

RIIMPO319E - Conduct backhoe/loader operations Learner Guide



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1.1 Introduction

This course is based on the unit of competency **RIIMPO319E Conduct Backhoe/Loader Operations.**

You will learn about:

- ◆ Planning and preparing for operations.
- ◆ Conducting pre-operational checks.
- ◆ Operating the backhoe/loader:
 - ◇ Lifting, carrying and placing materials.
 - ◇ Selecting, fitting and removing attachments for the backhoe/loader.
- ◆ Relocating the backhoe/loader from site to site.
- ◆ Carrying out machine operator maintenance.
- ◆ Cleaning up.



1.1.1 What is a Backhoe/Loader?

A backhoe/loader is a wheeled, self-propelled machine with a front-mounted bucket and rear-mounted backhoe/loader attachment.



The backhoe/loader loads and pushes materials. The backhoe/loader attachment digs into the ground to excavate materials.

When the bucket lifts or swings, it moves the materials toward the machine and then into the discharge area.

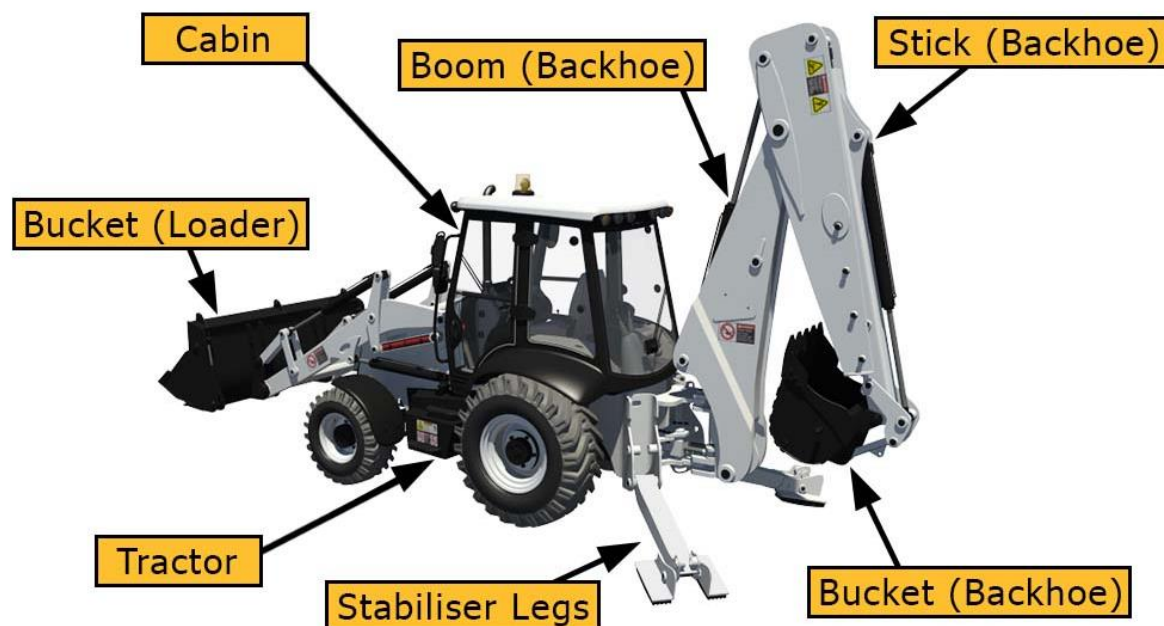
The machine should be stationary while the backhoe/loader attachment is being used.

The backhoe/loader attachment adds weight and length to the machine and this needs to be accounted for when moving it.

The attachment also adds crush, pin or pivot points. It is necessary to be aware of these points when operating the machine.

1.1.2 Backhoe/Loader Components

The following diagram and table outline the basic components of a backhoe/loader.



Component	Description
Bucket (Backhoe)	Hand section of the backhoe. The bucket does the digging and moving of material.
Stick (Backhoe)	Forearm section of the backhoe.
Boom (Backhoe)	Upper arm section of the backhoe. It is angled upwards so that digging is made easier with obstacles in the way.
Stabiliser Legs	Keeps the backhoe/loader stable while digging.
Cabin	Where the operator sits. The operator can face towards the loader or towards the backhoe. Each has separate controls to operate the attachments.
Tractor	Contains the engine of the machine.
Bucket (Loader)	Bucket at the front of the machine that loads, excavates, levels or pushes materials.

1.1.3 Backhoe/Loader Tasks

Backhoe/loaders are very functional machines capable of performing in a variety of tasks. These include:

Task	Description
Backfilling	Filling in holes.
Trench Excavation	Removing materials from designated areas in the trench formation.
Landscaping	Mixing of materials, stripping or spreading of topsoil or other materials such as gravels, also scrub clearing, ripping and cutting surfaces, compacting of surfaces.
Loading Plant	Loading materials onto other plant items, such as dump trucks, wagons, hoppers, chutes and any other cartage vehicle.
Lifting Materials	Transporting materials from one area to another.
Rock Breaking	Breaking rock and other demolition tasks.
Cutting and Boxing	◆ Cutting or removing material above a required level, i.e. cutting down to create a floor or design level. ◆ Boxing is the technique of removing materials below a level and may involve trenching, or removing sections of pavement in a "box" type shape to a desired level. ◆ Prior to both cutting and boxing, the area is usually ripped to loosen the materials. This makes the task easier to perform.
Battering and Benching	◆ Batters are the slopes adjacent to constructed works (cuttings or embankments). ◆ Benches are steps that are dug into the materials to allow safe working on slopes. ◆ Both battering and benching take practice to achieve the required tolerances and shapes. It is necessary to know the limitations of the machine. Check site procedures and talk to experienced operators before attempting to cut or trim batters.

1.2 Site Policies and Procedures



You must follow all safety rules and instructions when performing any work. If you are not sure about what you should do, ask your boss or supervisor. They will tell you what you need to do and how to do it in a safe way.

Before starting your work you need to make sure you have access to all operations documentation for the job. This will help you to do your work in the safest way and make sure all work is compliant.

Operations documentation includes:

Site Details	The information and safety requirements of the workplace environment (where you will be working).
Hazard Details	Any hazards in the work area or related to the work. This could also include instructions on how to handle dangerous or hazardous materials.
Task Details	Instructions of what the work is or what you will be doing (this can include diagrams or plans). Also instructions on how to safely do the job.
Faulty Equipment Procedures	Isolation procedures to follow or forms to fill out.
Signage	Site signage tells you what equipment you need to have, or areas that are not safe to be in.
Emergency Procedures	Instructions on what to do in emergency situations, for example if there is a fire, accident or emergency where evacuation or first aid is needed.
Equipment and Work Instructions	Details of how to operate plant and equipment and the sequence of work to be done.

Your worksite will also have instructions for working safely including:

- ◆ Emergency procedures, including using fire fighting equipment, first aid and evacuation.
- ◆ Handling hazardous materials.
- ◆ Safe operating procedures.
- ◆ Personal protective clothing and equipment.
- ◆ Safe use of tools and equipment.



1.3 Work Instructions

You need to be clear about what work you will be doing. Make sure you have everything about the job written down before you start.

This includes what you will be doing, how you will be doing it and what equipment you will be using.

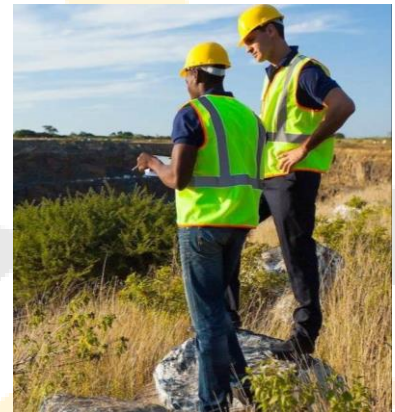
Make sure you have all of the details about where you will be working. For example:



- ◆ **The Site** – Is there clear access for all equipment? Are there buildings, structures, facilities or trees in the way? What are the ground conditions like? Is there a safe place for the materials to be moved to?
- ◆ **The Weather** – Is there wind, rain or other bad weather? Is it too dark?
- ◆ **Facilities and Services** – Are there power lines or other overhead or underground services to think about?
- ◆ **Traffic** – Are there people, vehicles or other equipment in the area that you need to think about? Do you need to get them moved out of the area? Do you need to set up barriers or signs?
- ◆ **Hazards** – Are there dangerous materials to work around or think about? Will you be working close to power lines or other people?

You also need to make sure you have all of the details about the kind of work you will be doing:

- ◆ **The Task** – What load is being moved? How much is there? How big is it? How much does it weigh? Does it need any special lifting equipment?
- ◆ **Plant** – What type of plant will be used? How big is it? How much room does it need?
- ◆ **Attachments** – What equipment or attachments will you need to shift or handle the load safely? Is the equipment available?
- ◆ **Communications** – How are you going to communicate with other workers?
- ◆ **Procedures and Rules** – Do you need any special permits or licences? Are there site rules that affect the way you will do the work?
- ◆ **Relevant workplace documentation and specific permits when working in a hazardous work area:** You would require hazardous work permits and site specific safe work method statement from an authorized person to operate a backhoe/loader in a hazardous working area. Perform risk assessment.



1.3.1 Reading and Checking Your Work Instructions

All work needs to follow worksite, environment and company safety procedures.

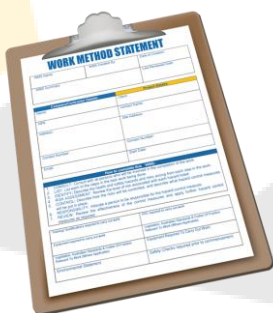
Procedures help to make sure that all work is done in a safe way, without damaging equipment or putting people in unsafe situations. They also help to make sure that work is done in the correct order and doesn't interrupt or get in the way of other work that is happening on the site.

Your work instructions will tell you the safest way to do the job, and the equipment that you will need to use. It is a good idea to check your work instructions with your boss or supervisor to make sure you know exactly what you need to do.

If you don't know where to get your instructions or you can't understand them, you can ask your boss or supervisor. They will tell you where to find your work instructions and explain what they mean.



1.3.2 Work Method Statements



Many worksites require a work method statement before any work can start. A work method statement is a list of steps that outlines how a job will be done. It also includes any hazards that occur at each step, and what you need to do about them.

These statements can also be known as Safe Work Method Statement (SWMS), Job Safety Analysis (JSA) or Safe Operating Procedure (SOP).

Work method statements are used for organising your work activities and making sure you have completed everything. They will also outline the details of all tools, equipment and coordination with other workers relating to your job. Make sure all of these are available and ready before you start.

1.3.3 Project Quality Requirements

Every civil construction project will have quality requirements. These outline when tasks need to be completed and the required standard of the work.

Your work instructions and plans or drawings will guide you, and help you to make sure you are achieving the quality standard for the project.

They can include:

- ◆ Project dimensions.
- ◆ Project tolerances.
- ◆ Standards of work.

You need plans, drawings and sketches before you operate a backhoe/loader:

- ◆ To know and understand the site requirements, offsets, measurements and dimensions.
- ◆ To get an overview of the site and project as a whole.
- ◆ Instructions will guide you help make sure you achieve the desired quality of works.



1.3.3.1 Site Material Characteristics



Make sure you are familiar with the site product or materials before you start to move them around. Have a look at the composition of the materials to see what kind of equipment you will need to move them, and what techniques to use.

Some materials are more cohesive or sticky while others may be much less stable to work with, or create hazards like dust or damage to equipment if they are not handled just the right way.

1.3.3.2 Plans, Drawings and Sketches

Some of your work instructions might be given to you in drawings and sketches. You will need to get the information out of these and use it to do your job.

