it called and what is it used for?



Horizontal borer. It is used for boring holes for dowelled joints, in carcase construction, widening joints, rails and stiles of doors and general framed joints.

When should it not be used?

Without the appropriate training.

Without PPE.

When starting up or slowing down.

Describe how to set up and use the machine.

Clamp small material firmly to the table.

Make sure the drill bit is held firmly in the chuck and the chuck key is removed.

Chuck guards if fitted are in place.

What are 3 important points for using the machine safely?

Always wear eye protection when operating the machine.

If they are fitted, ensure that all guards are in place and that no pulley belts are exposed.

Isolate the machine from the power supply before making any adjustments.

Never try to stop the machine by grabbing the spinning chuck.

On deep holes, back out often to clean out the hole.

Never use a hand auger bit in a drill press - use round shank drill bits.

Hold small pieces of work with a clamp.

Make sure the bit is tight in the chuck.

Always remove the chuck key before switching the machine on.

Make sure that long hair is tied back or secured under a hairnet.

What PPE should you wear when operating it?

Wear safety glasses or full face shield.

Do not wear loose clothing.

Tie hair back or wear a hairnet.

How do you maintain the bits?

Keep sharp and free from rust.

Store separately in a rack or container.

What regular maintenance does the machine need?

Clean and lightly oil after each use.

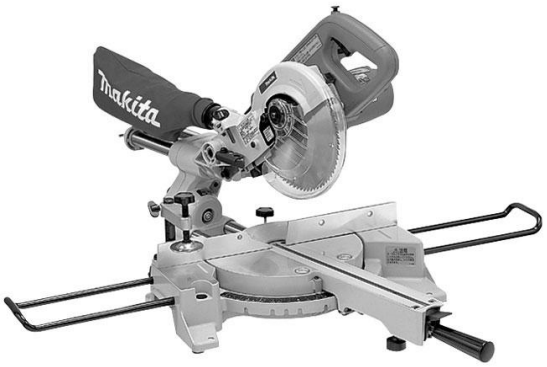
Oil adjusting screws and table slides.

Apply grease to bearings if required.

Check operation of the on/off buttons.

Inspect electrical cords and plugs for damage.

8. Answer the following questions for the machine shown in the picture.
What is it called and what is it used for?



Mitre saw, or compound mitre saw. They are used for general crosscutting work and some models have the ability to cut angles in two planes making it an idea saw for cutting operations and finishing work.

When should it not be used?

Without the appropriate training.

Without PPE.

When the blade is starting up or slowing down.

Describe how to set up and use the saw.

Make sure that the saw is securely fixed in the correct position.

Remove chips and pieces of off-cut from the table top before setting up the saw.

Secure the work in position.

Switch on the saw, and when the blade has attained full speed, lower it onto the work.

When you finish the cut, release the trigger and wait for the blade to stop spinning. This will protect the cut surface from being caught by the saw teeth.

What are 3 important points for using the machine safely?

Clean work area.

No loose clothing.

PPE is used.

Timber is free of nails, knots etc.

Keep hands away from the path of the blade.

Operate in a well lit area.

What PPE should you wear when operating it?

Safety glasses or full-face shield.

Hearing protection.

Dust mask.

Heavy duty footwear.

How do you maintain the blade?

Keep blade sharp and free from rust.

Replace blunt blades.

Lightly oil after use.

What regular maintenance does the machine need?

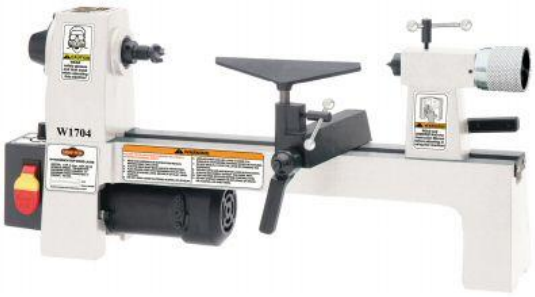
Clean and lightly oil after each use.

Oil adjusting screws and table slides.

Check operation of the on/off buttons.

Inspect electric cords and plugs for damage.

9. Answer the following questions for the machine shown in the picture.
What is it called and what is it used for?



Wood lathe. Used for spindle and faceplate turning.

What are 3 important points for using the machine safely?

Inspect turning tools for split handles' loose blades and blunt or chipped cutting edges.

Never wear ties, rings, long hair or loose clothing when using a lathe.

Isolate the machine from the power while setting it up.

Clear the area around the lathe of hazards; e.g. power leads, timber off-cuts, excessive build-up of shavings.

Maintain adequate ventilation around the work area.

Turn on dust extraction fans to remove dust and waste.

Only use materials that are straight grained, free from splits, cracks, knots and defects.

Describe how to set up and use the machine

Select the correct speed for the work to be turned.

Ensure the work is fixed securely to the face plate or between centres.

Rotate the work slowly to ensure that it clears the lathe bed and the tool rest.

As the timber is removed, regularly adjust the position of the tool rest.

Use only the specially designed gouges. They are fitted with extra long handles designed to counteract the pull of the revolving timber.

Return tools to the tool tray.

What PPE should you wear when operating it?

Hearing protection.

Safety glasses or full-face shield.

Dust mask.

Heavy duty footwear.