Project plans and drawings give you an overview of the site, for example:

- ◆ Location of the site and earthworks in relation to the surrounding area.
- ◆ The position of structures, roads, access areas.
- ◆ Layout of drainage lines.
- ◆ Foundation details and landscaping features.

Depending on the project, drawings may be very detailed or they could be simple sketches.

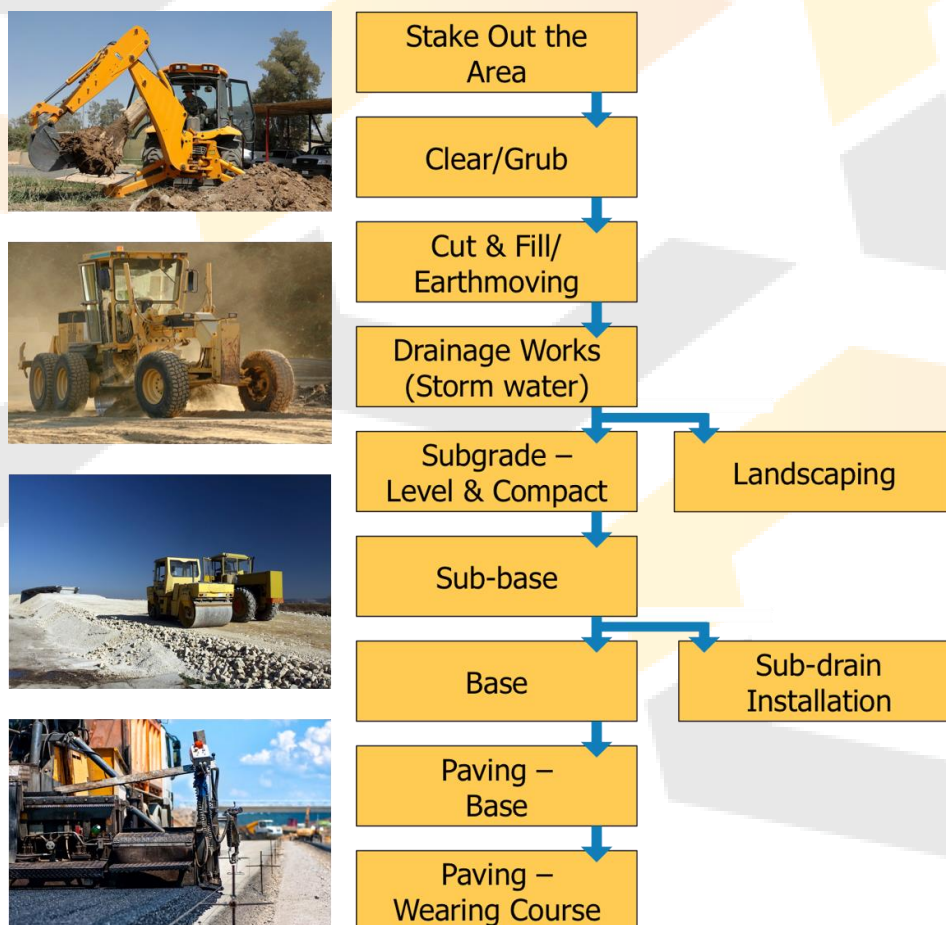
You should learn about the conventions and symbols used in the plans and drawings so you can understand what the information means.



1.3.4 Civil Construction Sequences

Civil construction projects are made up of a range of smaller tasks or activities. It is important that these are done in the right order for the project to go smoothly.

Here is a basic civil construction sequence from clearing the area through to preparing for road construction:



1.3.5 Basic Earthworks Calculations

As an operator, the 2 main calculations you will need to be able to apply are for Area and Volume.

Area can be calculated using the following formula:

$$\text{Area} = \text{Length} \times \text{Width}$$

For example:

A section 20m long and 4m wide would have the following area.

$$\text{Area} = 20\text{m} \times 4\text{m}$$

$$\text{Area} = 80\text{m}^2$$

The other common calculation is for volume. This is calculated by multiplying length x width x depth or height. That is, depth if it is a hole or height if it is a pile.

$$\text{Volume} = \text{Length} \times \text{Width} \times \text{Depth}$$

For example:

A trench 20m long, 4m wide and 0.5m deep would be calculated in the following manner.

$$\text{Volume} = 20\text{m} \times 4\text{m} \times 0.5\text{m}$$

$$\text{Volume} = 40\text{m}^3$$

It is important that you are familiar with basic earthworks calculations, and are able to access and use calculation data on the worksite.

1.4 Emergency Procedures

Emergency procedures will vary depending upon the worksite. These procedures could include:



- ◆ Emergency shutdown.
- ◆ Evacuation.
- ◆ First aid.
- ◆ Fire fighting.

1.4.1 Emergency Shutdown of Equipment

If there is a fire, emergency or accident you might need to use the emergency stop on the equipment you are using. This will turn the equipment off immediately. You can also use the emergency stop if the equipment stops working properly or you lose control of the equipment.



1.4.2 Evacuation



Things to remember are:

1. Keep calm.
2. Move away from the danger to a designated evacuation point, sometimes called an emergency assembly area.
3. Do not let other people into the area.
4. Call emergency services in accordance with workplace procedures and policies.

1.4.3 First Aid

First Aid is the quick care given to an injured or ill person. Every site will have a First Aid Officer.

If somebody needs first aid you must tell your supervisor or First Aid Officer. Do not try to give first aid if you have not been trained.



1.4.4 Fire Fighting Equipment



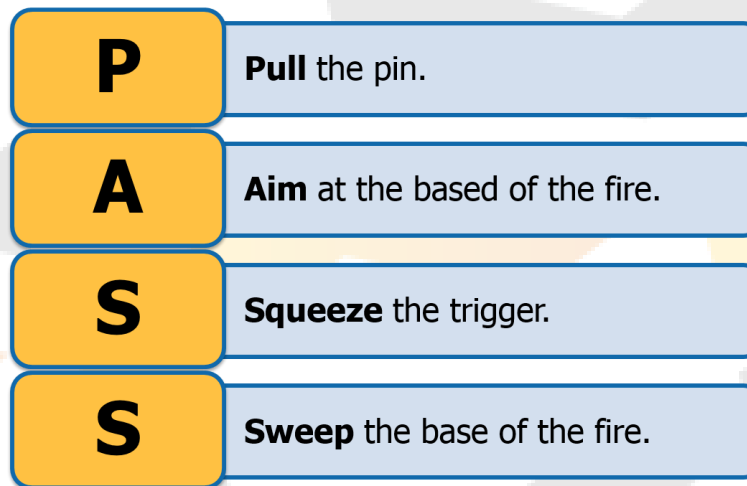
Fire fighting equipment on site could be anything from small fire extinguishers through to large water cannons.

Different fire fighting equipment should be used for different types of fire. Always check the equipment for information on what type of fire it can be used on.

Steps for using a fire extinguisher:

1. Evacuate the area.
2. Isolate the area.
3. Call emergency services or other designated on site procedure.
4. If it is safe to do so, use an extinguisher to attempt to control the fire using the PASS system.

The **PASS** system:



Contact your site emergency management team as soon as possible and call the fire brigade on 000.

1.5 Hazard Identification & Control

Before you start work, you need to check for any hazards or dangers in the area. If you find a hazard or danger you need to do something to control it. This will help to make the workplace safer.



The best way to control hazards is to use a simple problem-solving approach:

1. Identify the problem (What is the hazard?).
2. Identify the cause of the problem (What is causing the hazard?).
3. Work out the different options that you have to solve the problem (What can be done to eliminate or minimise the hazard as much as possible?).
4. Choose the best option to solve the problem and apply it (What is the best option to eliminate or minimise the hazard?).
5. Check to see if the problem has been solved (Has the hazard been eliminated or reduced to a safe level?). If not, you will need to use additional, or better options for fixing the problem (controlling the hazard).

1.5.1 Identify Hazards

Part of your job is to look around to see if you can find any hazards before you start any work.

A **hazard** is a thing or situation that causes injury, harm or damage.

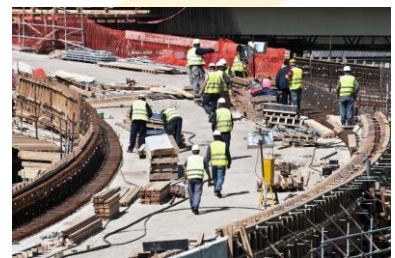
When you start checking for hazards, make sure you look everywhere. A good way to do this is to check:

- ◆ Up high above your head.
- ◆ All around you at eye level.
- ◆ Down low on the ground (and also think about what is under the ground).



Some hazards you should check for in the work area:

- ◆ Overhead and underground services.
- ◆ Uneven, soft, slippery or unstable terrain.
- ◆ Trees.
- ◆ Fires.
- ◆ Bridges.
- ◆ Excavations.
- ◆ Buildings.
- ◆ Traffic.
- ◆ Embankments.
- ◆ Cuttings.
- ◆ Hazardous materials.
- ◆ Structures such as site offices and scaffolds.
- ◆ The weather and environment.
- ◆ Other workers or site visitors.
- ◆ Pedestrians and other public traffic.
- ◆ On site vehicles, plant, equipment and machinery.
- ◆ Poorly maintained or faulty equipment.
- ◆ Hazards from components of the backhoe/loader (e.g. hoses under pressure, hydraulic tanks, cooling systems or braking systems).
- ◆ Road surface and edge solidity.
- ◆ Handling characteristics of the backhoe/loader.
- ◆ Effects of the load as you move or scoop it.
- ◆ Chemical hazards such as fuel, chemicals, contaminants, gases or dusts.



1.5.2 Working Near Power Lines

Working near power lines can be really dangerous if you are not careful.



It is very important that you know the safe operating distances for different types of power lines and the steps you must take if your job needs you to work closer than the safe distances.

Generally, if you need to work closer than the safe work distance you must:

- ◆ Contact the local electrical authority for permission to work closer (this is called an exemption).
- ◆ Have the power lines shut off. If this is not possible then have the power lines insulated.
- ◆ Use a spotter (depending on local laws and rules).

Distances are different depending on the voltage of the power lines. You should check with the local electrical authority for information and advice to find out the voltage of power lines in your work area.

QLD

The Queensland Electrical Safety Regulation breaks down the distances in detail. Exclusion zones are broken down not only by size of electric/power line but also by the competency level of the operator. This means that the requirements should be clarified with the electrical authority before work commences even if the distance appears to be outside the zones.

The following minimum distances are provided as guidance:

Electric/Power Line Type	Distance
Up to 132kV	3.0m
132kV up to 330kV	6.0m
330kV and above	8.0m

NSW

In New South Wales, for anyone who is not accredited, equipment operation may not be any closer than the following distances to electric/power lines:

Electric/Power Line Type	Distance
Up to and including 132kV	3.0m
Above 132kV up to and including 330kV	6.0m
Above 330kV	8.0m

To work closer than these distances requires authority from the relevant electrical authority and adherence to cl.64(2)(e) of the regulations.

ACT

In the ACT mobile plant operators and persons erecting or working from scaffolding must maintain a safe minimum distance to power lines as outlined in the table below:

Electric/Power Line Type	Distance
Less than 33kv	4.0m
33kV or more (transmission lines)	5.0m

VIC

In Victoria the Framework for Undertaking Work Near Overhead and Underground Assets states that equipment must not be closer than the following distances to electric/power lines:

Electric/Power Line Type	Distance
Distribution lines up to and including 66kV (power poles)	6.4m (or 3.0m with a qualified/registered spotter)
Transmission lines greater than 66kV (towers)	10m (or 8m with a qualified/registered spotter)

If you are operating a backhoe/loader and it makes contact with power lines:

- Stay calm, remain in seat, warn others to keep away, try to break contact by lowering the bucket (if possible), try and get someone to switch off the power.
- If it is unsafe to remain on the machine – jump well clear of the machine, don't make contact with the ground and the machine at the same time. Hop or shuffle at least 10 meters away from the machine.
- Remain a safe distance from the machine and warn others to keep clear.
- Have someone notify the site manager/supervisor who should report immediately to the appropriate authority;

OR – Follow WASID

- Warn others to stay clear.
- Attempt to break contact.
- Stay in the machine if safe.
- Incident report.
- Do not use the machine until it has been inspected and deemed ready to use.

TAS

In Tasmania equipment must not be closer than the following distances to electric/power lines:

Electric/Power Line Type	Distance
Up to and including 133kV (poles)	6.4m (or 3m with a safety observer)
Greater than 133kV (towers)	10m (or 8m with a safety observer)

SA

In South Australia mobile plant operators and persons erecting or working from scaffolding must maintain a safe minimum distance to power lines as outlined in the table below:

Electric/Power Line Type	Distance
Up to 132kv (including 132kv poles)	6.4m (or 3.0m with a spotter)
132kv or more (including 132kv towers)	10.0m (or 8.0m with a spotter)

WA

In Western Australia this falls under Regulation 3.64 from the OSH Regulations and states the following as the minimum distances:

Electric/Power Line Type	Distance
Up to 1kV (insulated)	0.5m
Up to 1kV (uninsulated)	1.0m
Above 1kV and up to 33kV	3.0m
Above 33kV	6.0m

NT

In the Northern Territory equipment must not be closer than the following distances to electric/power lines:

Electric/Power Line Type	Distance
Up to and including 132kV (distribution lines)	6.4m (or 3m with a spotter)
Greater than 132kV (transmission lines)	10m (or 8m with a spotter)

1.5.2.1 Tiger Tails



Tiger tails are used to show where overhead power lines are. They are bright coloured and easier to spot overhead than the standard wire on its own.

Just because power lines have tiger tails doesn't mean they are safe to hit. The tiger tails do not stop the flow of power. Even with tiger tails in sight you still must keep to the safe distances for the state you are working in.

1.5.3 Control Hazards

After you have found hazards or dangers you need to work out how bad they are:



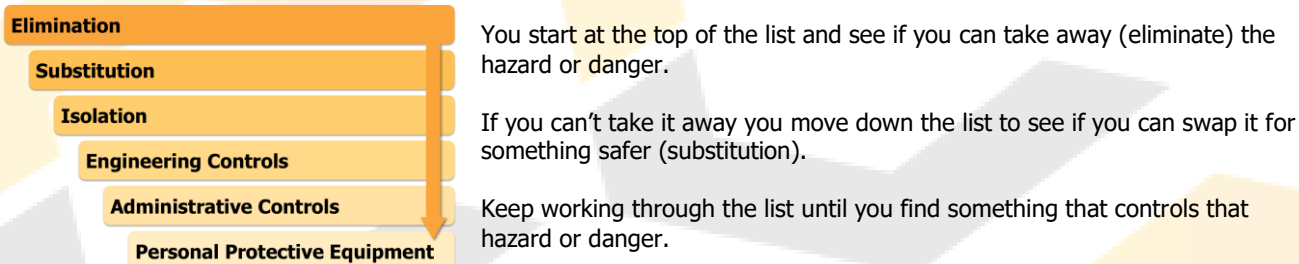
1. What is the chance that the hazard will hurt someone or cause damage?
2. If it does happen, how bad will the injury or damage be?

Thinking about these things will help you to choose how to control the hazards. Hazards controls need to follow:

- ◆ Legislation (laws).
- ◆ Australian Standards.
- ◆ Codes of Practice.
- ◆ Manufacturers' specifications.
- ◆ Industry standards.



The best way to control hazards is to use the Hierarchy of Hazard Control. The hierarchy of hazard control is a range of options that can eliminate, or reduce the risk of hazards.



This table shows you the 6 different types of controls in order from best to worst:

Hierarchy Level	Action
1. Elimination	Completely remove the hazard. This is the best kind of hazard control.
2. Substitution	Swap a dangerous work method or situation for one that is less dangerous.
3. Isolation	Isolate or restrict access to the hazard.
4. Engineering Controls	Use equipment to lower the risk level.
5. Administrative Controls	Site rules and policies attempt to control a hazard.
6. Personal Protective Equipment	The least effective control. Use PPE while you carry out your work.

Hazard control measures need to be put in place before you start your work, or as soon as you see a hazard while you are doing your work. Hazard controls can sometimes be listed in your work instructions or you can ask your boss or supervisor for help.

Once a hazard control is in place you will need to check to make sure it is working well to control the hazard or danger.

Talk to your supervisor or safety officer if you are not sure if it is safe enough to carry out your work. If you think the hazard is still too dangerous you should not try to do the work.



1.5.3.1 Personal Protective Equipment

Personal Protective Equipment (PPE) is clothing and equipment designed to lower the chance of you being hurt on the job. It is required to enter most work sites.

It includes:



cold.

- ◆ **Head protection** – hard hats and helmets.
- ◆ **Foot protection** – non-slip work boots.
- ◆ **Hand protection** – gloves.
- ◆ **Eye protection** – goggles, visors or glasses.
- ◆ **Ear protection** – plugs or muffs. An ear protection must be worn when the noise level could contribute to the hearing loss (e.g. above 85dba)
- ◆ **Breathing protection** – masks or respirators.
- ◆ **Hi-visibility clothing** – clothing that makes you stand out and lets other people know where you are.
- ◆ **Weather protection** – clothing that protects you from the sun or from the

Make sure any PPE you are wearing is in good condition, fits well and is right for the job.

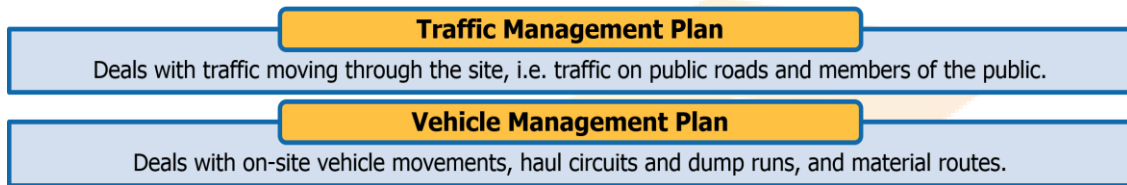
If you find any PPE that is not in good condition, tag it and remove it from service. Then tell your supervisor about the problem and they will organise to repair or replace the PPE.



1.5.3.2 Traffic Control Signage

In some cases you may need to isolate the work area. Set up barricades and signage to warn others that you are working in the area and that it is dangerous for them to come too close.

On worksites it is often necessary to control the movement of traffic around and through the site. To do this there are 2 different types of traffic management plans:



In the traffic or vehicle management plan, signs and the distances between signs will be listed. Reading the plans will show you where particular signs need to be placed.

Signs and barriers may include:

- ◆ Danger or warning signs like speed limits, 'workmen ahead' or 'reduce speed'.
- ◆ Flashing lights.
- ◆ Barricades and fences.



1.5.4 Environmental Protection Requirements

Environmental protection requirements are part of every worksite. Make sure you check with your supervisor about what environmental issues need to be managed during your work.



All environmental details should be listed in an 'Environmental Management Plan' for the site. It can include details for:

- ◆ Waste management.
- ◆ Water quality protection.
- ◆ Noise control.
- ◆ Vibration control.
- ◆ Dust management.

The plan will outline the steps and processes needed to prevent or minimise damage to the environment through the use of machinery and equipment.

2.1 Choose and Check Plant and Equipment

Once you have confirmed your job requirements you need to choose the right equipment and attachments to get the job done.

When choosing equipment you need to think about:

- ◆ The task requirements, specifications and goals.
- ◆ The appropriateness of the equipment for the completion of the task.
- ◆ The characteristics, correct use, operating capacity and limitations of each item.
- ◆ The potential risks to yourself and others in the intended use of the equipment.

Information about technical capabilities and limits can be found in the operator manuals supplied by the manufacturer of each item.

It is not safe to operate plant, equipment or attachments outside site procedures and the manufacturer's specifications. This may cause the machinery to break and could also cause an accident or injury.



2.1.1 Backhoe/Loader Characteristics and Limitations

The differences between types and models of backhoe/loaders varies greatly. The one you choose will depend on the work to be carried out and the terrain to be worked in.

You should assess the ground conditions to decide whether or not the backhoe/loader you choose is suitable for the conditions.

Check the operator's manual and manufacturer's specifications for information about:



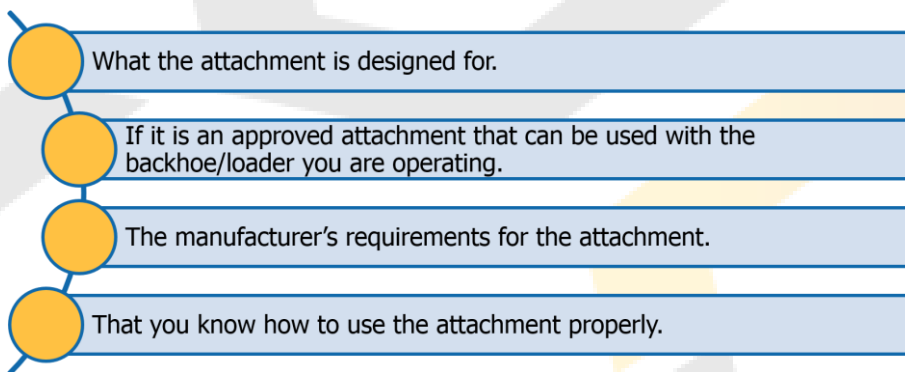
- ◆ Load limits and operating capacities.
- ◆ Balance requirements with and without a loaded bucket.
- ◆ The limits on slopes that can be negotiated both loaded and unloaded.
- ◆ Manoeuvring capability, such as turning radius and stopping distances.
- ◆ Attachment use.
- ◆ Use of slings.
- ◆ Materials and handling requirements.

2.1.2 Select and Fit Attachments

There are a range of attachments and equipment that can be fitted to the backhoe/loader, including:

Attachments	Examples of Use
Scarifier	Used for breaking up the surface of the site.
Ripper/Tynes	Used for ripping the surface and loosening materials where needed.
Auger	Used for moving materials up or down.
Rock/Concrete Breaker (Hydraulic Hammer)	Used to break rocks and concrete. Will often look like a large jackhammer.
Buckets	Tilt bucket, four-in-one bucket, standard bucket. The most common attachments for backhoe/loaders. Could be front or rear mounted depending on the needs of the worksite.
Mower/Slasher	Used for mowing or slashing of vegetation.
Forklift	For using the backhoe/loader as a forklift.
Free Grab/Rock Grab	Used for picking up large items such as rocks. Usually attached to the rear support frame.
Broom	Used to sweep the surface clean. Particularly important for removing debris from public roads.
Lifting Devices	Slings, lifting gear, platforms.
Vibrating Compaction Plate and Wheel	Used for compacting areas. The most effective method to compact the trench: Use vibrating plate or wheels and compaction plates.
GPS	Used for machine guidance. Useful for keeping the backhoe/loader on a set path.
Extending Devices	Used to extend the reach of the attachments.
Other Approved Attachments	This includes magnet attachments, log grapples and blade graders.

When selecting an attachment you have to work out if it is suitable for the tasks you need to complete by confirming:

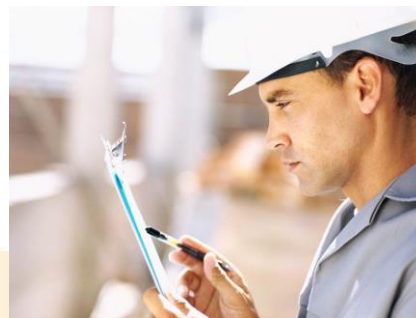
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- What the attachment is designed for.
 - If it is an approved attachment that can be used with the backhoe/loader you are operating.
 - The manufacturer's requirements for the attachment.
 - That you know how to use the attachment properly.