How do you maintain the gouges?

Regularly inspect handles for splits.

Regularly check for loose blades and blunt or chipped cutting edges.

Keep sharp and free of rust.

Clean and lightly oil after each use.

What regular maintenance does the machine need?

Clean and lightly oil bed after each use.

Apply grease to bearings if required.

Check operation of the on/off buttons.

Inspect electrical cords and plugs for damage.

Examples of oral questions and answers

1. What general safety precautions should be observed when operating wood working machines?

Keep the machine well maintained and in good working order.

Blades and cutters are sharp.

Correctly set up and use all safety guards.

Maintain a clean and tidy working environment.

Do not leave machine running if unattended.

Isolate machine from power source when setting up or adjusting

2. What is the purpose of the riving knife on a circular saw bench

Prevents the timber from binding on the saw blade when ripping.

Helps to prevent kickback.

Provides support for the hood guard.

3. Identify three hazards which can be directly related to circular saws.

Injury from the rotating blade.

Timber kickback.

Flying particles.

4. What safety precautions should be observed when operating a thicknesser?

Wear the appropriate PPE.

Check that all timber is clean and free from hard particles such as stones or nails before machining.

Do not look directly into the machine.

Stand to the side of the work when feeding in to the machine.

Do not wear gloves.

Do not place your hands on top of the timber when feeding into the machine.

5. Why should you never wear gloves when using machinery with rotating components such as blades or rollers?

The gloves may become snagged in the equipment and drag your hand into the machine.

6. Identify three operations that can be carried out using the buzzer.

Surfacing or flattening.

Edging.

Bevelling.

Rebating.

Tapering.

7. Identify two common causes of band saw blade breakages.

Using blades that have become blunt or dull places greater stress on the blade.

Cutting too sharp a curve or forcing the cut.

Feeding too fast.

Backing out of a cut.

Upper guide set too high above the timber being cut.

Incorrect tensioning of the blade.

Incorrectly adjusted side guides and thrust wheel..

8. What does a clicking noise as the band saw blade rotates indicate?

The blade is cracked and is about to break.

Assessment Schedule

US 24351 Demonstrate knowledge of and use specified fixed machinery in the construction of BCATS projects (Level 2, Credit 6)

Outcome 1	Demonstrate knowledge of the setting up and operation of fixed machinery. Range: thicknesser (panel planer), band saw, bench grinder, drill press, horizontal borer, compound mitre saw, wood lathe, surface planer (buzzer), bench saw.	**Assessment evidence and judgement**
ER 1.1	The machine's purpose, advantages and limitations are identified and described in terms of the manufacturer's instructions for use.	Evidence gathered from the worksheet Q1- Q9 showing; • Fixed machinery's purpose, advantages and disadvantages. • Accurate description of the correct set up and safe guarding of the machine. • Accurate description of the safe operation of the machine. • Correct use of PPE when using fixed machines. Could include eye protection, hearing protection, footwear, respiratory protection.
ER 1.2	The correct set up and safe guarding of the machine are described.	
ER 1.3	The safe operation of the machine is described.	
ER 1.4	Items of personal protective equipment for use with fixed machines are identified and described.	
Outcome 2	Demonstrate procedures for the setting up of fixed machines. Range: four of – thicknesser (panel planer), band saw, bench grinder, drill press, horizontal borer, compound mitre saw, wood lathe, surface planer (buzzer), bench saw.	**Assessment evidence and judgement**
ER 2.1	Machines are isolated from power supply throughout the setup procedures.	Evidence gathered from the assessment record sheet showing; • Power supply is isolated during the set up procedures of fixed machines.
ER 2.2	Machines are set up in accordance with job requirements, supervisor's instructions and workplace practice.	• Evidence gathered from the assessment record sheet showing machines are set up correctly.
Outcome 3	Demonstrate the correct use of fixed machines for the construction of BCATS projects. Range: four of - thicknesser (panel planer), band saw, bench grinder, drill press, horizontal borer, compound mitre saw, wood lathe, surface planer (buzzer), bench saw.	**Assessment evidence and judgement**
ER 3.1	Machines and personal protective equipment are used in accordance with supervisor's instructions and workplace practice.	• Evidence gathered from the assessment record sheet showing correct PPE is used.
ER 3.2	The machined material is in accordance with job specifications.	Evidence gathered from the assessment record sheet showing; • Machined material is as the job requirements (verified evidence required).
ER 3.3	Machines and work area are cleaned and cleared after use in accordance with workplace practice.	Evidence gathered from the assessment record sheet showing; • Machines and work area were cleaned after use.
Outcome 4	Demonstrate knowledge of maintenance requirements for fixed machines. Range: thicknesser (panel planer), band saw, bench grinder, drill press, horizontal borer, compound mitre saw, wood lathe, surface planer (buzzer), bench saw.	**Assessment evidence and judgement**
ER 4.1	Maintenance requirements for cutting edges, saw teeth or grinder wheels are described in accordance with workplace practice.	Evidence gathered from the worksheet Q1 - Q9 showing; • Correct maintenance requirements for cutting edges, saw teeth or grinder wheels. • Routine maintenance requirements.
ER 4.2	Routine maintenance requirements of fixed machinery are described in accordance with manufacturers' instructions and workplace practice.	