You will find this information in the operator's manual for the backhoe/loader and the operator's manual for the attachment. Otherwise you may need to check the workplace equipment procedures for your site.

Once you have decided that the attachment is right, you need to attach it securely using approved attachment points and methods.

Once again, the operator's manual for the specific backhoe/loader you are operating will have exact instructions on the connection process which must be followed at all times.

Once the attachment is fitted to the backhoe/loader you need to inspect the coupling points and any hydraulic hoses to make sure they are secure.



2.1.2.1 Remove and Fit Backhoe/Loader Attachments

Attachments need to be treated in accordance with the manufacturer's specifications and guidelines.



Each attachment has a different job to perform therefore must be fitted in a different location or manner.

You must familiarise yourself with the requirements for each individual attachment by reading the operator's manual or equipment guides.

Most attachments are fitted and removed using locking pins, coupling attachments or screws, nuts and bolts.

Fitting Attachments

Generally, to fit an attachment:

1. Collect any documentation needed such as manufacturer's instructions, operator's manuals.
2. Collect any equipment that may be needed, including hand tools.
3. Park the backhoe/loader in the appropriate location.
4. Connect the attachment; making sure all bolts, nuts and locking pins are correctly applied.
5. Refer to the operator's manual or speak to your supervisor if you have any concerns with attachments.



Removing Attachments



When removing attachments it is necessary for you to remember safety first:

- ◆ Ensure the attachment is safe to remove.
- ◆ Check that all points of the attachment have been undone before removing the attachment.
- ◆ Heavy attachments should be removed with good manual handling techniques. Use team lifts as much as possible.

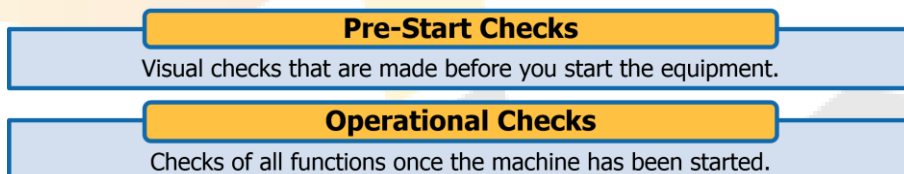
2.1.3 Conduct Routine Checks



Before you use any piece of plant or equipment, you need to conduct routine checks to make sure it is safe to use. Check the machine logbook before you start your inspection to see if there are any faults that still need to be fixed before you can use the backhoe/loader.

Also make sure you are wearing the correct PPE before you start checking the machine.

Routine checks are made up of:



Generally, routine checks are performed at the start of each day or shift.

You can use an inspection checklist to keep a record of the checks you have made.

2.1.3.1 Pre-Start Checks

Pre-start checks are done before the engine is started. Walk around the backhoe/loader and look for anything that is out of the ordinary.

Part or Component	What to Check for
Structure	Check the general condition of the backhoe/loader. Check for oil or other fluid leaks. Check for any signs of visual weaknesses, damage, stressed welds or paint separation.
Tyres	Check for mud, which may be thrown from the tyres and cause damage. Check the condition and air pressure of the tyres to make sure they are within the manufacturer's specifications.
Bucket	Check the bucket for worn or broken components e.g. teeth, blade, bolts. Inspect the hydraulics and connections for wear and tear. Check the condition of the pivot pins.
Power Arms	Make sure you check the power arms for damage or defects, but be careful not to put yourself in a position where you could be crushed if there is a malfunction. If you find excessive wear in the power arms and connections that make the backhoe/loader dangerous to operate you need to inform your supervisor or an authorised person. Then isolate the backhoe/loader and don't use it until it is repaired.
Fluids and Lubrication	Check that the oils (engine, transmission, hydraulic) and fuel are at the right levels. Check that the water or other approved coolant is at the right level. Transmission fluid needs to be checked in accordance with the manufacturer's specifications. Check that parts are lubricated to ensure smooth operation.
Engine	Check condition and security of battery. Check electrolyte levels. Check for any obvious signs of damage or wear.

Part or Component	What to Check for
Hydraulic Rams and Hoses	Hydraulic rams and pressure hoses are checked for splits, leaks, fractures, bulges and bent piston rods.
Decals and Signage	Check that all decals and signage are present on the machine.
Windows	Check that the windows are clean and you have good visibility from the operator's chair.
Cabin	Check that the seat and safety belt or bar are in good condition. Check that the cabin is clean.
Service History and Logbook	Check the machine hour meter, manufacturer's recommendation and logbook to find out if the backhoe/loader needs to be serviced. You can also check the instruments or computer for this information on later models.

For exact details on the components for the machine you are operating, check the operator's manual as different brands may have different requirements.

2.1.3.2 Operational Checks

Operational checks are carried out once the engine is started.



Climb up to the backhoe/loader cabin using 3 points of contact at all times (2 hands and 1 foot or 2 feet and 1 hand). This is the safest way to climb in and out of the backhoe/loader. Never jump from the backhoe/loader.

Adjust the seat until comfortable and make sure you have maximum visibility.

You will need to let the engine idle for the required amount of time. Depending upon the individual machine this idle time could range from 3 to 10 minutes.

Always make sure your seat/safety belt is on and attachments are raised before moving off.

Controls and functions that need to be checked on the backhoe/loader:

Part or Function	What to Check for
All Controls	Test all arm and bucket movements.
Gauges and Instruments	Check that all instruments are displaying properly and are not signaling any alarms or warnings.
Safety Devices	Test all lights and other warning devices.
Attachments	Check that the attachment is secured and connected to the backhoe/loader properly. Check the condition of the attachment. Check that it works properly.
Travel, Turning and Brakes	Test all movements and brakes, including the emergency stopping device.
Ancillary Equipment	Test out all communications devices and any other systems or functions fitted.

Once you have finished your operational checks it is a good idea to check for external signs of oil or fluid leaks. It is common for the start-up process to cause a leak through hoses breaking.

2.1.3.3 Test Backhoe/Loader Attachments

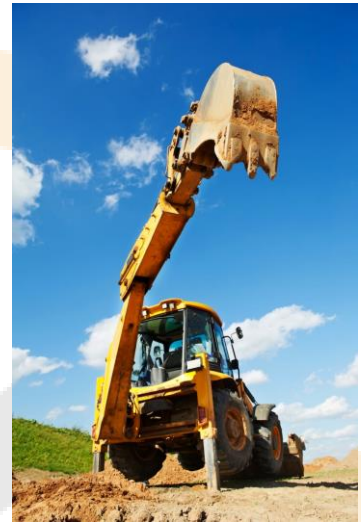
Once the attachment is fitted, it is necessary to test it to ensure the correct fit, that it is secure, and that the attachment will function as required. This is to ensure the attachment will not break or become unsafe during use or operation.

The testing procedure for each attachment will be outlined in the operator's manual for the machine or in your site procedures.

To test the attachment for correct fit and use, turn the machine on and operate the attachment controls. Ensure that the attachment moves as it should, and has full range of motion (appropriate to the specific attachment).

Things to consider when testing an attachment for fit and operation include:

- ◆ Site procedures.
- ◆ Backhoe/loader procedures.
- ◆ Safe operating procedures.
- ◆ Attachment operations manual.
- ◆ Backhoe/loader operator's manual.
- ◆ Site plans, i.e. don't do your test in the middle of a process or other activity.



When inspecting under a raised attachment, chocks, blocks, or safety bars must be used to prevent the raised bucket from falling.

The steps for checking attachments should include:

- 1 Visual inspection.**
- 2 Physical inspection.**
- 3 Check the hydraulic hoses for any bulges or unexpected lumps.**
- 4 Check the controls to manoeuvre the attachment.**
- 5 Check warning lights and alarms.**
- 6 Check that the attachments are authorised.**

2.1.4 Report All Faults

Once all routine checks are finished, you will need to report any problems, faults, defects and damage that you found during the inspection so that they can be repaired and the machine and equipment are safe for you or the next operator to use.

Make sure the backhoe/loader is tagged out (isolated from use) until the repairs have been made.

Record the details of the problem in a fault report or the backhoe/loader logbook.



3.1 Operate the Backhoe/Loader



During civil construction backhoe/loader operations you will need to:

1. Assess the materials you are working with.
2. Use the equipment safely within the technical specifications and limits.
3. Use the equipment for tasks that it is specifically designed for.
4. Continuously monitor and check for hazards.

It is important to coordinate your activities with other workers when you are planning and carrying out the work to make sure everyone knows:

- ◆ The work being completed.
- ◆ How, when and where you will be operating.
- ◆ What they need to do.

All workers on site must understand their own role and the roles of others before starting work. It helps to make sure work is done safely and efficiently.



Workers you may need to coordinate with include:

- ◆ Other mobile and processing plant operators.
- ◆ Maintenance workers.
- ◆ Water truck/cart operators.
- ◆ Service vehicle operators.
- ◆ Crane and float operators.
- ◆ Contractors and site visitors.
- ◆ Inspectors, both internal and external, including WHS, environmental and quality assurance officers.
- ◆ Supervisors.

3.1.1 Assess Materials to be Shifted

You will need to assess the materials you are working with to figure out the best way to handle them. For example, clay is more cohesive and harder to excavate than topsoil.

There may be different types of materials being handled at the worksite. They may include:



- ◆ Topsoil.
- ◆ Clays.
- ◆ Silts.
- ◆ Gravel.
- ◆ Mud.
- ◆ Stone.
- ◆ Rock, which might be:
 - ◇ Metamorphic.
 - ◇ Igneous.
 - ◇ Sedimentary.
 - ◇ Blended materials.
 - ◇ Organic materials.
 - ◇ Bituminous mixes.

You will also need to assess the weight of the materials you are working with.

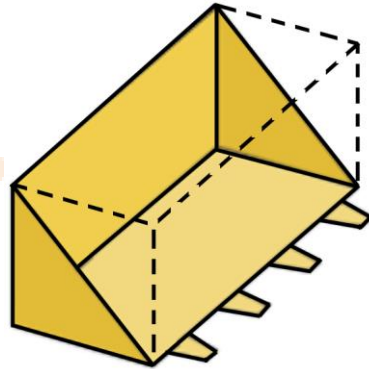
Material	Weight per m ³	Material	Weight per m ³	Material	Weight per m ³
Bronze	8.5t	Gypsum	2.3t	Sand, beach, wet	2.3t
Clay	1.9t	Iron Ore	5.4t	Sand, river, wet	1.5t
Coal	846kg	Lead	11.4t	Shale	2.6t
Concrete	2.4t	Lime (stone)	2.6t	Terracotta	1.8t
Earth	1.9t	Sand, beach, dry	2.0t	Zinc	7.0t
Granite	2.6t				

Think about the size of the bucket you are using and work out the weight of the load.

To work out the volume that the bucket can hold multiply the height (H), width (W) and length (L), then divide it by 2:

Bucket Length x Height x Width

2



Check the weight of the materials against the manufacturer's specifications to make sure you don't overload the backhoe/loader.

Keep in mind that uneven, rough, boggy or sloping ground can all reduce the amount or material that the backhoe/loader can safely carry.

3.1.1.1 Soil Technology

Characteristics of the materials being moved or loaded will affect your work.

You need to understand the basics of soils, clays and other materials so you are able to:

- ◆ Know how to best respond to them and handle them.
- ◆ Achieve the best outcomes in your work.
- ◆ Calculate load amounts.
- ◆ Understand conditions for moving the materials.

When handling low viscous materials such as mud or wet sand:

- ◆ Consider if there is room for run off at the stockpiling area
- ◆ Consider safety hazards and risks such as slips and fall, spilling out on to a road or into a water supply



3.1.2 Safe Operating Techniques

To make sure your work is done in a safe way it is important to follow some basic safe operating techniques, such as:

- ◆ Ensuring that you have read the operator's manuals prior to using a new machine.
- ◆ Identifying the terrain you will be moving through and noting any potential problems or hazard areas.
- ◆ Altering your operating techniques based on the prevailing conditions.
- ◆ Monitoring speed.
- ◆ Keeping within backhoe/loader tolerances and capacity.
- ◆ Following site procedures for safe operations of backhoe/loaders. This includes restricting passengers from riding in the backhoe/loader unless provided with an approved seat and seat belt.
- ◆ Recognising defects or problems.
- ◆ Using the appropriate operating techniques for the materials being moved. For example, clay is more cohesive and harder to excavate than topsoil. It would therefore need the operator to change their techniques used.
- ◆ Following movement plans and haul circuits established during site meetings.
- ◆ Abiding by communication protocols established for the site. This includes following all directions and using approved communication techniques for the site.
- ◆ Always following site procedures for incidents and emergency situation. This includes reporting all incidents that occur.



It is important to note that when running an internal combustion engine in an enclosed space the exhaust fumes can kill. Ensure that the space is adequately ventilated and that you are using an approved exhaust control unit, such as a catalytic converter (scrubber).

Appropriate safe operating limits and techniques should be outlined in site operations manuals and operator's manuals.

Speaking with team members or other backhoe/loader operators will allow you to exchange tips and techniques for the site or conditions you are operating in.

3.1.2.1 Safe Operating Speeds

While operating the backhoe/loader make sure movements are smooth, not jerky, and that you operate the backhoe/loader at a safe speed.

Operating too fast can cause instability.



3.1.2.2 Safe Travel Speeds

Going too fast will reduce the stability and control of the backhoe/loader, as well as putting yourself and other workers in the area in danger.

Your speed may be affected by a range of factors including:

- The age of the machine.
- The work environment.
- Ground conditions.
- Attachments fitted.
- Visibility.
- Site rules, policies and procedures.
- The amount of traffic, other vehicles or obstructions in the area.

3.1.3 Drive to the Work Area

Before shifting any material the backhoe/loader must be driven to the work area.

You should make sure that the route and direction of travel is clear and that you travel at a safe speed. Also ensure that grounded attachments are raised to the correct height or stowed.

Always check over both shoulders to ensure the direction of travel is clear before reversing, and use a higher gear or speed. A reverse warning device should indicate to others that you are intending to reverse.



Wherever possible, side hill travel should be avoided, as there is a greater chance of turning the machine over.



If you must drive the backhoe/loader down a sloping surface you should drive directly down the slope, not across or diagonally down. This will ensure the machine is as stable as possible.

On approach to downhill or uphill travel you should reduce the speed of the backhoe/loader and select an appropriate gear for the grade.

During downhill travel always select a low gear to help control the descent. Often this is the same gear that would be used to climb the hill.

If you need to cross a ditch you should slow your speed and approach the ditch at an angle.

DO NOT coast (put into a neutral gear and roll) the backhoe/loader downhill.

3.1.4 Backhoe/Loader Techniques

When operating a backhoe/loader it is important for you to feel confident in your machine and to know its capabilities.

This is best achieved by reading the operator's manual.

Also spend the time to work out engine rev performance, what speeds are appropriate for which tasks, at what height the bucket performs best and other factors for the backhoe/loader you are operating.

This will help you to operate safely in all terrains and to adjust your operating techniques effectively.



Operating techniques include:

- ◆ General driving.
- ◆ Reversing.
- ◆ Manoeuvring.
- ◆ Braking.
- ◆ Attachment operation.
- ◆ Bucket loading.
- ◆ Load carrying.
- ◆ Load discharge.

3.1.4.1 General Driving

General driving techniques include:

- ◆ Be alert to hazards and dangers at all times.
- ◆ Be careful not to drive over or too close to trench areas or be in a position that the machine may be exposed to an open or unprotected edge of a trench, bench or batter.
- ◆ Watch the terrain for hazards such as tree stumps.
- ◆ Keep clear of holes and soft areas.
- ◆ Travel downhill in gear and do not travel across steep slopes.
- ◆ If you are tired, sick, medicated or have drugs or alcohol in your system – don't drive.
- ◆ Do not carry passengers.
- ◆ Have the bucket close to the ground.
- ◆ Cross rail lines at an angle.



3.1.4.2 Reversing



Reversing techniques include:

- ◆ Make sure the way is clear before starting to reverse.
- ◆ Look behind you and keep looking in the direction you are travelling.
- ◆ Turn the seat to face the direction of travel or work (if possible). This will help you to avoid neck injuries as well as make the task safer and more efficient.

3.1.4.3 Manoeuvring

Manoeuvring techniques include:

- ◆ Room and space for movement are often limited but techniques can improve with practise.
- ◆ Look out for other plant, structures, stockpiles and roadways.
- ◆ Be familiar with the worksite and your work area.
- ◆ Know the limitations of machine.
- ◆ Talk to other operators about tips for improving operation and manoeuvring.



3.1.4.4 Braking

Braking techniques include:



- ◆ Have machine sympathy.
- ◆ Don't brake too suddenly unless in case of accident.
- ◆ Allow enough distance to stop, particularly with a loaded bucket.
- ◆ Don't put the machine off balance when braking.
- ◆ Watch out for braking while turning, especially if locking brakes are fitted.
- ◆ Read the operator's manual – know your machine's capabilities.

3.1.4.5 Attachment Operation

Every piece of equipment has design limits and operational recommendations. This applies both to the attachment and the backhoe/loader as a vehicle.

Operating within the specifications, recommendations and design limits ensures you do not damage either the backhoe/loader or the attachments.

How each attachment is used will be outlined in the operator's manual and shown to you during your equipment induction and familiarisation process.

It is important that you follow and respect the usage recommendations and the design limits for attachments, as this will guide you in using attachments safely and efficiently to achieve the desired results.

If you are unsure of how you should fit, use or remove an attachment, read the operator's manual or speak with an authorised mechanic or fitter or other members of your team.



3.1.4.6 Bucket Loading



Bucket loading techniques include:

- ◆ Apply the correct technique for the type of bucket you are using.
- ◆ Talk to more experienced operators and ask for mentoring if you feel you need help.
- ◆ Don't overload the bucket.
- ◆ Efficiency and effectiveness in loading comes with practice.

3.1.4.7 Load Carrying

Load carrying techniques include:

- ◆ Carry the load low to the ground wherever possible.
- ◆ Travel at a safe speed.
- ◆ Keep the machine balanced.
- ◆ Try to avoid spillages.



3.1.4.8 Load Discharge

Load discharging techniques include:



- ◆ Discharge the load on level ground or surface to avoid rollover.
- ◆ Have machine sympathy.
- ◆ Raise the bucket to the correct height for discharge before starting to roll the bucket.
- ◆ Roll the bucket to ensure clean discharge of materials.
- ◆ Ensure correct braking (or use of hand/load brake) to stop movement if applicable.

3.2 Backhoe/Loader Operations

Identifying and applying techniques that will help you achieve optimum output is a matter of knowing your backhoe/loader, the attachments you are using and the terrain you are operating in.

One of the best methods for developing operational techniques is to ask a more experienced operator to mentor you.

Due to the high centre of gravity of a backhoe/loader unit, you must be able to adapt to different terrain conditions. It is necessary to raise or lower the boom on the backhoe/loader and use the bucket to balance the machine.



Backhoe/loader operations include:

- Mixing materials.
- Stripping and spreading materials.
- Cutting and boxing.
- Trench excavation.
- Backfilling.
- Levelling.
- Loading vehicles and equipment.

3.2.1 Mixing Materials



Backhoe/loaders can be used to mix materials as they have a large bucket and are able to move large amounts of materials quickly.

A tiller attachment is useful for this kind of work. You can use one to break up the ground and mix topsoil or clay with other materials to prepare the ground for future work.

Rippers and scarifiers can also be used to break up the ground before mixing materials.

3.2.2 Stripping and Spreading Materials

Backhoe/loaders can be used to strip back the top layer of earth to excavate or level an area. This is achieved by the blade of the bucket as it is used to cut and lift a small amount of the topsoil.

This topsoil can be transported to another area and spread out. Spreading topsoil can be done a number of ways. You can discharge the soil from the bucket bit by bit as you move along, or scrape a small pile of topsoil over an area using the blade of the bucket or a 4-in-1 bucket.



3.2.3 Cutting and Boxing

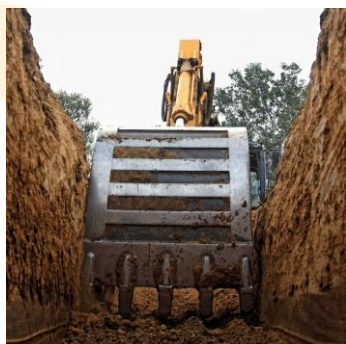


Cutting involves the cutting or removal of material above a required level i.e. cutting down to create a floor or design level.

Boxing is the technique of removing materials below a level and may involve trenching, or removing sections of pavement in a "box" type shape to a desired level.

3.2.4 Trench Excavation

Backhoe/loaders are often used for digging trenches and holes, i.e. excavations. If you are excavating or digging it is important to remember some points including:



- ◆ Check for underground services (power, telephone, gas, water, sewer, drainage and fibre optic cable lines) before starting to excavate. Talk to the site supervisor who will contact the supply authorities for council maps of the site.
- ◆ Cut a trench to required specifications and deposit full buckets of material away from the trench.
- ◆ If cutting a trench across a footpath:
 - ◇ Obtain information from relevant authorities who may run services under the footpath – Before you Dig Australia.
 - ◇ Ensure you have all the relevant plans, drawings and sketches
 - ◇ Excavate towards any underground services slowly to limit of approach
 - ◇ Provide appropriate barricades, signs, flashing lights and other suitable isolation devices.
- ◆ Remove any large rocks from a trench where required.
- ◆ If trench excavations are deeper than 1.5m, or the material is likely to collapse, the backhoe/loader operator is required to bench and batter the sides then lower trench shields before the excavation is entered.
- ◆ Do not undercut a trench, bank or stockpile, as it could collapse and cause the backhoe/loader to overturn and trap the operator underneath.
- ◆ When operating on soft or uneven ground the load that you can safely raise or carry will be reduced.
- ◆ Loads should be placed a safe distance from the trench – not closer than 1m with material coming to rest no closer than 0.5m from the excavation.
- ◆ Use barricades, guard rails or fencing and warning signs to prevent workers falling into a trench or vehicles/machines getting too close. Nobody should be standing within operating radius of the backhoe/loader.
- ◆ Monitor indication signs that you are getting close to a previous excavation or an underground service when excavating. If you notice any of the following signs, stop operating immediately and hand dig to investigate:
 - ◇ Crushed blue metal or plastic tape.
 - ◇ Clean sand or sand bags.
 - ◇ Broken tiles.
 - ◇ Moisture.
 - ◇ Any other unusual material.

3.2.5 Backfilling

The backhoe/loader can be used to backfill trenches or small excavations after work has been completed. When backfilling it is important that you ensure the right materials are deposited into the excavation, and that the right level of compaction is achieved.



Loose materials in a trench or excavation can settle over time and sink down. Make sure there is enough material packed into the trench to keep the ground even after the work is completed.

When backfilling trenches remember to:

- ◆ Keep a 90 degree angle unless your site plans say otherwise.
- ◆ Keep clear of edges and drop-offs.
- ◆ Avoid soft edges and deep holes.

Trenches over 1.5m must be shored to prevent collapse. This is required if people will be working in the trench area or alongside.

3.2.6 Levelling

Levelling with the backhoe/loader is performed by having the bucket placed flat on the ground and the machine move backwards, dragging the bucket.

It is important to remember the following points:

- ◆ Work to the designated grades in the required manner. This will include the type of levelling, the grade and slope, and the fall (for water to shed off).
- ◆ Levelling information and procedures will be discussed during your task briefings.
- ◆ In many cases GPS and laser control systems are now used to provide a more accurate finish to the work. This eliminates the need to have a person standing close by ready to take levels (although this may still need to occur with some works).
- ◆ Levelling equipment needs to be calibrated regularly and must be checked against site reference points such as pegs, benchmark points or other defined levels.



3.2.7 Loading Vehicles and Machinery

Backhoe/loaders can load materials into site vehicles and machinery, such as dump trucks, wagons, hoppers and chutes.



When loading materials and loads into vehicles it is important that you know where the driver is and coordinate your approach with them. You don't want to accidentally run into them.

Approach the side of the vehicle or machinery slowly once it has stopped in position.

Avoid contact with the vehicle or machinery by leaving enough room to raise the bucket.

Once the bucket is high enough you can move in closer and roll it forward to deposit the load into the vehicle or machinery.

3.3 Adjust Techniques to Meet Changing Conditions

While you are working and moving materials, the site will change.



Lighting Changes – Twilight is the time when your eyes might become more tired and difficult to focus. It could be more difficult to see the terrain and to judge distances. Set up temporary lighting where possible and go slowly.

Weather Conditions – Rain, sleet, snow, wind and humidity can all affect both your loader and the materials you are working with. Additional moisture from any source will change the composition of the materials, possibly making them heavier and slippery. This means you will not be able to lift or haul as much and you will need to adjust the quantities you are dealing with in each load.

Changing Work Conditions – As more materials are moved around or removed from a site the work conditions may change. Materials that you are working with can change throughout a project. As you excavate deeper or move onto other stages of the civil construction project such as landscaping or preparing road base you will be working with different materials, attachments and personnel.



3.4 Lift, Carry and Place Loads Using Slings and Lifting Gear

In civil construction projects you may need to use the backhoe/loader to lift and carry loads using slings and lifting gear. For example, lowering pipes into trenches. The backhoe/loader end of the machine should be used for this kind of work. Using the front bucket for lifting should only be done if using a bucket attachment that is specifically designed for lifting (has an approved and rated lifting lug).

It is important that this work is conducted in coordination with authorised personnel such as a licensed dogger or rigger.



3.4.1 Determine the Weight of the Load

You need to coordinate with authorised personnel to work out the weight of the load to make sure your backhoe/loader can safely lift it without damaging the equipment, attachment or making it unstable.

The weight of the load can be found in a number of ways:

- ◆ Check for weight markings on the load.
- ◆ Check delivery dockets or information sheets.
- ◆ Check the weighbridge certificate.
- ◆ Calculate the weight of the load or material.



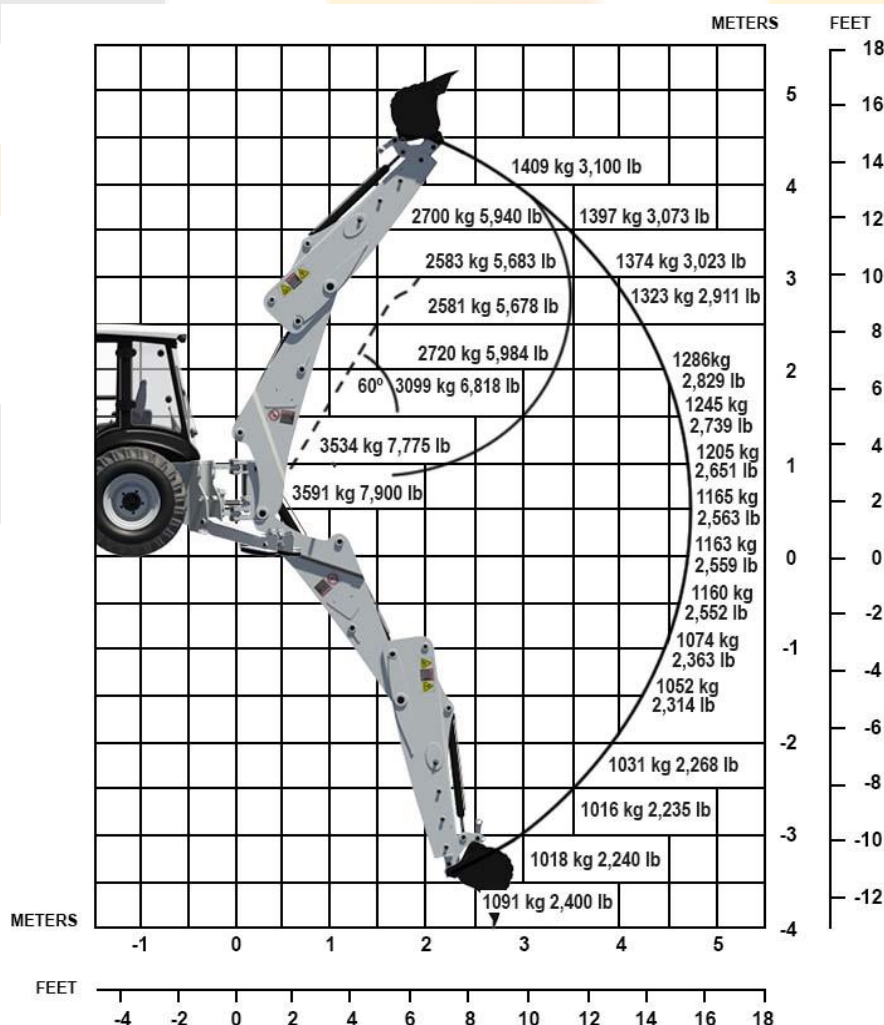
If you cannot be sure of the weight and cannot calculate it, do not lift the load.

Once you know the weight of the load you need to make sure the backhoe/loader you are using has the capacity to lift it safely. You can check the capacity of the machine in the operator's manual or manufacturer's specifications.

If you are using an attachment to lift the load you need to check that it is also rated to be able to lift the load. Keep in mind that using an attachment may also reduce the overall capacity of the backhoe/loader.

Always check the backhoe/loader load chart to make sure that any load that is lifted is within the capacity of the machine.

Pass on any information about machine and equipment capacity to the person slinging the load.



3.4.2 Select Lifting Gear



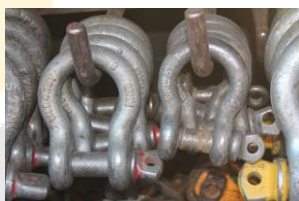
When using the backhoe/loader for lifting, make sure it is fitted with the correct lifting attachment or that the machine has the appropriate lifting lugs. Always use an approved lifting lug or lift connection that is clearly marked with the Safe Working Load (SWL).

Lifting gear needs to be selected based on the type, size, weight and shape of the load to be lifted. Only a licensed dogger or rigger is authorised to select and inspect lifting gear, determine the weight of loads and select and apply slinging techniques.

3.4.2.1 Types of Lifting Gear

Lifting gear that may be used with the backhoe/loader includes:

- ◆ Wire rope slings – also known as Flexible Steel Wire Rope (FSWR).
- ◆ Chain slings.
- ◆ Synthetic slings.
- ◆ Eye bolts, shackles and hooks – used to attach lifting gear to the load and backhoe/loader.



Each piece of lifting gear is rated to a specific capacity known as a Working Load Limit (WLL). This WLL can change depending on how the lifting gear is connected and arranged. This is why a licensed dogger or rigger needs to decide what lifting gear is being used and how it will be used.

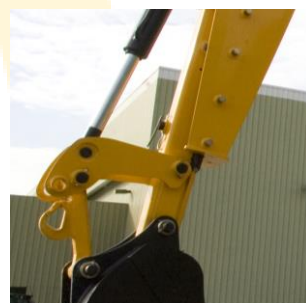


3.4.3 Inspect and Connect Lifting Gear

Slings and other lifting gear must be inspected before and after use for any signs of damage or wear. All faults must be reported in accordance with site procedures and the equipment must be isolated (removed from service).

Defects that would condemn a lifting chain and hook from safe use include:

- ◆ Cracks in links
- ◆ Over 10% wear
- ◆ Over 10% elongation
- ◆ Over 5% wear or stretch in throat of hook
- ◆ Over 10% wear in bite hook
- ◆ Twisted or damaged links
- ◆ No SWL tag
- ◆ Rusted
- ◆ Chain or hook affected by heat
- ◆ Spot welded links



Once the correct attachment and lifting gear has been chosen and inspected by a licensed dogger or rigger, you need to make sure it is connected to the backhoe/loader properly. Slings should only be attached to manufacturer approved lifting lugs using a shackle that is rated to lift the load.

You are not permitted to join a chain sling with a bolt because the bolt is not an approved joining method, and it does not have a load rating (i.e. not rated).

You are not allowed to attach slings to the teeth of the bucket because it may break off the teeth and /or the sling could slip off the teeth and cause the load to fall, which may injure or kill someone or damage the load. It is against regulations to sling loads using a backhoe/loader without the approximately approved lifting connection fitted. Also teeth of the bucket is not a rated lifting point.

Remember: Only a licensed dogger or rigger can select, inspect and apply slinging techniques and determine the weight of loads. You may only participate in these activities under the direct guidance of a qualified dogger or rigger.

3.4.4 Position the Backhoe/Loader

Before lifting a load with slings you need to get the backhoe/loader into the right position. Make sure:

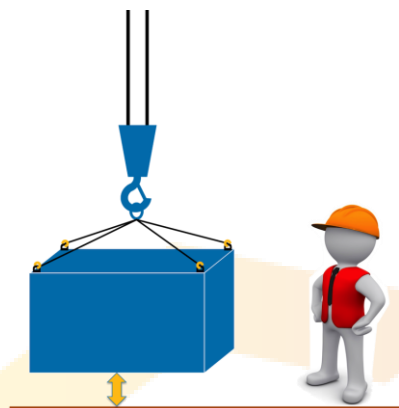
- ◆ The machine is on firm level ground.
- ◆ The load, backhoe/loader and lifting gear can all be safely accessed.
- ◆ Any other personnel, plant and equipment not directly involved are a safe distance away.
- ◆ You have enough overhead clearance to lift the load.
- ◆ You have enough room to move once you have lifted the load, especially if you need to travel with it.
- ◆ The backhoe/loader is in line with the load so it will not swing when it is lifted. This could include being at a 90 degree angle to the excavation area.
- ◆ You have a clear line of sight to the excavations and areas you will be lifting loads into.
- ◆ You have enough swing room to operate the backhoe/loader safely.
- ◆ You are using extended or engaged stabilisers for additional support.

If the load you are going to lift is likely to swing, you can attach taglines to the load. The minimum diameter size of the tagline that can be used to control loads must not be less than 16mm in diameter.



3.4.5 Lifting Techniques

Follow these guidelines whenever using the backhoe/loader to shift a load using slings and lifting gear:



- ◆ Follow directions from the dogger to position the lifting point over the centre of gravity of the load to keep the load from swinging.
- ◆ When you are given the signal perform a test lift then lower the load again so that any changes to the slings and load can be made.
- ◆ Keep all movements smooth and slow.
- ◆ Stop the lift immediately if the weight of the load causes the machine to tilt or if the hydraulics begin to strain.
- ◆ Check the hydraulic hoses and rams before and after lifting to make sure no damage has been done to the equipment.
- ◆ Materials should be moved the shortest distance possible to maintain effective and efficient control of the machine and the load.
- ◆ Constantly monitor the load during any moving activities.
- ◆ Keep the load as low as safe and practical if travelling with the load.
- ◆ The swing zone of the backhoe/loader attachment should be clear.
- ◆ Monitor your speed of travel and stay within safe speed limits.
- ◆ Maintain a safe distance from exposed edges.
- ◆ Follow all hand signals or other designated signals.
- ◆ If the slings shift on the load being lifted stop the backhoe/loader, warn workers in the area, carefully lower the load and have the slings re-positioned and secured.
- ◆ Make sure that if lowering objects such as pipes into trenches that the trench is shored and workers are standing a safe distance away.
- ◆ Land the load at the designated location. Ensure that it is secure and stable.
- ◆ Make sure lifting equipment is properly detached before moving off.

3.4.6 Communicate When Moving and Lifting Loads

Communicating when transporting and lifting loads may involve communication equipment such as two-way radios. Whistles, bells or other devices may also be used as audible signals to assist with movement of loads.

There are also specific hand signals that apply to the lifting and movement of loads. Hand and audible signals are designed to make the lifting and placement of objects safer and more effective.

Make sure you confirm all signals with the dogger who is directing you before you start to shift the load. Make sure you follow all directions given to you by the person who is directing the lift.



Shown here are the hand and audible signals used in Australia:

HAND SIGNALS	
Hoisting Raise  Whistle, Bell & Buzzer Signals 2 Short ..	Hoisting Lower  Whistle, Bell & Buzzer Signals 1 Long —
Luffing Boom Up  Whistle, Bell & Buzzer Signals 3 Short ...	Luffing Boom Down  Whistle, Bell & Buzzer Signals 4 Short
Slewing Right  Whistle, Bell & Buzzer Signals 1 Long, 2 Short — ..	Slewing Left  Whistle, Bell & Buzzer Signals 1 Long, 1 Short — •
Jib/Trolley Out; Telescoping Boom Extend  Whistle, Bell & Buzzer Signals 1 Long, 3 Short — ...	Jib/Trolley In; Telescoping Boom Retract  Whistle, Bell & Buzzer Signals 1 Long, 4 Short —
Stop  Whistle, Bell & Buzzer Signals 1 Short •	
Creep Speed: Appropriate hand signal for motion with hand opening and closing	

3.5 Monitoring Systems and Alarms

Each machine has its own set of alarms, monitoring systems and gauges to help you safely and efficiently operate it, and warn you if something is wrong. Each make and model of the same type of machine can be different so it is important that you are familiar with all of the systems for the equipment you are using. Check the operator's manual for a full list of devices, alarms and warnings.



Here are some examples of the gauges and warning systems for a backhoe/loader:



- ◆ Engine oil pressure.
- ◆ Engine temperature.
- ◆ Hydraulic oil pressure.
- ◆ Hydraulic oil temperature.
- ◆ Electrics.
- ◆ Fuel.

Generally alarms and warnings fit into 3 categories:

Warning Type	Category	Examples	What You Should do
Category 1	These types of warnings let you know that the machine needs some attention, but it is still safe to operate.	◆ Low fuel. ◆ Low system voltage.	Keep operating as long as it is safe to, and report the problem once you stop work.
Category 2	These warnings indicate that there is a problem caused by the way you are operating that may lead to problems with the equipment.	◆ Equipment is overheating. ◆ Equipment is overloaded.	Change the way you are operating and if the problem is not fixed, stop operating and report the issue.
Category 3	This is the most serious warning level. Continuing to operate while this warning is sounding will cause damage to the machine.	◆ The park brake is on. ◆ Low engine oil pressure.	Stop operating and shut down the equipment immediately. Report the problem straight away.

If you hear an alarm while you are operating the backhoe/loader:

- Stop operating and consult the operator's manual or dealer.
- If the problem cannot be fixed, stop operating and report the issue to your employer.

3.5.1 Monitor and Check for Hazards

While you work it is important to always be on the lookout for new hazards, and to check that hazard controls are still in place and working effectively. This will help to ensure the safety of yourself, other personnel, plant and equipment.

Check the following things while you work:

Overhead Power Lines, Structures and Clearances – Know how far you are from overhead power lines at all times. Use a spotter to guide you if you cannot clearly see. Be aware that the distance to the overhead services may be reduced as ground conditions change or stockpiles are created. You also need to be aware of overhead clearances when dumping materials into trucks or other haulage units.

Other Machines – At all times you need to know when other machines are working near the backhoe/loader. Know and stick to your agreed travel paths or roads. Good communication between operators is essential to avoid collisions.



Live Stockpiles – Movement of materials in a live stockpile is likely. There is always the potential for the walls of a stockpile to collapse if it is incorrectly excavated.

Personnel – Good communication is the key to working with other personnel. Be aware of people in the work area. Make sure they are not in danger and are a safe distance from the backhoe/loader. If they are in the way, tell them to leave if they shouldn't be there, or call on someone who is authorised to remove them.

3.5.1.1 Operator Fatigue

Fatigue is one of the leading causes of accidents for operators of all types of vehicles and equipment. Fatigue can be caused by:



Fatigue Warning Signs

Warning signs that you are suffering fatigue include:

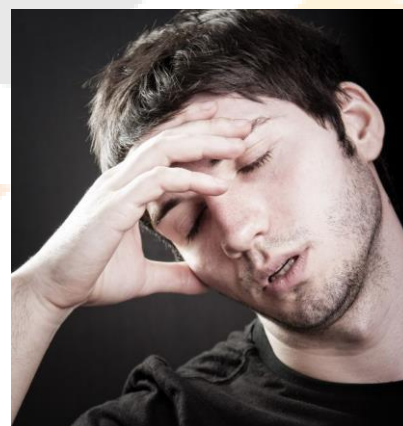
Physical	◆ Slow reaction time. ◆ Tiredness, yawning or sore eyes. ◆ Headaches, stomach or other problems. ◆ Micro sleeps (nodding off for a short period of time).
Mental	◆ Trouble concentrating and thinking clearly. ◆ Shorter than normal attention span. ◆ Boredom, irritability or lack of motivation.
Work	◆ Poor or careless performance. ◆ Overlooking minor but potentially important details. ◆ Lower levels of communication and cooperation with others.

How to Manage Fatigue

It is very important that fatigue is managed properly. Here are some ways you can manage fatigue:

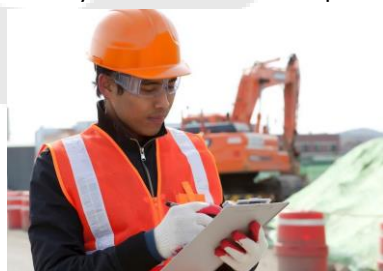
1. Get enough sleep.
2. Drink plenty of water.
3. Take regular breaks.
4. Keep a healthy diet.
5. Keep a reasonable level of fitness.

Talk to your boss or supervisor about breaking up boring or monotonous tasks or rotating the work you are doing with other workers if possible.



3.5.2 Reporting Hazards

Any hazard or environmental issue that you identify during your work will need to be reported. If you have taken any action you will also need to report those details. This could include written or verbal reports.



Your worksite may have standard paperwork that needs to be filled out, for example:

- ◆ Hazard report forms.
- ◆ Work method statements.
- ◆ Other reports or documents.

3.6 Checking Completed Work



The key to completing tasks efficiently is good time management and knowing how to use your equipment properly.

Once you have completed your work you will need to check it against:

- ◆ Your work instructions and project plans and drawings.
- ◆ Project quality requirements and timelines.

Speak to your supervisor when the work is completed to see if there are any other tasks that need to be done to complete the job.

4.1 Park and Shutdown the Backhoe/Loader

Every piece of machinery has slightly different park and shut down procedures. For the exact procedure for the machine you are operating, check the operator's manual.



4.1.1 Parking the Backhoe/Loader

Backhoe/loaders need to be parked in a safe way that will allow easy access to the vehicle.



Safe parking practices include:

- ◆ Stop the backhoe/loader on a flat level surface in the designated area and keep the access points clear.
- ◆ Park the backhoe/loader away from overhangs, excavations, access ways and tidal or flood areas.
- ◆ If the backhoe/loader must be parked on a sloping surface it should be facing across the slope.
- ◆ Keep the backhoe/loader away from refueling sites and areas when parking or you can block the rest of the machines on the site from accessing fuel.
- ◆ Apply all locks and brakes.
- ◆ Move all attachments into the shut down position and release any pressure from the lines.

If the backhoe/loader has to be parked on a public access way, lights, signs and barricades should be erected to warn people.

4.1.2 Shutting Down the Backhoe/Loader

Shut down procedures include:

- ◆ Cooling of the engine before shutting it down. This depends on the backhoe/loader but is usually the same amount of time as the engine warm up time.
- ◆ Monitoring the controlled lowering of temperatures and pressures.
- ◆ Walking around the machine looking for any signs of damage or faults that may have occurred during the task.
- ◆ Securing the backhoe/loader using any applicable lock out or isolation devices and removing the keys. This will prevent any movement of the backhoe/loader.
- ◆ Ensuring equipment is correctly stowed in accordance with site and manufacturer's requirements.



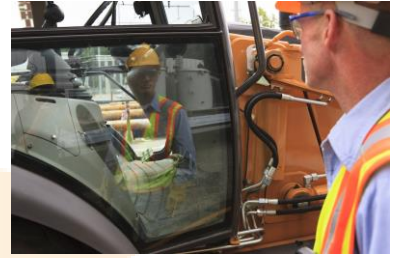
Any problems found during the shutdown procedures need to be documented in the way required by the worksite.

4.2 Post-Operational Checks

Post-operational checks need to be done to make sure the backhoe/loader is ready for the next operator.

General maintenance activities are done to keep all plant and equipment working safely for longer.

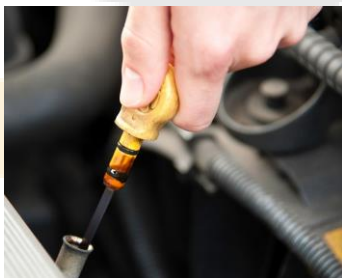
As part of your job as an operator, you need to inspect your machine to find and report any faults or damage that may have occurred during your work activities.



Your inspection should include:

Visual Inspection	Physically looking for anything odd, wrong, broken or damaged.
Visual Inspection of the Environment	Is any fluid leaking?
Signals	Alarms, lights, electronic indicators showing that something may be wrong.
Gauges	Showing temperatures and the levels of fuel, oil and other fluids.

Post-operational checks should include all of the things you look for when conducting pre-start checks. For example:



- ◆ Fluid levels.
- ◆ Condition of tyres.
- ◆ Visibility (windows and mirrors).
- ◆ Hydraulics (rams, hoses and connections).
- ◆ Structure and attachments for damage or wear.

4.2.1 Reporting Faults

Once a fault has been found, it needs to be reported and fixed.

Most sites have a fault report form that will need to be filled in with the details. The form will generally need the machinery or equipment make and model numbers, the site identification numbers, the type of fault and the person reporting the fault.

You also need to make sure the backhoe/loader is tagged out (isolated from use) until the repairs have been made. This will stop anybody from using it before it has been repaired.

Some sites will have a verbal system of reporting where you speak with a supervisor who then documents the fault, while others may require the operator to organise repairs of the fault directly.



4.3 Prepare the Backhoe/Loader for Transportation

Before a backhoe/loader can be moved from one site to another, it will need to be prepared for transport. On most sites it is necessary to:

Clean the Machine Thoroughly	Cross-contamination is an issue for sites. Most will not allow a dirty machine onto site because of cross contamination of weed seeds, dirt particles, bacteria, fuels, or oils.
Empty the Fuel Tank	Fuel should be emptied from the machine as a safety issue if required or if specified in site procedures.
Secure any Moving Parts	Security pins, locking pins and plates applied where appropriate. These pins are designed to keep movable parts from moving.
Lock and Lower the Bucket for Relocation	Sometimes the bucket may need to be removed altogether if the backhoe/loader is a large model.
Remove Attachments	These may need to be removed from the backhoe/loader and stowed appropriately for transporting with the machine.

4.3.1 Move Backhoe/Loader between Worksites



Moving larger plant and equipment between worksites is normally done on a float (trailer) because the machines are too slow, or not allowed to drive on the road.

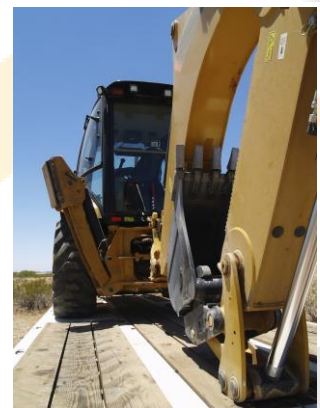
Make sure that an approved traffic management plan is in place. This may include:

- ◆ Stopping other traffic to allow the equipment to move freely.
- ◆ Using escort vehicles where needed.
- ◆ Sometimes a haul vehicle crossing will be established to allow materials movement across public roadways. Always follow designated traffic control and maintain communication with other workers involved.

When transportation is required, you will need to drive the machine onto the float. The safest way to do this is to use a spotter to make sure you are moving onto the float as straight as possible and that you stop in the right position to secure the equipment onto the trailer.

Once the equipment is in place on the back of the float, locking pins will need to be engaged and it will be tied down and secured onto the float.

A spotter would also be used when unloading the vehicle once it gets to the next place.



4.4 Carry Out Maintenance Tasks



Maintenance activities could include:

- ◆ Cleaning the backhoe/loader.
- ◆ Authorised servicing and minor replacements or repairs.
- ◆ Refuelling.
- ◆ Recording and reporting of faults through workplace procedures.

When conducting maintenance activities it is important to keep people in the area safe by using barricades or fences if necessary and locking out machines.

Tasks should be completed within designated areas and others should be informed of what you are doing.

You should conduct servicing, maintenance and housekeeping tasks to ensure the backhoe/loader stays at its operating capacity for as long as possible.

You will also need to coordinate with mechanics, maintenance supervisors or other site workers to ensure the vehicle is serviced at regular programmed intervals.



4.4.1 Servicing and Minor Replacements



Replacements that the operator can make will vary with the backhoe/loader and worksite but could include filters, fluids, wiper blades, attachments, accessories and ancillary items.

If you need to remove the radiator cap on a machine that has not completely cooled off, slightly loosen the cap to release the pressure and then slowly remove the cap. Make sure you use gloves and safety goggles and a rag or cloth when removing the cap.

4.4.2 Vehicle Refueling Procedures

All refueling of equipment needs to be done in line with safety procedures and workplace instructions.

Some sites may have refueling areas for plant and machinery set up to make sure any spills or incidents can be contained without causing damage to the environment. Spill response procedures need to be clear and spill kits available to manage any incident.

Other sites use a service truck or fuel tanker that travels to each machine to refuel. On these sites it is very important that all procedures are followed to avoid any incidents (such as fires in a coal mine environment) or damage to the environment. For example, there may be site rules against refueling plant and equipment near a waterway or sensitive area.



Refueling can be a dangerous activity, so it is important that you know and understand the correct procedures and techniques. If you are not sure what to do, speak with your supervisor.

These are some general guidelines for refueling plant and equipment. Always check the procedure for your work site before any refueling is done.



- ◆ Park the machine in an appropriate location or within a bunded area. This contains any environmentally sensitive fluids or spills from entering and causing damage to the environment.
- ◆ Shut down the machine and apply all brakes and isolations.
- ◆ Leave the cabin, or if company procedures do not allow this make sure you do not restart the machine until you have permission from the refueling operator.
- ◆ If you are responsible for refueling the machine make sure you have the right PPE on before you start. This may include safety glasses, face shields, gloves or other approved gear.
- ◆ Activate the fuel pump correctly and make sure all safety procedures are followed.
- ◆ Shut down the fuel pump once the machine has been refueled.
- ◆ Roll up or safely tidy all fuel lines or hoses.

4.4.3 Processing Maintenance Records

Most sites have workplace forms, logbooks or checklists for writing down details of all machine maintenance work.

They are used to record the history of the machinery and equipment so that all operations and any problems can be monitored.

They are also a way of making sure that all repairs and maintenance are done correctly and on time.



Written maintenance records for your backhoe/loader may include:



- ◆ Inspection checklists.
- ◆ Fault reports.
- ◆ Fuel, oil, hydraulic and other fluid usage.
- ◆ Computer readings of various backhoe/loader functions.
- ◆ Diary entries.
- ◆ Service manuals or logbooks.
- ◆ Repair request forms.
- ◆ Part requisition forms.

You will usually need to include details like the backhoe/loader make and model number, site identification numbers, the type of maintenance carried out, the repairs or replacements that were done and the person who did the work.

Follow your site record keeping and reporting procedures. If in doubt about completing and processing written maintenance records, talk to your supervisor or an experienced worker.



4.5 Clean Up After Work

Once all your backhoe/loader tasks are finished, you will need to clean up the site. This includes removing any tools and equipment that have been used.



4.5.1 Clearing the Work Area

In clearing your work area you will be carrying out housekeeping activities. Housekeeping procedures on your site may include:

- ◆ Eliminating or controlling any potential hazards. Your duty of care means you shouldn't leave a possible source of danger or accident for others.
- ◆ Using the correct PPE – Make sure you use appropriate PPE when dealing with waste or possible hazardous materials as you clear up. For example, chemicals used for cleaning can be dangerous unless used correctly.
- ◆ Removing any hazard controls that are no longer needed, e.g. temporary fences, barricades and signage.
- ◆ Recycling or disposing of materials, e.g. clays, mud, topsoil, organic materials, stones, rocks, gravel and bituminous mixes, paper and site rubbish – Put any waste materials in the bins provided, and recycle where possible, in line with the site plans for environmental management or waste disposal.
- ◆ Maintaining and storing plant, equipment and tools.



Good housekeeping will help you to see any problems or hazards on the worksite. This will help you to make sure the working environment is safe.

It is your responsibility to clean up after your work activities and not leave it to someone else to do.

4.5.2 Clean and Store Backhoe/Loader Attachments

Attachments need to be kept in good working order. This requires correct maintenance such as cleaning the attachments, and storing them in designated storage locations.



Things to consider if your attachments require manual cleaning:

- ◆ Some materials that you work with can become extremely hot and sticky, and could possibly burn through your clothing and skin. Use appropriate cleaning instruments and wear personal protective equipment (PPE) as required.
- ◆ Backhoe/loader attachments such as ripping tynes can be sharp. Clean with care.

Most attachments will have designated storage locations as outlined in the site requirements.

This is to ensure the attachment can be found quickly and easily the next time it is needed, and so that it is kept free from damage.

Storage requirements could include:

- ◆ Must be stored in a padded hard case box – particularly with laser levels.
- ◆ Must be stored in particular environmental conditions such as a certain temperature.

Reading, knowing and understanding the particular requirements for each attachment is the only way of ensuring items are correctly cleaned and stored.

Refer to the manufacturer's guidelines, operator's manual and worksite procedures for each item.



4.6 Process Written Records

Site record keeping procedures keep the site running smoothly.

Part of your role will include completing and processing records for your backhoe/loader and the tasks that you have completed.

As well as the maintenance records you have filled in, some other records, reports and paperwork that may be needed include:



- ◆ Computer readings – from process monitoring, test results, activity reports, and materials readings.
- ◆ Logs – supply logs, work activity logs, training logs, stockpile logs, usage or driver logs.
- ◆ Shift documents – end of shift, end of process, quality information.
- ◆ Fault reports.
- ◆ Hazard reports – including Take-5 forms.
- ◆ Incident reports – accident forms, incident reports, environmental incident reports, WHS investigation reports, quality assurance (QA) reports.

It is important that you keep detailed records of all your activities, especially any problems you had during your shift.

Make sure you keep notes about what happened and what you did to fix it. This includes faulty or broken equipment, operational issues (mistakes or not following procedures correctly for some reason) and any other unusual things.



Appendix A – Backhoe/Loader Inspection Checklist

Backhoe/Loader Inspection Checklist			
Company Name		Date	
Operator Name		Site	
Machine Number		Operator Name	
Check Type (please circle)		Pre-Start Post-Operational	
Component	What to Check for	✓	Comments
External Check			
Tyres and wheels.	Inflation, pressure, damage, covers.		
Loader bucket, linkage and retainers.	Wear, damage, cracks, leaks.		
Backhoe/loader bucket, linkage and retainers.	Excessive wear, damage, cracks, leaks.		
Backhoe/loader stick, boom, cylinders.	Damage, wear, cracks, grease, loose parts.		
Underneath machine.	Leaks, loose parts, damage.		
Frame, steps, handholds.	Condition, damage, cleanliness.		
Hydraulic cylinders, tubes, hoses, fittings.	Damage and leaks.		
Outriggers & stabilisers.	Clean, secure, packing present.		
Covers and guards	Damage, wear, secured.		
Windows, wipers and mirrors.	Cleanliness, damage, fluid levels.		
Decals and signage.	Readability, wear.		
Load capacity plate.	Damage, wear, visible.		
Overall machine.	Loose/missing parts, damage, wear, missing guards and safety devices.		Out of Service Tag Attached? Yes / No
Engine Check			
Fluids.	Engine oil, hydraulic oil, transmission oil, coolant, engine pre-cleaner, brake fluid.		
Batteries.	Cleanliness, loose nuts/bolts.		
Air filter.	Damage, dirt buildup, indicators.		
Radiator.	Damage, leaks, dirt buildup, blockages.		
Hoses.	Leaks, wear, damage.		
Belts.	Tightness, wear or cracks.		
Overall engine.	Damage, dirt buildup, leaks.		Out of Service Tag Attached? Yes / No
Internal/Cabin Check			
Levers, controls and gauges.	Damage, cleanliness, labels, working.		
ROPS.	Damage, cracks, wear.		
Floor plates.	Clear and free of oil/grease.		
Seat and seat belts.	Adjustment, damage, wear.		
Fire extinguisher.	Damage and charge.		
Logbook, running sheet, vehicle history, service sheets.	Present and correct		
Overall cabin interior.	Clean, damage, missing parts.		

			— —
			Out of Service Tag Attached? Yes / No



Component	What to Check for	✓	Comments
Operational Checks			
Master and isolation switches, start switch or key	Present, functioning, damage.		
Joy sticks or levers	Functioning, damage, wear.		
Accelerator and brakes, emergency stopping device	Working, damage, wear, dirt build up on pedals.		
Buckets.	Movements, smooth or jerky.		
Outriggers, stabilisers.	Functioning, secure, packing.		
Air-conditioning, radio, two-way radios, lights, horn.	Functioning, damage, wear.		
Windscreen wipers and washers.	Wear, damage, functioning.		
Gauges.	Oil pressure, fuel level, engine temperature, hydraulics, and speedometer.		
Gear change buttons and or quick shift arrangements,	Damage, wear, functioning.		
Start-up alarms.	Functioning and visible.		
GPS, auto levelling controls.	Working, visible, accurate, damage, wear.		
			Out of Service Tag Attached? Yes / No

Action Taken to Repair Backhoe/Loader:	
Name:	Date of Repair:

Return to Service Authority by Supervisor		
Comments:		
Supervisor Name:	Signature:	Date: