

Learner Name:



Learner Guide

Earthmoving Course

**RIIMPO321F Conduct Civil Construction Wheeled Front End
Loader Operations**

Learner Guide

1.1 Introduction

1.1.1 What Do You Use A Front End Loader For?

- Agriculture – farming
- Construction
- Clean up
- Moving dirt/rocks etc
- Can use for lifting purposes



1.1.2 What Industries Do You Use A Front End Loader In?

- Civil construction



- Mining

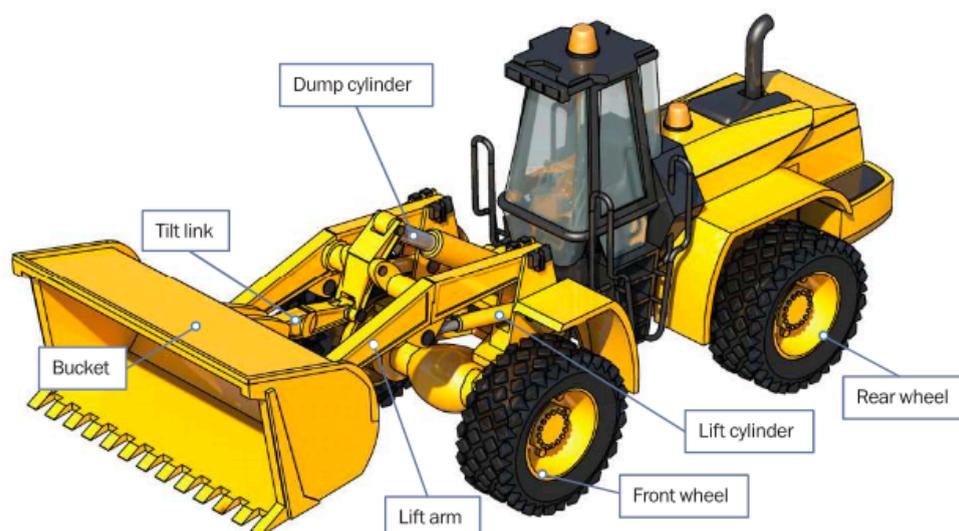


1.1.3 An Example of A Wheeled Front End Loader

A wheeled front end loader is a type of machine, that has a front-mounted square wide bucket connected to the end of two booms (arms) to scoop up loose material such as dirt, sand or gravel and move it from one place to another without pushing the material across the ground.

A wheeled front end loader is commonly used to move material from ground level and deposit it into an awaiting dump truck, stockpile or into an open trench excavation.

Front end loaders can also come in tracked models (refer RIIMPO322 Conduct civil construction tracked front end loader operations).



1.1.4 Who Has Duty of Care?

You have a duty of care. So does anyone who has something to do with the worksite. Duty of care applies to:

Employers/persons conducting a business or undertaking (PCBU). This includes managers, manufacturers/suppliers, importers, designers, inspectors, etc.



Workers. This includes employees, contractors and sub-contractors, employees of labour hire companies, outworkers, volunteers, etc.



1.1.4.1 Worker's Duty of Care

As a worker you must take care of your own health and safety – and the health and safety of others at the workplace. You must not put your own or other people's health and safety at risk.

Never work where you believe a hazard is a serious risk to your health and safety. You must also:

- do your best to follow reasonable health and safety instructions from your boss (PCBU)
- follow workplace health and safety policies and procedures
- do not work where you believe a hazard would be a serious risk to your health and safety.



1.1.4.2 PCBU/Employer's duty of care

The PCBU must:

- Provide a safe workplace
- Train workers and make sure they know what to do on the job
- Try to get rid of risks, or find ways to minimise risks
- Tell workers about any hazards or risks. Workers must know what to do in an emergency.
- Have a workplace safety plan. For example, workers should be trained in the use of fire fighting equipment and first aid equipment.

Penalties

If you are a PCBU/employer or a worker, the government can fine you or even imprison you for failing your duty of care.

Australian standards

Your front end loader (and its attachments) must comply with (meet) the Australian Standard (AS 1418.19).

If you are going to pick and carry a suspended load, the front end loader must have documentation saying it meets Australian Standards.



1.2 General Information

1.2.1 The Basics of Road Construction

A surveyor will stake out the site according to the site plan. The stakes mark where the road will go and any drains or pits, which will help to drain water away from the road area.



An excavator or dozer removes the trees, shrubs and other plants and levels the area. Some trees may be protected with padding or fencing.



Sometimes contractors may use a borrow pit (also called a sand box). A borrow pit is an area where soil, sand or gravel (material) is dug out to be used in another area. Sometimes the borrow pit will become the drains, or water catchment areas at the end of the work.



The excavator or dozer may use material from the borrow pit to build up low areas in the road. They may also build up diversion blocks. Diversion blocks divert water away from the road and into drains.



As the operator shapes the ground, they will usually create drainage at the sides of the road area. They will also make sure there is enough fall (slope) on the road so that water drains away from the road.



Drains are installed to help take water away from the worksite.



A front end loader or dozer shapes the road base. This helps smooth out the surface ready for grading.



A water truck may wet down the ground. This helps the soil to bond.



The grader grades the road to produce a much smoother surface.



A roller or compactor then compacts the road. This breaks up lumps and smooths the surface out.



A site supervisor or roller operator tests the compaction. Sometimes they will use a deflectometer or penetrometer. Some rollers/compactors can test the compaction as they drive.



Many layers of the ground material are built up. This is called the subgrade. Each layer is compacted and tested.



Trucks then deliver subbase. Haul trucks or tip trucks sometimes tip the subbase, and front end loaders spread it.



A water truck may spray water on the subbase to help the soil bond. This makes the particles stick together and make it compact better.



Several layers of subbase are laid. The subbase is compacted and tested.



Once the subbase is at the right thickness and is compacted properly, trucks deliver the course road base. The road base is built up in many layers. Water trucks may wet down the road base if it helps the roller/compactor compact the base.



When the road base is thick enough, and is compacted properly, the road is finished.



If asphalt is being laid, more layers will go on top of the road base. There will be an asphalt base course, then a binder course, and finally, a surface course.



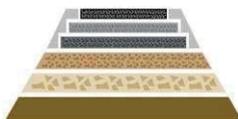
Finally the planting, erosion control and drainage work is completed.



1.2.2 Principles of Soil Technology for Civil Works

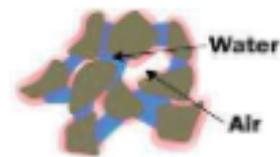
One of the most important jobs you will do, as a machine operator, is to help lay foundations. Foundations are the base for roads, railway lines, swimming pools and buildings. If you do not have a solid foundation, you cannot build something solid on top of it.

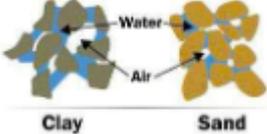
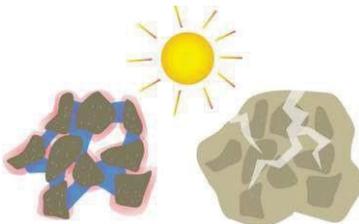
When soil is firmly compacted it has an increased density, this provides a stronger foundation to build on.



In civil construction, moisture content means how much water is in a soil, rock, aggregate or road base. Moisture is very important in earthmoving. Moisture affects the weight of soils. It makes soils swell, and it also affects the handling properties of the soil. Handling properties means how easy or hard it is to work with that soil.

The amount of water in soil affects its viscosity. Viscosity is how thick the soil is. For example dry loose soil has a low viscosity and is easy to work with. Wet muddy soil has a higher viscosity and can be more difficult to work with.



| | |
|---|--|
| <p>All soils usually contain moisture. How much moisture the soil has depends on many things. The weather, drainage, and the soil's ability to hold water all affect the moisture in a soil. Retention properties mean how much water a soil can hold. Different soils can hold different amounts of water. Sometimes you can treat a soil to change its moisture content. To do this you mix a chemical with the soil.</p>  <p>The diagram shows two soil types: Clay and Sand. Clay particles are small and irregular, with blue arrows labeled 'Water' pointing to the spaces between them. Sand particles are larger and more rounded, with blue arrows labeled 'Air' pointing to the spaces between them.</p> | <p>Different types of soils can cause problems with foundations. Wet, boggy soil can cause foundations to sink. That is why it is important to make sure water can run or drain from the site. It is also important that the foundation is built up to the right level. You can sometimes treat wet boggy soil with lime. Lime helps dry out the soil, and helps it 'clump' together.</p>  <p>The illustration shows a green house with a brown roof sitting on a layer of brown, textured soil representing wet, boggy ground.</p> |
| <p>Clay soils can also cause problems under foundations. This is because clay attracts water. When this happens, the clay expands and swells. Later, when it is hot and sunny, the water dries up and the clay cracks.</p>  <p>The illustration shows two clay soil particles. The one on the left is surrounded by blue water molecules and is shown swelling. The one on the right is under a yellow sun and is shown with white cracks, indicating it has dried and shrunk.</p> | <p>Over time, this swelling (expanding) and cracking (while shrinking) can warp your foundations. This can cause cracks and potholes in roads, cracked walls or ceilings in buildings, or swimming pools to crack and leak.</p>  <p>The illustration shows a green house with a brown roof. The house is tilted and has several white cracks running through its walls and roof, indicating structural damage from soil movement.</p> |
| <p>You can treat clay soils with chemicals that stop clay from attracting water. Once you treat the clay, you can compact it. This makes a much better foundation that won't swell and crack as much.</p>  <p>The illustration shows a blue liquid being poured from a blue container onto a mound of brown soil.</p> | <p>Before you use any chemicals, you must make sure they are safe. Check the safety data sheet (SDS) to find out how to safely use, store and handle the chemical. Check the site's environmental management plan. If you are not sure about using a chemical, talk to your site supervisor.</p>  <p>The illustration shows a yellow rectangular sign with black diagonal stripes at the top and bottom. In the center, it says 'SDS' in large black letters, with 'Safety Data Sheets' written in smaller black letters below it.</p> |

1.2.3 Earthmoving Site Hazards

1.2.3.1 Checking for Underground Services

You should always check where services are before you start work. You may phone 'Dial before you dig on 1100'. You may look at the site plan or talk to your supervisor. You may need to look at the location of pits and meters to get an idea of where the services run. You may need to check with the local council or service company. You may even need to get underground detection equipment.

If you hit a service line, contact the provider immediately. You may need to organise to get the



service disconnected while a qualified person fixes the problem.

You can sometimes tell there are services below by the types of ground. Some services are surrounded by a different type of soil, rock or sand. You may notice that the soil is looser, or does not match the soil around where you are digging. There may be a line of tape alerting you to the services.

If you suspect there are services underground, stop working. Check the ground. You may need to excavate the area by hand, or dig in another area.

1.2.4 Operating Techniques

1.2.4.1 Building A Stockpile

A stockpile is a pile of material (soil, sand, rock, etc) that you use for earthmoving work. You must choose a good location for your stockpile. If you choose the wrong location, your stockpile could get washed away or become dirty (mixed with other materials).

| | |
|--|--|
| <p>If you can, choose an area of well drained, firm level ground.</p>  | <p>You should set up drainage so that rainwater does not cause the stockpile to wash away or slide.</p>  |
| <p>Make sure the stockpile is close to the area you are working. You don't want to drive too far to work with the stockpile.</p>  | <p>Make sure you have clear access to the stockpile.</p>  |
| <p>Clear the area of any rubbish or debris, so it doesn't get mixed in the stockpile.</p>  | <p>When you fill out a stockpile, start by filling the area closest to the back of the stockpile area.</p>  |
| <p>Don't work too close to the edge of the stockpile as it could give way.</p>  | <p>Keep filling out the stockpile one row at a time or by dozing material to the correct position on the stockpile.</p>  |

1.2.4.2 Taking from A Stockpile

| | | |
|---|---|---|
| <p>When you take from a stockpile, try and work neatly.</p>  | <p>Take from the top, working down in layers.</p>  | <p>Do not undercut the stockpile. It might collapse on you.</p>  |
| <p>You may need to maintain the stockpile by neatening it up.</p>  | <p>To do this, you push material up that has been spread out. Keep the loading area clean and level.</p>  | |

1.2.5 Environmental Management Plan (EMP)

| | |
|--|--|
| <p>The Environmental management plan (EMP) tells you important things about the environment at the worksite. It explains how the work you are doing could damage the environment. The possibility that you will cause this damage is called the environmental risk.</p> <div data-bbox="320 1312 667 1536" style="border: 1px solid black; padding: 10px; text-align: center;"> <p>Environmental Management Plan</p>  </div> | <p>The EMP tells you what you must do so you do not damage the environment. It tells you how to work in a way that reduces damage to the environment.</p>  |
| <p>The EMP also tells you how the worksite meets all environmental protection laws and what to do with waste.</p> <div style="text-align: center;">  </div> | |

1.2.5.1 Example of an Environmental Management Plan

| | | | |
|---|--|------------------------|--|
| Company Details: | EGA Earthworks - 19 Chandler Road, Boronia. Vic. 3155. | | |
| Work description: | Soil removal | | |
| Date | 12/12/2015 | Contact | Dick Osborne - 0455 555 555 |
| Environmental concerns for the site | Risk Level | Risk likelihood | Protection measures |
| Excessive noise generation associated with the construction and operation of support infrastructure. Public nuisance /complaints. | Minor | Possible | Work on site to be carried out between 7:00am and 6:00pm. |
| Vegetation loss leading to increased runoff during wet periods. | Moderate | Almost certain | Use cut off drains to direct water away from area being worked on. Put silt cloth barrier on high side of trench. Put straw bales in trench to filter water. |
| Mud on surrounding roads near entry and exit points. | Moderate | Possible | Use rumble grids and wash wheels of vehicles leaving site. |
| Dust generation due to removal of top soil. | Moderate | Likely | Use water carts to keep soil moist. |
| Combustion products from exhaust pipes. Air emissions. | Moderate | Likely | Check that catalytic converters fitted to machinery. |
| Damage to remaining trees on site. | Moderate | Possible | Use temporary fencing and/or safety mesh to isolate trees from surrounding work. |
| Approved by: | TJ Crossbow | Signed: | TJ Crossbow |

1.2.5.2 Working with an Environmental Management Plan

When preparing an Environmental management plan (EMP) there are three things you must decide:

1. How serious is the environmental risk?
2. How likely is it to happen?
3. How can you control the risk?

How can you control the environmental risk?

Here are some examples of environmental risks and the controls that could be used. They can be written into an environmental management plan.

Example 1

Risk : Soil and clay spread on residential streets.

Cause : Not cleaning wheels of vehicles leaving the worksite.

Control : Wash wheels or use rumble grids or put gravel at exit points.



Example 2

Risk : Noise.

Cause : Engine noise from heavy machinery.

Control : Work on site to be carried out between 7 am and 6 pm.



Example 3

Risk : Loss of topsoil.

Cause : Driving across a paddock or over vegetation.

Control : Go around the paddock even if it increases the time the job takes.



How serious is the environmental risk?

You can use the following table to rate how serious the environmental risks are.

| Level | Rating | Examples of impact on the environment |
|-------|---------------|--|
| 1 | Catastrophic | Death, injury or illness to humans or animals. Destruction of a heritage site. Toxic release into waterway and groundwater. |
| 2 | Major | Release leading to measurable change to storm water quality. Soil contamination over a wide area. Damage to a heritage site. |
| 3 | Moderate | Short term minor change to ecosystems. On site release that is contained with little contamination. Localised, short-term change in storm water quality. |
| 4 | Minor | On-site release immediately contained. Isolated complaints from the community. |
| 5 | Insignificant | Impact on the environment is too small to measure. |

How likely is the environmental risk?

You can use the following table to rate how likely it is that an environmental incident may happen.

| Level | Rating | Examples of impact on the environment |
|-------|----------------|--|
| A | Almost certain | Environmental concerns that you expect will happen. |
| B | Likely | Environmental problem that has happened in the past and is likely to happen again. |
| C | Possible | Environmental concern that has sometimes been a concern and may happen. |
| D | Unlikely | Environmental concern that has sometimes been a concern but is not expected to happen. |
| E | Rare | Environmental issues that are very unlikely to happen. |

1.2.6 Earthmoving Hazards and Risks

The most common hazards and risks with earthmoving work are:

| | | |
|--|---|--|
| <p>Falls from plant or machinery</p>  | <p>Traffic and other mobile plant</p>  | <p>Overhead or underground power</p>  |
| <p>Underground gas lines</p>  | <p>Water and sewage piping</p>  | <p>Rollovers</p>  |
| <p>Noise</p>  | <p>Dust</p>  | <p>Manual handling</p>  |
| <p>Contaminated soil</p>  | <p>Falling into trenches or excavations</p>  | <p>UV rays (radiation) from working in the sun</p>  |

1.2.7 Decibel Levels of Common Sounds

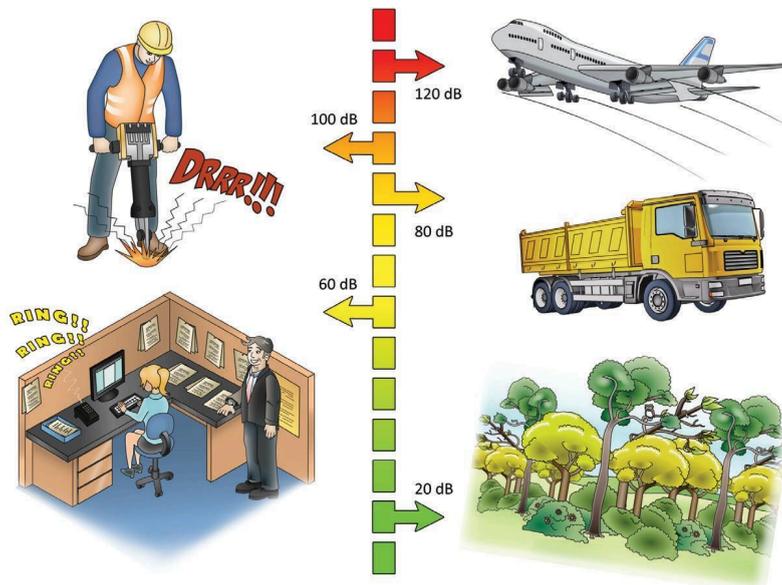
You must wear hearing protection when operating heavy equipment. This is important because 8 hours of noise at 85 db (decibels), or noise levels of 140 db even briefly can permanently damage your hearing.

Hearing loss is:

- Slow
- Painless
- irreversible.

Here are some examples of levels of noise in different environments.

- A forest has about 20 db of noise
- In an office there might be around 60 db
- Standing outside a truck generates about 80 db
- A jackhammer generates around 100 db
- A jet taking off generates about 120 db



1.2.8 Chemicals and Solvents

Chemicals should always have a label, so that you can easily tell what you are working with. They should be stored in a safe place where nobody may accidentally come in contact with them.

Always check the safety data sheet (SDS) before handling any chemicals.

An employer must provide an SDS to a person using chemicals in the workplace. They must make sure the person using the chemical knows how to read and understand the SDS.

If you are not sure about a chemical, put the chemicals in a safe, isolated area and talk to your supervisor.



1.2.9 Fatigue

Fatigue is an acute, ongoing state of tiredness that leads to mental or physical exhaustion and prevents people from functioning normally. It is more than feeling tired and drowsy, it is a physical condition that can occur when a person's physical or mental limits are reached.

Fatigue can happen because of work or lifestyle related factors. Fatigue is a significant hazard and can lead to poor concentration, slow reaction times and increased mistakes.



| Work related factors | Lifestyle related factors |
|---|---|
| <ul style="list-style-type: none"> • Working time • Scheduling and planning (for example: rosters, length and timing of shifts) • Inadequate rest breaks • Lengthy periods of time being awake • Insufficient recovery time between shifts • Payment incentives that may lead to working longer shifts • Environmental conditions (for example: climate, light, noise) • Type of work being undertaken (for example: physically or mentally demanding) • Work demands placed on the person (for example: time frames, deadlines) • The organisation's culture • The person's role within the organisation. | <ul style="list-style-type: none"> • Inadequate or poor quality of sleep due to sleep disorders • Social life • Family responsibilities • Other employment • Travel time • Health and wellbeing (for example: nutrition and diet, exercise, pain, illness). |

1.2.5.1 Signs of Fatigue

You should be able to identify signs of fatigue in yourself and others. A person who is affected by fatigue may display the following signs:

- Headaches and/or dizziness
- Wandering or disconnected thoughts, daydreaming, lack of concentration
- Blurred vision or difficulty keeping eyes open
- Constant yawning, a drowsy relaxed feeling or falling asleep at work
- Moodiness, such as irritability
- Short term memory problems
- Low motivation
- Hallucinations
- Impaired decision-making and judgment
- Slowed reflexes and responses
- Reduced immune system function
- Increased errors
- Extended sleep during days off work
- Falling asleep for less than a second to a few seconds, and being unaware they have done so (otherwise known as micro-sleeps)
- Drifting in and out of traffic lanes or missing gear changes and turn offs when driving.

Dizziness



Confusion



Low motivation



1.2.5.2 Managing Fatigue

Sleep is the only effective long term strategy to prevent and manage fatigue. While tired muscles can recover with rest, the brain can only recover with sleep. The most beneficial sleep is a good night's sleep taken in a single continuous period.

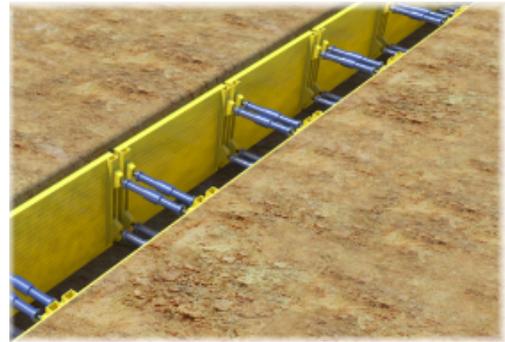
1.2.10 Safety around Trenches

There is a risk that a person could fall into an open trench or excavation on a worksite. People working in trenches are at risk of being crushed or trapped if the trench caves in. You must try to reduce this risk. Isolation is a good way to reduce the risk. You could put up para-webbing, barriers or temporary fencing. You may put trench shields with guard rails.



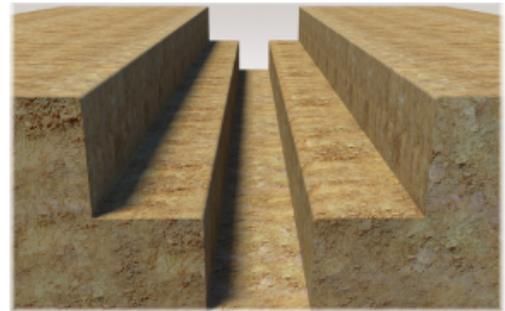
1.2.10.1 Trench Shields and Shoring

If a trench is 1.5 metres deep or more you must use trench shields or shoring. You should use trench shields that have approved lifting points. The shields weight must be permanently marked on the shield. If the shield does not have its weight marked, it must be rigged by a licenced dogger or rigger. The shoring must meet Australian Standard 4744: Steel shoring and trench lining equipment. It must also come with an instruction manual. You should secure a ladder for workers to get in and out of the trench.



1.2.10.2 Benching

Benching is where you cut levels in the soil to reduce the fall risk. For example, instead of having a single 2 metre trench, this area is excavated in two (2) levels. The first level is a 1 metre drop and is 3 metres wide. The second level is 1 metre x 1 metre.



1.2.10.3 Battering

Battering is where the edges of a trench are 'tapered' back on a gentle slope. Battering means that instead of a straight drop off, you have a more gentle slope. In this example, the drop off has been 'battered' back so the fall hazard is reduced. Benching and battering reduce both the fall risk and the risk of collapse.



1.2.11 Confined Space

A confined space is an enclosed or partially enclosed area. It is an area that was not designed for people to go into. It may have no natural or mechanical ventilation. There are also hazards (such as a gas or flammable substance) that makes it dangerous.

Gases in the atmosphere such as LPG, which are heavier than air, may enter spaces like trenches, underground tanks or pits displacing oxygen.

When you drive a petrol, gas, or diesel machine into a space like this you create a hazard. The exhaust gasses can fill the space. Dangerous gases like carbon monoxide can build up in the area. You can't smell all the

dangerous gasses or fumes. You might breathe in a dangerous gas and not even know it. The gas could make you unconscious or even kill you.

You must be trained to work in a confined space, you must also have a permit. The permit makes sure you have thought about all hazards and controls, including a rescue plan, and that you have a team there to help you in case something goes wrong. You must get your permit approved by a supervisor.

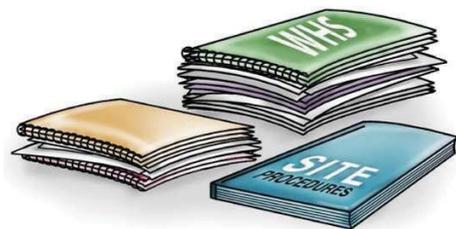
If you are going to work a machine in a confined space, you might need a catalytic converter installed. A catalytic converter takes out harmful gasses (like hydrocarbons, carbon monoxide and nitrogen oxides) and turns them into harmless gasses (like carbon dioxide, water and oxygen).



1.2.12 Worksite requirements

Examples of documents and training your employer should provide include:

- Safety plan for the site
- Emergency procedures, for example a site evacuation plan
- Environmental management plan for the job.

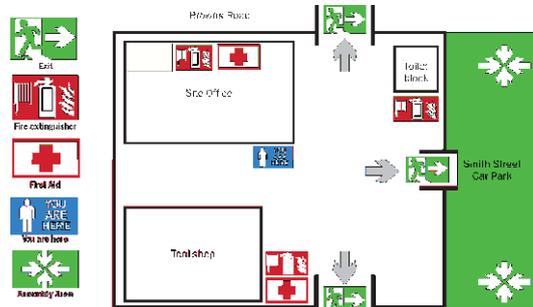


1.2.13 Emergency Evacuation Plan

Many worksites have an emergency evacuation plan which is displayed on the noticeboard.

You should make sure you know how to interpret this plan.

For example, start by looking for a 'You are here' sticker on the plan drawing. Note how nearby areas are shown on the plan. Then work out where the emergency exit is – on the plan and in real life.



1.2.14 Disposing of Environmentally Sensitive Fluid

There are times when you will need to dispose of environmentally sensitive fluids. You may have to deal with oil spills or chemical spills.

There are disposal companies who remove used oil, oily water and emulsions, waste grease, filters, rags, brake fluids and coolants.

Oil is a good example of an environmentally sensitive substance that needs to be disposed of properly.



The damage oil and chemicals can do

If oil ends up in landfill, it will slowly leach into surrounding land and underground water. Storm water and sewage, polluted by oil, can cause long term damage to coastal and marine habitats and ecosystems, seabirds, mammals, fisheries and people.



1.2.15 Clean Up

1.2.15.1 Recycling Items

Many environmentally sensitive items can be recycled. Items such as batteries, oil and gas cylinders can sometimes be recycled and reused. Some oils can be taken to a recycling centre. With oil, bring your materials to the recycling centre in a clean, plastic container with a lid. The original container is a good container to return the oil in.



Pressure Clean

You may need to pressure clean the wheels, tyres, or attachments.



1.2.16 First Aid and Emergencies

Employers should make sure there are trained first aiders and first aid kits available. The employer should make sure:

- The first aid kits are checked, maintained and kept in a clean dry place.
- There are clear signs indicating the location of first aid kits.
- They have recorded and displayed the numbers and location for emergency services (or local doctors or hospitals).



1.2.16.1 Reporting Incidents

As a PCBU, employer or self-employed person you must report serious incidents to the SafeWork authority in your state. You must give a written report within 48 hours if any of the following happen on a site you are controlling:

| | | | |
|--|--|--|--|
| <p>A death</p>  | <p>An injury that requires medical treatment</p>  | <p>Exposure to a substance that requires treatment</p>  | <p>Other injuries or health issues caused from a workplace incident.</p>  |
|--|--|--|--|

The authorities may send an inspector to come and examine the site. You must leave the site as it is, unless you need to; protect people, help an injured worker, make the site safe, or stop other incidents happening. The inspector will tell you when you can continue working normally.

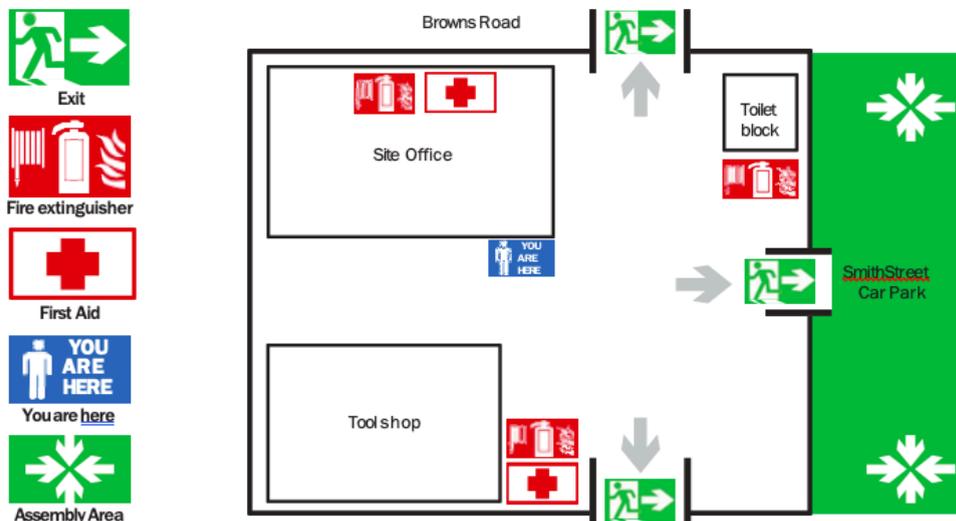
1.2.17 Safety Plan

The safety plan may tell you things like:

- How to use tools and equipment safely
- How hazards and risks need to be controlled
- Emergency procedures
- Emergency exits and assembly areas
- What PPE to wear
- Safe areas to park machinery.



1.2.17.1 Site Evacuation Plan (Example)



1.2.18 Tools and Equipment

Here are some typical tools and equipment you might need. Remember, if your workplace has a policy about what PPE you need to use, you must use it.

Personal protective equipment (PPE)

- Steel cap boots
- High visibility safety vest
- Hearing protection
- Hard hat
- Goggles/glasses
- Gloves
- Dust mask



Hand tools

- Shovel and levels
- Socket sets
- Screwdrivers or wrenches
- Wire brush
- Spanners



Maintenance equipment

- Grease gun
- Tyre pressure gauge



Lifting equipment

- Slings
- Chains
- Shackles



1.2.19 Defective Parts

If you notice a defective part, for example, a fuse is blown or not working, you should arrange to have it replaced immediately. You must check the rules for your site and your state or territory. In some states only licenced mechanics are allowed to do any repairs.



1.2.20 Job Safety and Environment Analysis (JSEA) or Safe Work Method Statement (SWMS)

These forms help you plan for the work you will do. It is very important you fill these out before you start work. They help you work out the tools, equipment and PPE you need to do the job safely. All workplaces should have these types of forms.

Example:

| Job safety and environment analysis (JSEA)/Safe work method statement (SWMS) 123456 | | | | | | | |
|---|------|---|------|--------------------------|------|---|---|
| 1. ACTIVITY/TASK INFORMATION AND LOCATION | | | | | | | |
| Location/Project: | | 123 Belmaine Highway, Roseville | | | | | |
| Activity or Task Description: | | Load spoil from excavation right hand turn lane | | | | | |
| Competency/Qualification needed to do work safely: | | All operators have current tickets | | | | | |
| 2. HAZARD IDENTIFICATION | | | | | | | |
| Location/Area Hazards | Rate | Work/Task Hazards | Rate | Work/Task Hazards | Rate | | |
| Area | | Visibility and hearing | | Plant/machinery | | | |
| Entry or exit is difficult | | Poor lighting | | Plant or Machinery | | X | 8 |
| Engulfment/entrapment | | Poor visibility | | Tools/equipment | | | |
| Work at heights | | Bright lights/UV | | Traffic | | X | 8 |
| Confined space | | High noise levels | X | Pedestrians | | | |
| Remote location | | Communication difficulties | | Railway | | | |
| Rescue could be difficult | | Services | | Pneumatics | | | |
| Temperature extremes | | Multiple electrical feeds | | Process lines | | | |
| Hazardous/Toxic substances (attach MSDS) | | Electrical hazards - LV | | Suspended loads | | | |
| | | Electrical hazards - HV | | Slips/trips/falls | | | |
| Gases/oxygen/chemicals | | Overhead power | X | Slips/trip hazard | | | |
| Poisonous gas/es | | UG services (gas, power, water) | | Fall hazard | | | |
| Explosive/flamable gas | | Hazardous/toxic substances | | Other | | | |
| Oxygen levels (high or low) | | Pressurised fluids | | Sharp materials | | | |
| Inhalable dusts/fibres | | Gas cylinders | | Confined space | | | |
| Hazardous/toxic substances (attach MSDS) | | Flammable materials | | Work at heights | | | |
| | | Toxic materials | | Welding/Grinding | | | |
| Exposure | | Acids/solvents | | Manual handling | | | |
| Heat/Cold | | Other chemicals | | Using ladders | | | |
| Sunlight/ Radiation | X | Inhalable dusts/fibres | | Using EWP's | | | |
| | | | | | | | |

| 3. PPE | | 4. ACCESS/EQUIPMENT/ISOLATION | | 5. ENVIRONMENTAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--------------|--------------------------------------|----------|--|--|--------------|--|--|--|--------------|-------|----------|-------|-----------------------|---|---|---|---|---------------|---|---|---|---|-----------------|---|---|---|---|-----------------|---|---|---|---|-------------|---|---|---|---|
| Hands, feet and body | | Access equipment | | Environmental Hazards ✓ x Rate | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gloves (type) | X | Scaffold | | Air pollution (dust, fumes) | X 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Safety boots | X | Ladders | | Noise (plant and equipment) | X 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Long sleeves/pants | X | EWP | | Spills to drains/waterways | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| High visibility vest/clothing | X | | | Spills to ground | X 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Head and face | | Static plant/equipment: | | Soil erosion | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Safety glasses/sun glasses | X | | | Hazard to flora/fauna | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Full face shield | | | | Other: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hearing protection | X | Mobile plant/equipment: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hard hat | X | Excavators, Loaders, Trucks, Machine | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dust gas mask | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Breathing apparatus | | Safety/emergency equipment: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Welding face shield | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fall protection and access | | Isolation and warnings | | Risk Rating Table: Use the following table to rate the risk. • 1-2 = Low • 3-4 = Medium • 5-6 = High • 7-8 = Extreme | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Safety harness | | Barricades | X | <table border="1"> <thead> <tr> <th rowspan="2">Likelihood: (How likely is it to occur)</th> <th colspan="4">Consequences</th> </tr> <tr> <th>Catastrophic</th> <th>Major</th> <th>Moderate</th> <th>Minor</th> </tr> </thead> <tbody> <tr> <td>Almost Certain</td> <td>8</td> <td>7</td> <td>6</td> <td>5</td> </tr> <tr> <td>Likely</td> <td>7</td> <td>6</td> <td>5</td> <td>4</td> </tr> <tr> <td>Possible</td> <td>6</td> <td>5</td> <td>4</td> <td>3</td> </tr> <tr> <td>Unlikely</td> <td>5</td> <td>4</td> <td>3</td> <td>2</td> </tr> <tr> <td>Rare</td> <td>4</td> <td>3</td> <td>2</td> <td>1</td> </tr> </tbody> </table> | Likelihood: (How likely is it to occur) | Consequences | | | | Catastrophic | Major | Moderate | Minor | Almost Certain | 8 | 7 | 6 | 5 | Likely | 7 | 6 | 5 | 4 | Possible | 6 | 5 | 4 | 3 | Unlikely | 5 | 4 | 3 | 2 | Rare | 4 | 3 | 2 | 1 |
| Likelihood: (How likely is it to occur) | Consequences | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Catastrophic | Major | Moderate | | Minor | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Almost Certain | 8 | 7 | 6 | | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Likely | 7 | 6 | 5 | | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Possible | 6 | 5 | 4 | | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unlikely | 5 | 4 | 3 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rare | 4 | 3 | 2 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fall protection equipment | | Group isolation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fall arrest equipment | | Personal locks or lock out tags | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other: | | Warning signs | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Area lighting | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Other: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Traffic controllers | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. PERMITS (Attach and record number) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hot work | | Excavation | | Hazardous work | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Access-to-work areas | | High voltage | N/A | Confined space | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Job safety and environment analysis (JSEA)/Safe work method statement (SWMS) 123456

| 7. JOB STEPS, HAZARDS AND CONTROLS | | | | | |
|------------------------------------|-------------------------------|--|------------------------------|--|-----------------------------|
| Step (No.) | Job Step (Describe each step) | Hazard/Environmental Issue | Risk Rating (Before control) | Control | Risk Rating (after control) |
| 1 | Set up traffic control | Traffic in busy intersection | 8 | Barriers and flag person supplied by ABC Traffic. | 1 |
| | | Noise of traffic and plant | 7 | Hearing protection must be worn at all times. | 1 |
| | | Sunlight | 4 | Long sleeve pants, tops, hard hats with visor and sunglasses. | 1 |
| 2 | Unload excavator from float | Excavator sliding on ramps | 5 | Pedestrian exclusion zones 1.5 x excav. height. Operator wear seat belt. | 3 |
| 3 | Excavate turn lane | Powerlines overhead | 8 | Power will be isolated. This must be confirmed before starting. | 1 |
| 4 | Load tip truck | Location of tip truck and drivers while loading. | 8 | Traffic controllers will direct drivers where to safely park. Drivers must remain in truck while being loaded. | 1 |
| 5 | Load excavator on float | | | | |
| | | Dust and noise | 5 | Noise restrictions limit work to between 6am-5pm. Water truck available to reduce dust if needed. | 2 |
| | | Spills to ground | 5 | Pre-op checks on excavator before work. Spills kit on site if needed. | 2 |

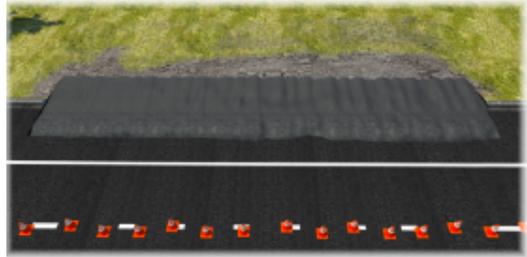
| 8. CONSULTATION AND WORKER OFF | | | | | |
|---|----------------------|------|------|-----------|------|
| By putting my signature below I confirm that I have attended a briefing and understand and will comply with all environmental and safety issues, as described in this JSEA/SWMS. I have reviewed and will comply with all necessary paperwork including permits, SDS, isolation plants etc. | | | | | |
| Name | Signature | Date | Name | Signature | Date |
| Dick Osborne | <i>Dick Osborne</i> | 2/4 | | | |
| Paul Williams | <i>Paul Williams</i> | 2/4 | | | |
| Jason Tennant | <i>Jason Tennant</i> | 2/4 | | | |
| Amanda Jones | <i>Amanda Jones</i> | 2/4 | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| 9. FINAL APPROVAL/SIGN OFF | | | |
|----------------------------|----------------|-----------------------|------|
| | Name | Signature | Date |
| Approved by: | Mark Alabaster | <i>Mark Alabaster</i> | 2/4/ |
| Approved by: | Duncan Morton | <i>Duncan Morton</i> | 2/4/ |
| Customer/Client | N/A | | |

1.2.21 Calculation

1.2.21.1 Working Out How Much Material You Need

The work plan has an area which is 4 metres × 20 metres that must be covered by a layer of road base of 150 mm depth.



How many square metres of road base are to be laid?
How many cubic metres of road base will you need?

Step 1:

To work out the square metres, multiply the Length (L) by the Width (W).

$$L \times W = \text{Square metres}$$

$$4 \text{ m} \times 20 \text{ m} = 80 \text{ square metres}$$

This can also be written as:

$$80 \text{ m}^2 \text{ or } 80 \text{ square metres}$$

Step 2:

Convert the layer thickness from millimeters to metres.

To do this divide the layer thickness by 1000

$$150 \text{ mm} \div 1000 = 0.15 \text{ m}$$

Step 3:

Multiply the square metres by the layer thickness to get the cubic metres.

$$80 \text{ square metres} \times 0.15 \text{ m} = 12 \text{ cubic metres}$$

This can also be written as:

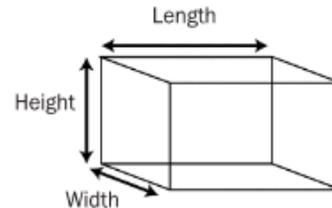
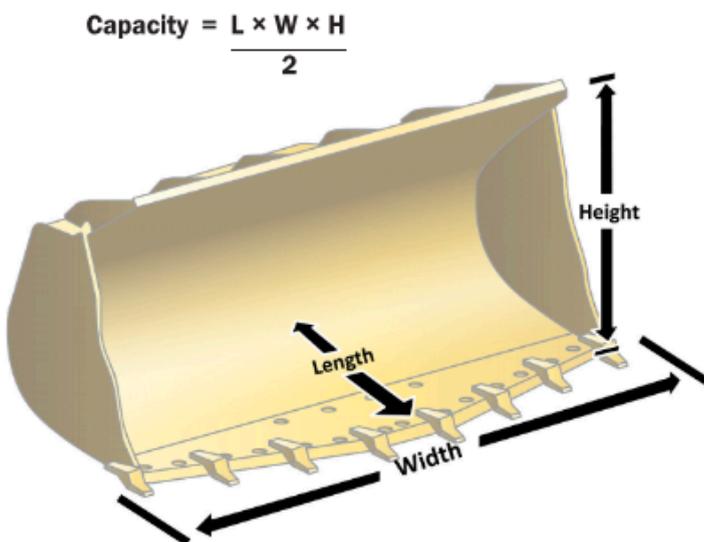
$$12 \text{ m}^3 \text{ or } 12 \text{ cubic metres}$$

Answer:

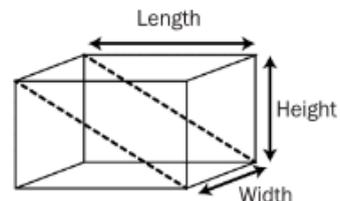
There are 80 square metres of road base to be laid.

You will need 12 cubic metres to cover the area to 150 mm depth.

1.2.21.2 How to Find the Cubic Capacity of A Bucket



Cubic capacity of cube
 $= L \times W \times H$



Cubic capacity of bucket
 $= L \times W \times H \div 2$

Cubic capacity is $\div 2$ because of the shape of the bucket (a triangular prism)

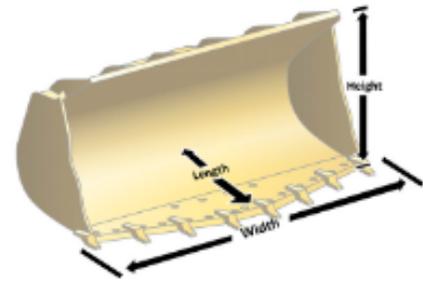
1.2.21.3 Loading A Truck to Capacity

This truck has an 8 tonne load capacity. Dry beach sand weighs 2 tonnes per cubic metre.

How many buckets will it take to fill the truck to capacity using a bucket with these dimensions?

Bucket dimensions:

- Length = 2 metres
- Width = 1 metre
- Height = 1 metre



Step 1:

To calculate the capacity of the bucket, use the formula:

$$L \times W \times H \div 2$$

$$2 \times 1 \times 1 \div 2 \\ = 1 \text{ cubic metre}$$

Capacity of the bucket
= 1 cubic metre

Step 2:

The weight of dry sand is known (see Table of Common Weights).

Dry sand weighs 2 tonnes per cubic metre

Weight of material
= 2 tonnes (per cubic metre)

Step 3:

The bucket has a capacity of 1 cubic metre. So a full bucket of dry sand will weigh 2 tonnes.

Bucket capacity
× Weight of material
(per cubic metre)

$$1 \times 2 = 2 \text{ tonnes}$$

Each full bucket of dry beach sand weighs 2 tonnes.

Step 4:

Truck load capacity is 8 tonnes.

$$8 \text{ tonnes (truck)} \\ \div 2 \text{ tonnes (per bucket)} \\ = 4 \text{ buckets}$$

Answer:

It will take 4 buckets of sand to fill the truck to capacity.

2.1 Plan and Prepare for Water Vehicle Operations

2.1.1 Work Health & Safety Legislative Requirements

'Laws to keep your workplace safe'

WHS/OHS requirements are outlined in Acts, Regulations, Codes of Practice and Australian Standards.

WHS/OHS Acts

'WHS/OHS Acts' are laws that explain how to improve health and safety in the workplace.

For example: Model National WHS Act, June 2011.

WHS has the same meaning as OHS in this document.



Regulations

'Regulations' explain specific parts of the Act.

For example: Part 4.3 – Confined spaces, Part 4.4 – Falls.

Codes of Practice/Compliance Codes

'Codes of Practice' are practical guidelines on how to comply with (meet the rules of) legislation.

For example: HAZARDOUS MANUAL TASKS Code of Practice, 23rd December 2011.

Australian Standards

'Australian Standards' are work guidelines that set the minimum accepted performance or quality for a specific hazard, process or product.

For example: AS 2550 – Cranes, hoists and winches – safe use set.

2.1.2 Where to Find WHS Information

You can check these websites for more information about workplace health and safety. The National WHS Act started in some states/territories on January 1, 2012.

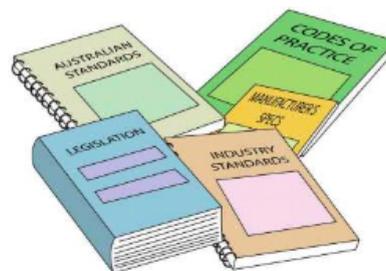


What are the National Work Health (WHS) and Occupational Health and Safety (OHS) Acts about?

The Acts explain how to keep your workplace safe and healthy. They explain what you need to do to meet your duty of care.

For example:

You must make sure you do earthmoving work in a way that won't put yourself or others at risk. You must use earthmoving equipment according to instructions.



Note:
Check your state requirements as Acts may vary from state to state.

Under WHS/OHS laws, what are your responsibilities while working?

You must work in a way that is safe. You must not risk the health and safety of yourself or others.



What do codes of practice explain?

Codes of practice are practical guidelines on how to comply or follow the rules in legislation/laws.

For example:

A traffic management code of practice will tell you all the rules a traffic controller must follow. For example, a traffic controller must have a zero percent blood/ alcohol concentration/ reading while performing traffic control duties.



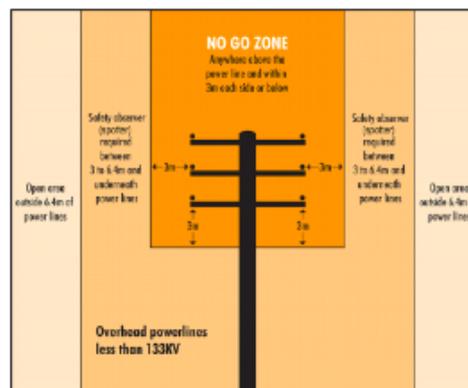
What do Australian Standards explain?

Australian Standards are work guidelines that set the minimum accepted performance or quality for a specific hazard process or product.

For example:

A2250.1-2011 - Powerline distances

This standard tell you the distances you can safely work near powerlines on poles and towers.



What are examples of documentation you need to read before doing earthmoving work?

- Health and Safety Acts and Regulations
- Codes of practice
- Standards, eg: AS 2598-1995 Earthmoving machinery
- Manufacturer's specifications
- Operator's manual
- Site requirements and procedures
- Work and/or quality requirements
- Drawings and sketches of the work to be done
- Company policies and procedures for employment and workplace relations, Equal opportunity and disability.



Why should you check the operator’s manual before using earthmoving equipment?

The operator’s manual tells you how to operate your machine. The manual also tells you about maintenance (how to keep your machine working well).



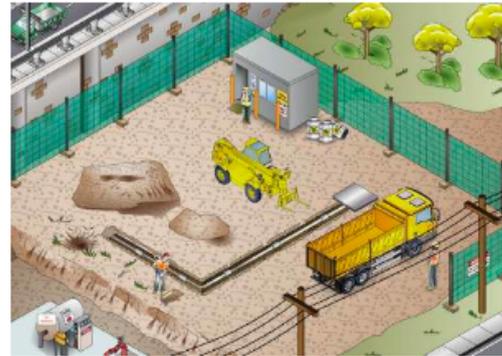
What kinds of information do you need before starting work?

- Plans – Drawings and sketches outlining what you need to do
- Specifications – rules and details about the job
- Operational details – how you will do the job
- Quality requirements of the job – the standards you are expected to meet.



Why do you need to know what other people are doing on site?

- To make sure you will not get in the way of other jobs being done
- To make sure you know what others are doing near where you must work.



What are quality requirements?

The quality requirements tell you the standards you must meet when doing earthmoving work. They tell you what you need to do and how to do it to satisfy the customer. You may need to follow codes of practice, regulations, national standards etc.

| Slab Foundation Preparation. Quality & Specification check list. | | |
|---|--|------------|
| ✓ | Job stage | Checked by |
| | Correct area pegged out | |
| | Vegetation removed | |
| | Top soil removed and dusted/piled | |
| | Slab size pegged out in correct location | |
| | Slab size pegged out to correct size | |
| | Level markers in place | |
| | Site leveled to pegs | |
| | Crushed rock is correct size as per specification | |
| | Slab area boxed to correct height off floor | |
| | Crush rock is the correct height as specified | |
| | Reinforcing at correct spacing and depth | |
| | Crushed rock is level to specification | |
| | Crushed rock covers the specified area | |
| | Crushed rock compaction meets specifications | |
| | Compacted crushed rock base is at the specified height | |
| | Slab preparation meets specification and ready for concrete contractor | |
| | Contractor notified _____ @ _____ AM / PM | |

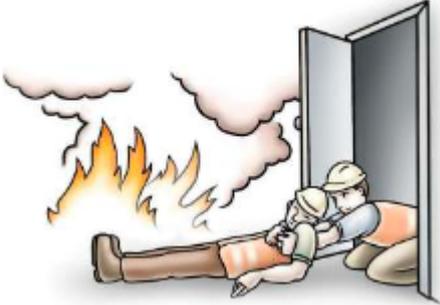


What do the job's work instructions explain?

Work instructions explain:

| | | | |
|--|----------------------------|-----------------------------------|--|
| What to do in unexpected situations like bad weather | What the job is | Where the job is | |
|  | | | |
| How to do the job safely | How long the job will take | What tools and equipment you need | How to do the job from start to finish |

If a fire starts what are four (4) steps that should be taken?

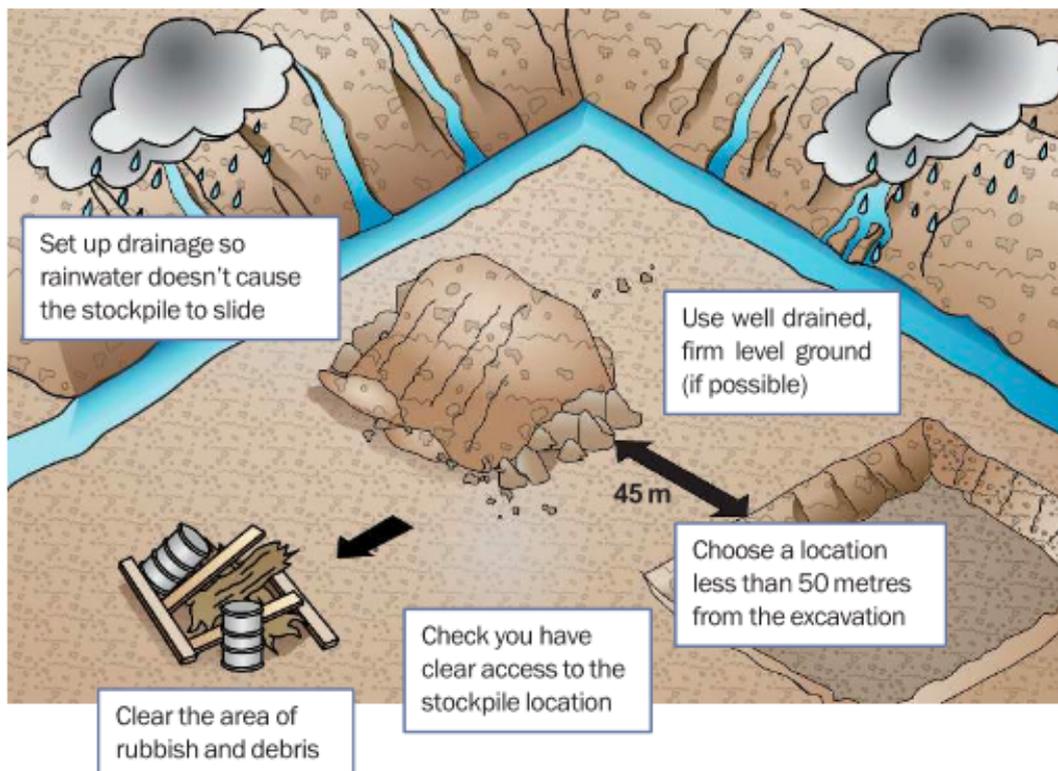
| | |
|--|---|
| <p>Remove any person from immediate danger</p>  | <p>Alert others nearby (and your supervisor if possible) to call the fire services</p>  |
| <p>Control and extinguish the fire if possible</p>  | <p>Evacuate the area if the fire cannot be controlled.</p>  |

Why is it important to co-ordinate your work activities with others at the worksite both before and during operation?

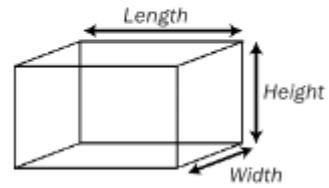
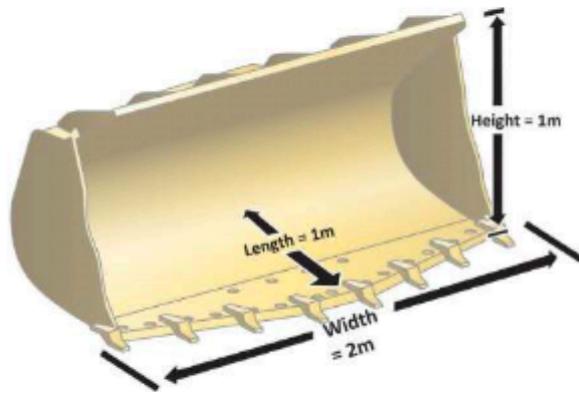
This is important so work can be planned in a way where it will not interfere with the work of others. During work activities you must continue to co-ordinate activities with others so changes can be made to work plans if necessary.



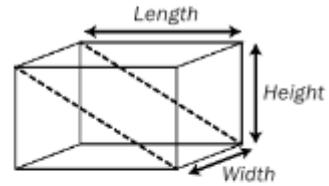
How do you choose and set up a location for a stockpile?



$$\text{Capacity} = \frac{L \times W \times H}{2}$$



Cubic capacity of cube = $L \times W \times H$



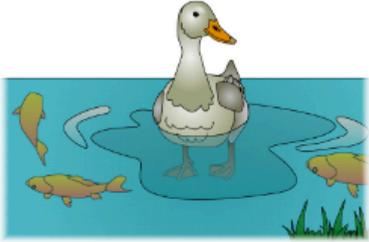
Cubic capacity of bucket = $L \times W \times H \div 2$
 Cubic capacity is $\div 2$ because of the shape of the bucket
 (a triangular prism, or half of a rectangle)

2.2 Identify and Control Hazards

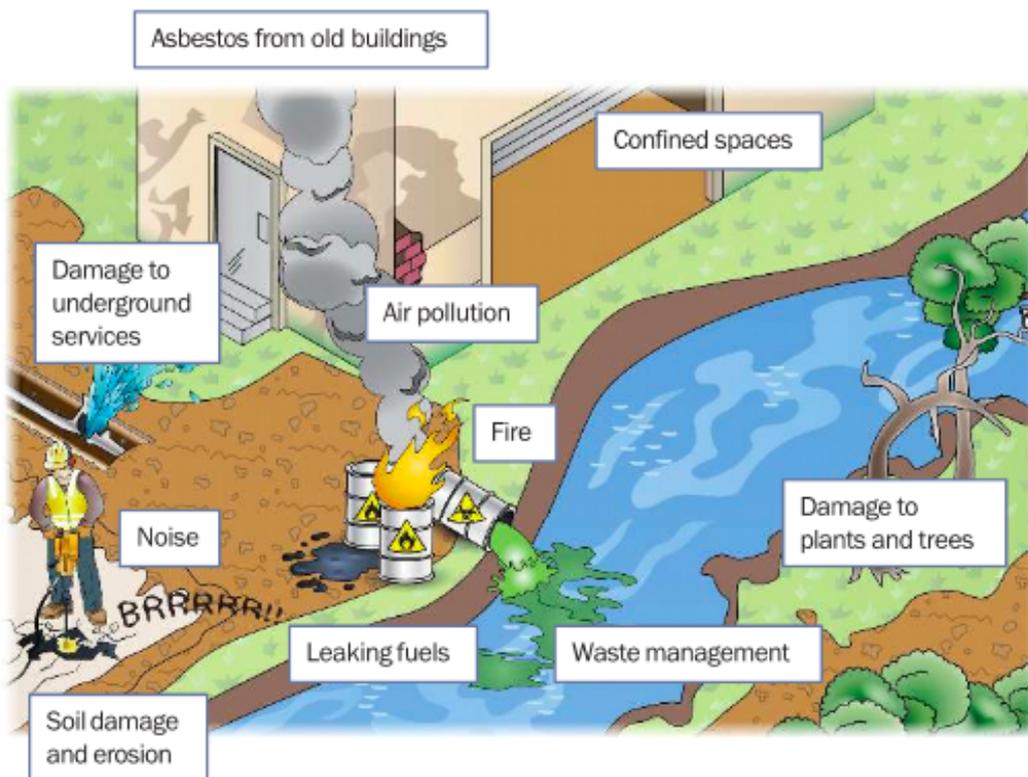
What does the environmental management plan (EMP) tell you?

The EMP tells you:

| | |
|---|---|
| Possible risks to the environment on the worksite | How to work in a way that reduces damage to the environment |
|---|---|

| | |
|---|---|
|  |  |
| <p>How the worksite meets all environmental protection laws</p>  | <p>Who is responsible for each part of the environmental management plan (EMP)</p>  |

What environmental challenges should you be careful of when working?



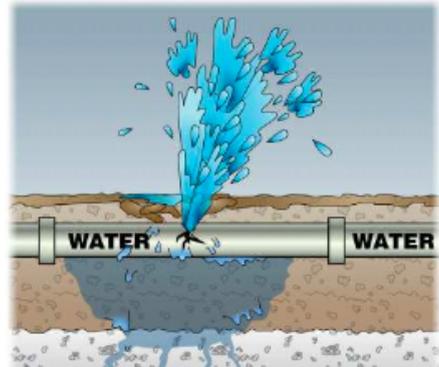
What could happen if you damage an underground gas line?

You could cause a gas leak, and maybe an explosion.



What could happen if you damage an underground water pipe?

You could cause a water leak, and the water could be polluted.



What is the danger if you damage an underground electrical cable?

There is a risk of an electric shock.



Who do you talk to if you damage an underground cable, gas line or other service?

You must tell your supervisor. Your supervisor will tell the relevant authority.



You are using the front end loader for demolition work. What extra protection do you need?

A falling object protective structure (FOPS).



Why should you check the noise laws for your state/territory before starting work?

Because there are rules about how early or late you can work.



What does the safety plan tell you?

The safety plan tells you how the worksite intends to meet all the safety rules. It tells you:



| | |
|---|--|
| <p>How to use tools, plant and equipment safely</p>  | <p>Emergency procedures and exits</p>  |
| <p>How to park safely and where to park</p>  | <p>How to control hazards and risks</p>  |

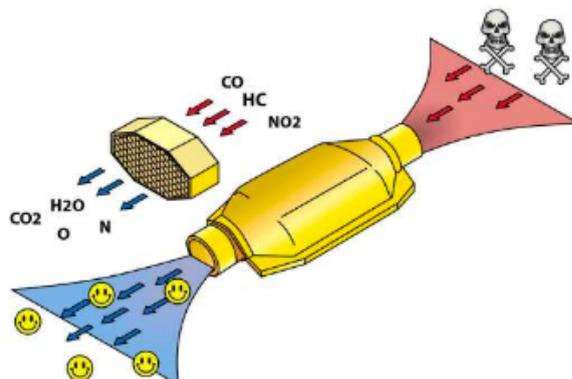
Why is it dangerous to leave the engine running in an enclosed space?

The exhaust fumes cannot escape the space, so the gasses might suffocate you or people in the enclosed space.



If you must work in a tunnel or enclosed space, what must the backhoe/loader have?

The backhoe/loader must have a catalytic converter or scrubber. Try to get as much fresh air as you can.



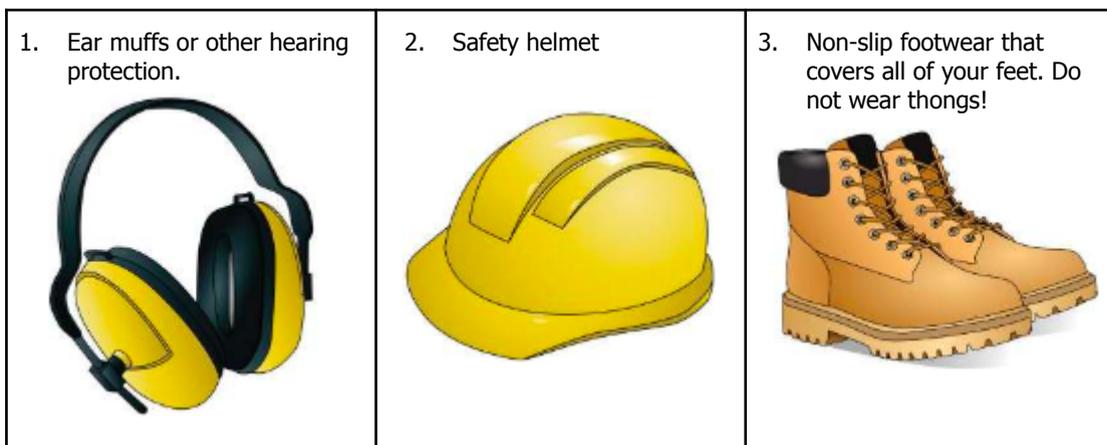
There is a trench near a pedestrian footpath. How can you stop people falling into the trench?

Put up barricades, guard rails or fencing. Use signs to warn people of the danger.



What kinds of personal protective equipment (PPE) should you use when:

- 1. The work area is noisy?**
- 2. Something might fall on you?**
- 3. You are operating equipment?**



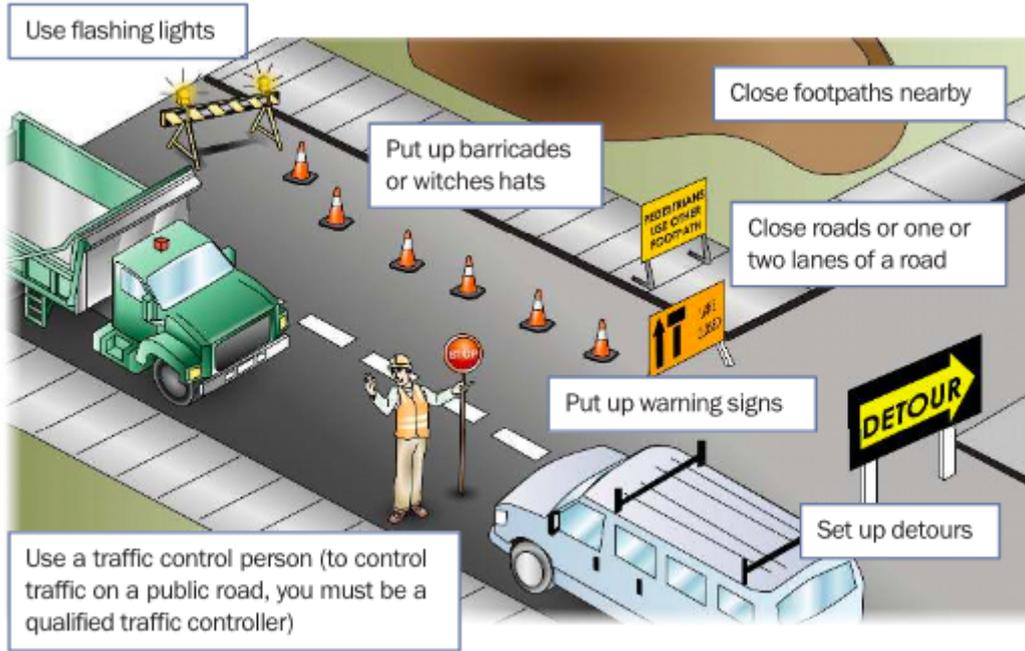
What does the traffic management plan (TMP) tell you?

It tells you how to control vehicles in and around the worksite. It helps keep the site safe for you and others. You may require a traffic control licence in your state or territory.



What can you do to control traffic in and around a worksite?

You can:



Where do you put up warning signs?

| | |
|--|---|
| <p>Near underground services. For example, gas and water pipes</p>  | <p>On the site fencing</p>  |
| <p>In places you need to control traffic</p>  | <p>Near trenches</p>  |

What safety action do you need to take when checking the pressure for inflating/deflating a tyre fitted to the wheel that has a split safety-locking ring?

Do not stand in front of the wheel

WARNING:
Inflate the tyre in a cage (if available) or stand to one side.



Use a gauge with a chuck.

WARNING:
This job may need to be done by an authorised fitter. Check with your supervisor.



How do you safely get in and out of the backhoe/ loader's cabin?

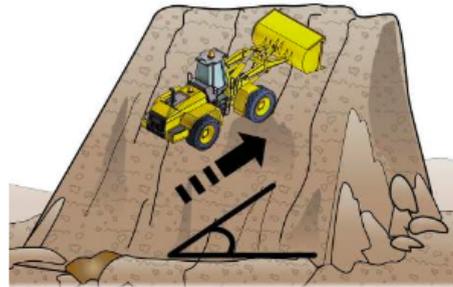
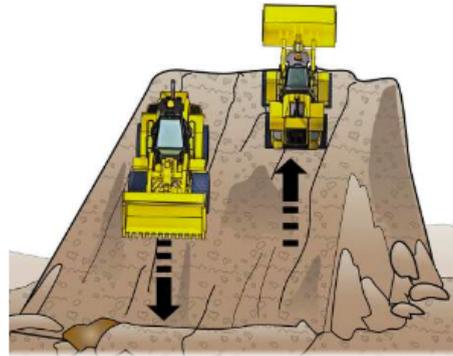
Always use three (3) points of contact facing the machine. For example, use two hands and one foot or two feet and one hand.



*3 Point Contact
(Both hands and foot)*

Which way should you travel when driving on sloping ground?

Go straight up or down the hill, not at an angle.



What do you do if you find a fault with the loader?

For example you might see a bulge in a hydraulic hose or a damaged radiator hose.

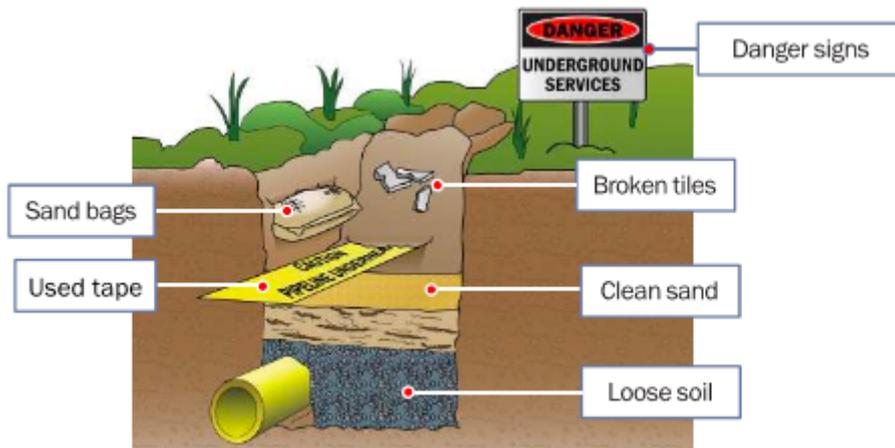
| | |
|--|---|
| <p>1. Stop working</p>  | <p>2. Tag out the machine</p>  |
| <p>3. Record the fault in the logbook or daily inspection checklist.</p>  | <p>4. Report to your supervisor. Have the hose replaced.</p>  |

Who can you ask about underground services on the worksite?

| | |
|---|---|
| <p>Ask your site supervisor</p>  | <p>Call 'Dial Before You Dig' on 1100 as a guide to services location only. Ask a specialist consultant to check the site.</p>  |
| <p>Ask the local supply authority (for example, the electricity, gas or water company).</p>  | <p>Check the council maps for the site</p>  |

How can you tell you are near an underground service?

Look for:

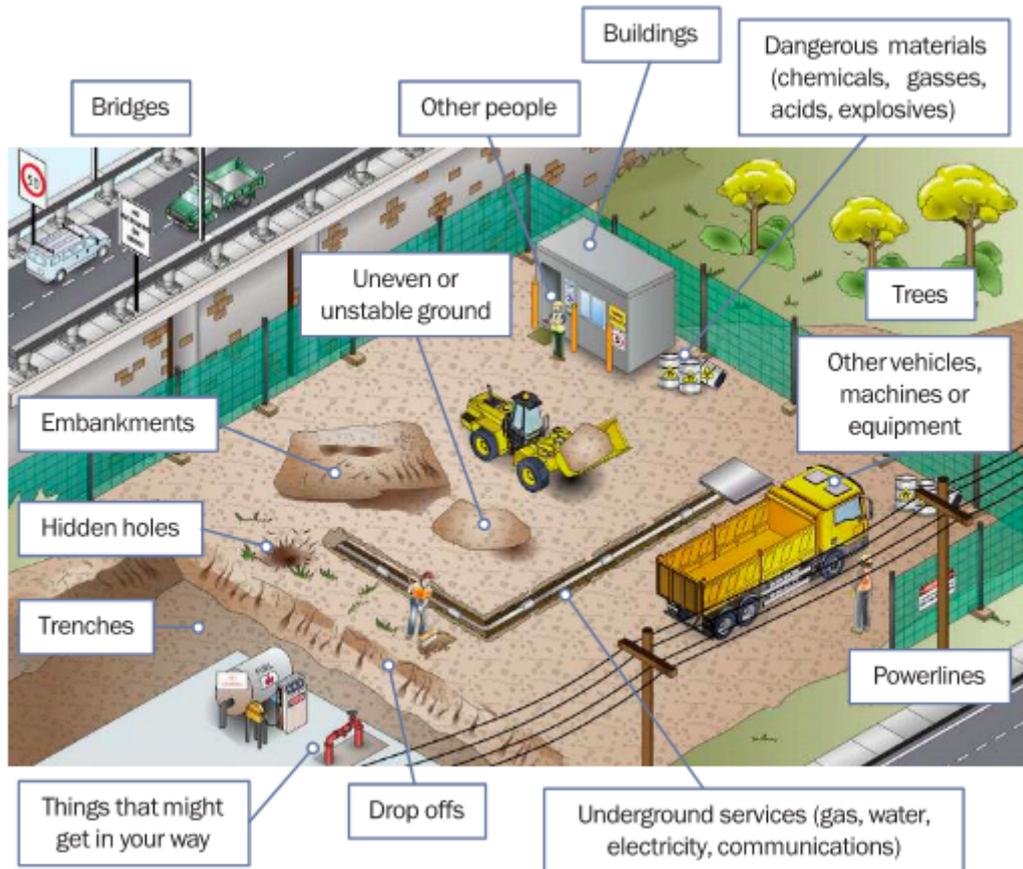


What should you use to excavate if you think there's an underground service nearby?

Stop. Use a hand tool to expose the service lines. Dig carefully so you won't cause damage.

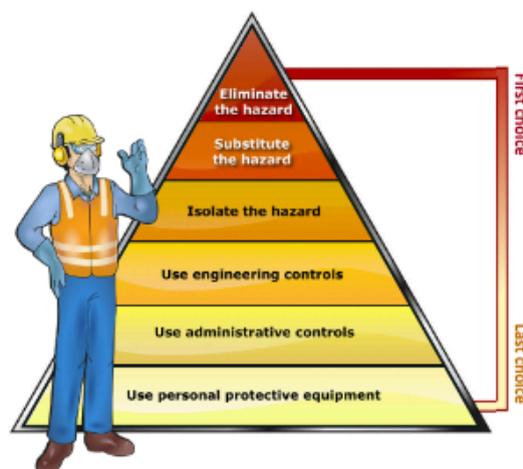


What are some hazards you must look for before starting work?



The hierarchy of hazard control is a list of controls you can use to lower the danger from a hazard on the worksite. What are the six (6) levels in the hierarchy of hazard control from the first choice to the last choice?

1. **Elimination:** If possible, remove (take away) the hazard.
2. **Substitution:** Use a safer method if you can't remove the hazard.
3. **Isolation:** Stop access to the hazardous (dangerous) area.

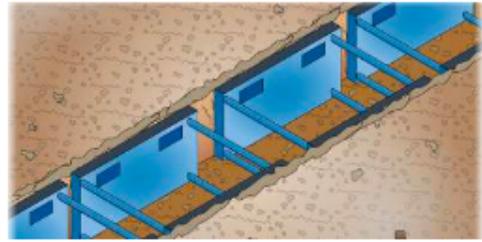


4. **Engineering Control Measures:** Change the tools, equipment or environment to make it safer.
5. **Administrative Practices:** Reduce the time the worker is exposed to the hazards by using training, job rotation, the timing of jobs, etc.
6. **Personal Protective Equipment (PPE):** Use PPE as your **last line** of defence.

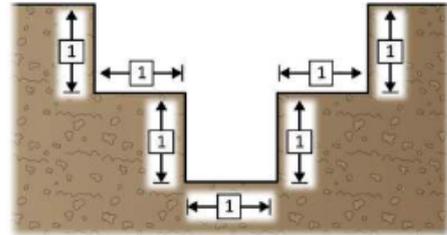
Memory aid: Every Saturday I Eat A Pie

How can you prevent a trench or excavation from caving in on you?

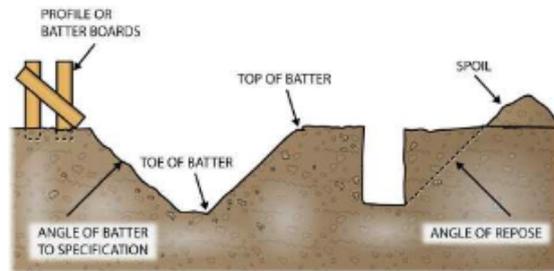
Shoring or trench shields. You must use shoring if the excavation is more than 1.5 metres deep. Use shoring in any unstable ground.



Benching

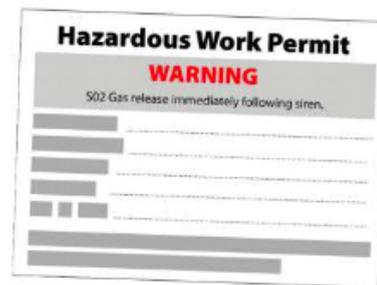


Battering



You will work in a hazardous area, for example, a confined space. What type of permit might you need to get?

You may need to get a hazardous work permit.



2.2.1 Overhead Powerlines on Poles (National Standard)

These are usually 'Low Voltage'. This means powerlines of less than 133KV. The information below is taken from the National Standard.

Always check the distances for your state or territory, as they may be different.

AS2550.1 Powerline distances

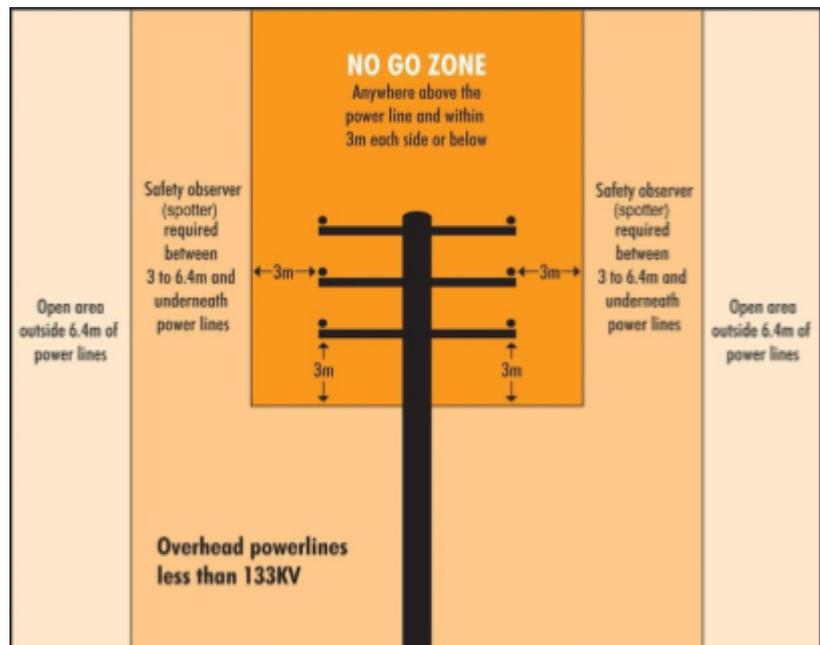
Powerline distances "Look up and live!"

Always check overhead for powerlines and make sure you and any equipment or materials you are using do not come into contact with them.

The safe operating distances for working near powerlines are outlined on the following pages. A spotter is required if you are working between 3 to 6.4 metres from distribution lines on poles.

The term 'spotter' is defined as a safety observer who is a person competent for the sole task of observing and warning against unsafe approach to overhead powerlines and other electrical apparatus.

(In Victoria the spotter must be registered by Energy Safe Victoria).



2.2.2 Overhead Powerlines on Towers (National Standard)

These are usually 'High Voltage'. This means powerlines of more than 133KV. The information below is taken from the National Standard.

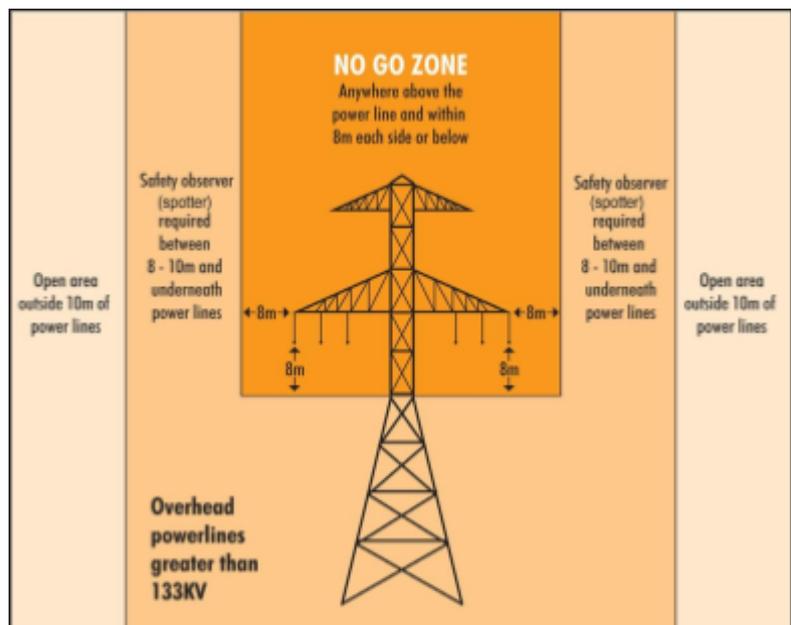
Always check the distances for your state or territory, as they may be different.

AS2550.1 Powerline distances

A spotter is required if you are working between 8 to 10 metres from transmission lines on towers.

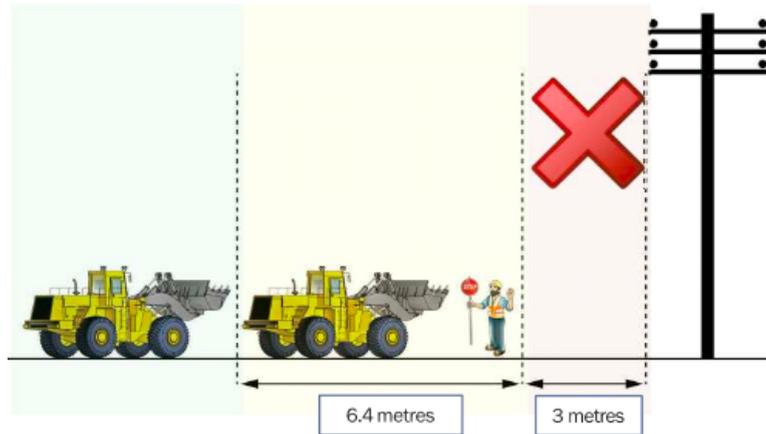
The term 'spotter' is defined as a safety observer who is a person competent for the sole task of observing and warning against unsafe approach to overhead powerlines and other electrical apparatus.

(In Victoria the spotter must be registered by Energy Safe Victoria).



What is the minimum safe distance from powerlines?

Check the Australian Standards or distances in your state/territory. For example:



You are operating a front end loader and it touches live powerlines. What do you do?

Try to stay calm. Stay in your seat if possible. Tell other people to keep away.



Try to lower the bucket away from the powerlines. Ask someone to get the power turned off.



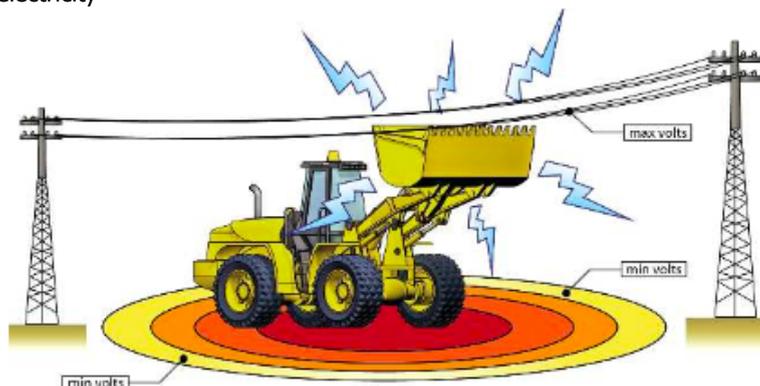
In an emergency if you are alone or you think the machine might catch fire, jump well clear of the machine.



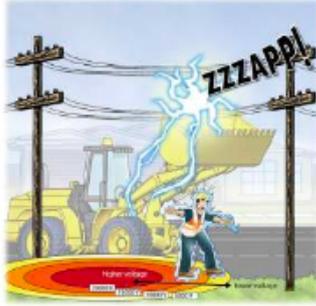
Never touch the ground and the machine at the same time – you may be electrocuted and killed.



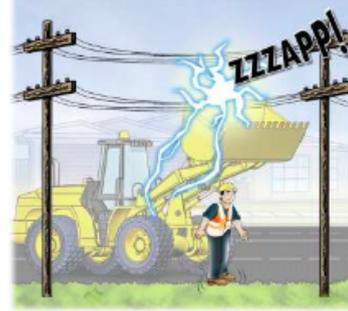
Area affected by electricity



Do not make contact with different ground areas at the same time



Shuffle away keeping your feet closely together



What is fatigue?

It is a physical condition that can occur when a person's physical or mental limits are reached.

The only way to overcome fatigue is uninterrupted sleep



What are some causes of fatigue?

Inadequate or interrupted rest breaks



Lengthy periods of time being awake



Insufficient recovery time between shifts.

| | Monday | Tuesday | Wednesday | Thursday | Friday |
|--------|----------|----------|------------|----------|----------|
| Start | 6.00 AM | 6.00 AM | 4.00 AM | 8.00 AM | 7.00 AM |
| Finish | 12.00 AM | 12.00 PM | 12.00 Noon | 2.00 AM | 11.00 PM |
| Total | 18 hrs | 18 hrs | 8 hrs | 18 hrs | 16 hrs |

How can you tell someone is fatigued?

Constant yawning, a drowsy relaxed feeling or falling asleep at work



Slowed reflexes and responses



Falling asleep for less than a few seconds, and unaware they have done so.



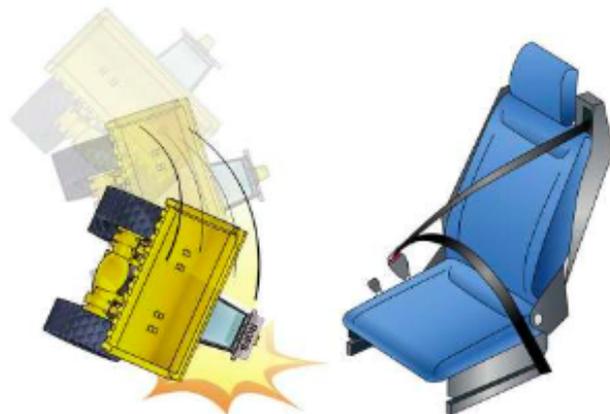
You should never lift people in the bucket. Why is this?

The bucket is not made to lift people. There is a risk of a person being injured in the bucket. This is also illegal and you may be prosecuted.



Which safety devices on a loader help protect you from being hurt or killed if it rolls over?

A roll over protective structure (ROPS) and a seat belt. Always wear the seat belt when using a loader!



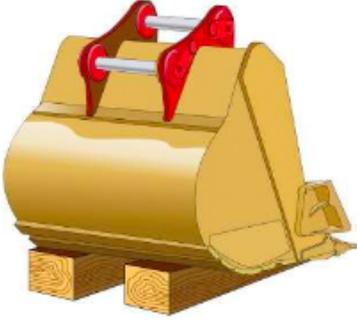
What might happen if you undercut a stockpile, trench or bank?

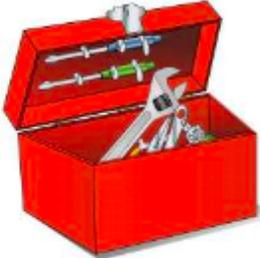
It could collapse.



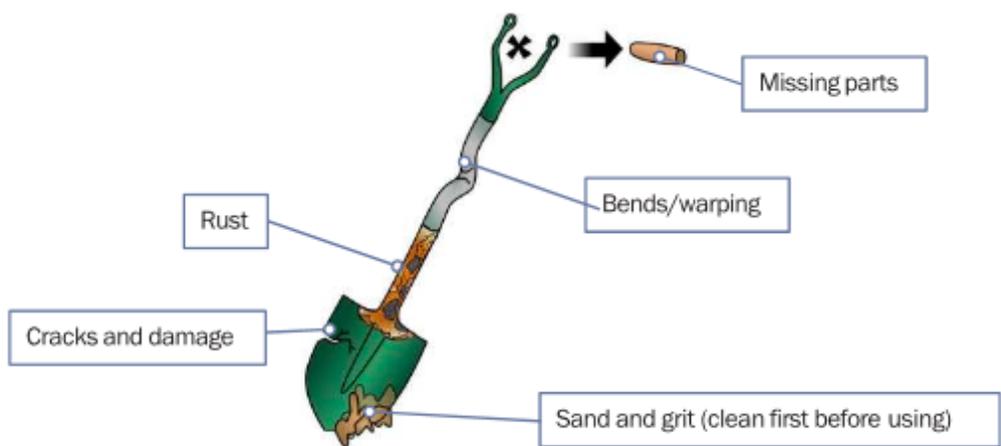
2.3 Check and Monitor Equipment

What kinds of tools and equipment might you use when doing earthmoving work?

| | |
|--|--|
| <p>Chocks, blocks or safety bars to stop the bucket dropping.</p>  | <p>Crow bars</p>  |
| <p>Hand tools such as spanners, ratchets, wrenches, screwdrivers and hammers.</p>  | <p>Socket set</p>  |
| <p>Laser level</p>  | <p>Wire brush</p>  |
| <p>Welder</p>  | <p>Jack</p>  |

| | |
|---|---|
| <p>Grinder</p>  | <p>Oxy set</p>  |
| <p>Portable lighting</p>  | <p>Grease gun</p>  <p>Other hand tools that come with the front end loader.</p>  |

What kinds of faults do you check hand tools for?



What do you do with faulty hand tools?

If you can, arrange to have them repaired. If that is not possible, tag them as faulty, or put them in the rubbish.



When do you test and inspect the front end loader?

Every day. Always test and inspect before you use the loader. You do this to make sure it's safe to use.

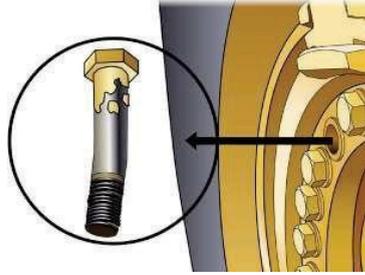


What pre-operational checks do you do before using the loader?

Look for leaks under the machine



Check tyre condition, tyre pressure and wheel nuts.



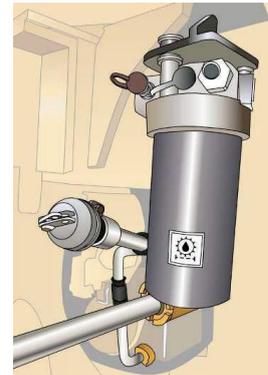
Check the fuel gauge to make sure the backhoe/loader has enough fuel.



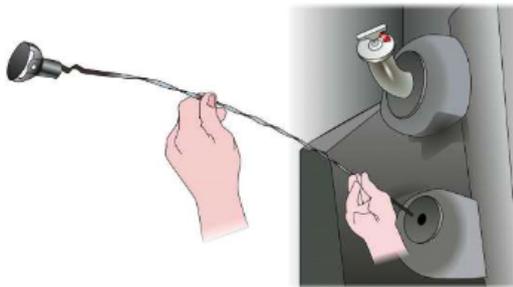
Check hydraulic fluid



Check transmission oil



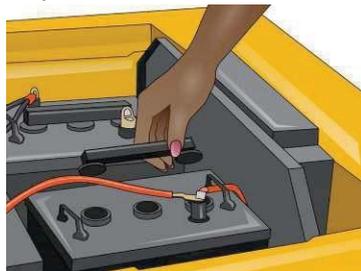
Check engine oil



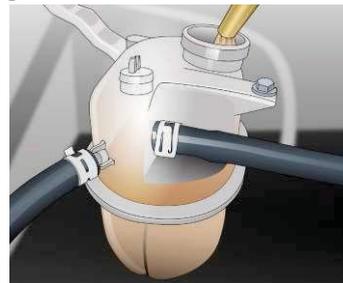
Check power steering fluid



Check battery water level



Check engine coolant



Check air filter

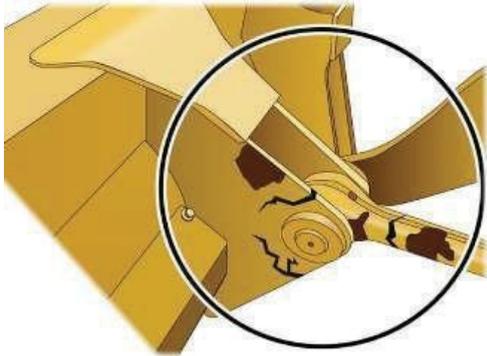


Check the air tank (if fitted) and drain condensation.

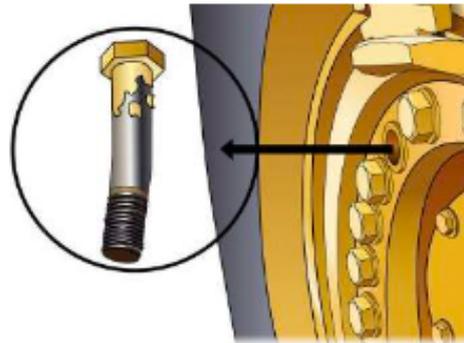


What checks do you do to the loader's moving parts and safety features?

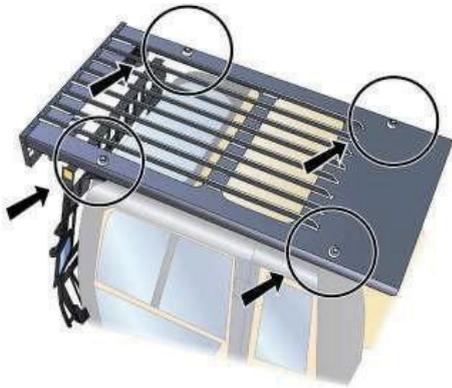
Check the condition of attachments



Look for broken or damaged parts



Check that mounting bolts are attached on the falling object protective structure (FOPS)



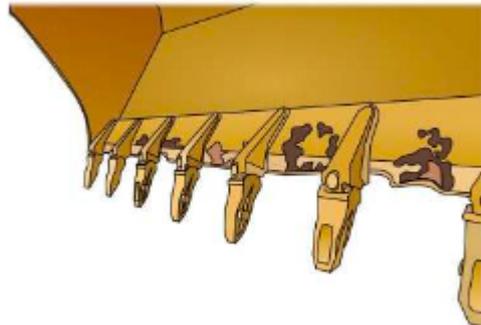
Look for damage to the roll over protective structure (ROPS).



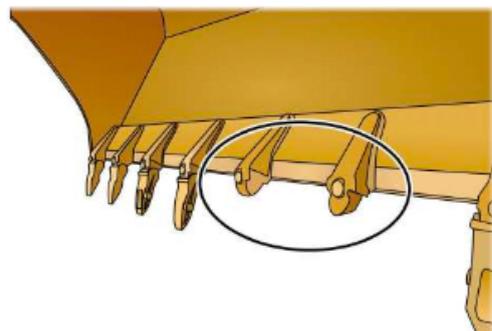
Check oil leaks from hoses, fittings and hydraulic rams



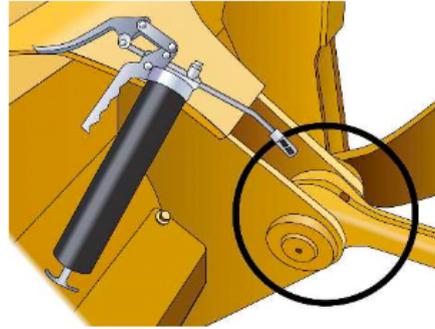
Check worn cutting edge or skid plates.



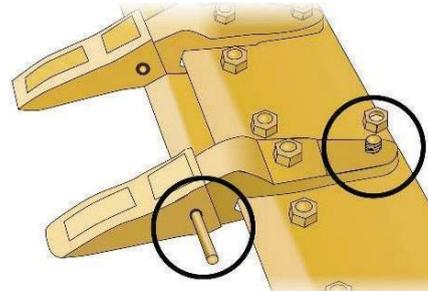
Check worn, loose or missing teeth



Check grease nipples

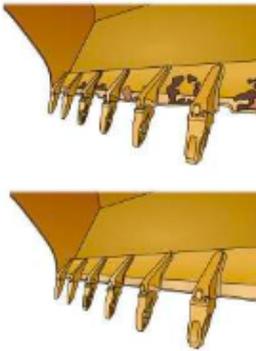


Check missing pins and keepers



When checking attachment pins, how do you make sure they won't fall out?

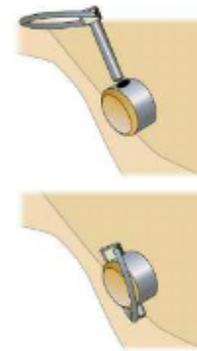
Check if the keeper plate is worn



Check for damage

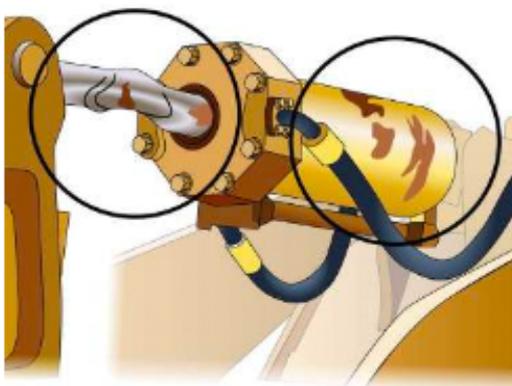


Check the pins are not missing



What problems do you check the hydraulic system for?

Damaged or bent hydraulic rams



Leaks

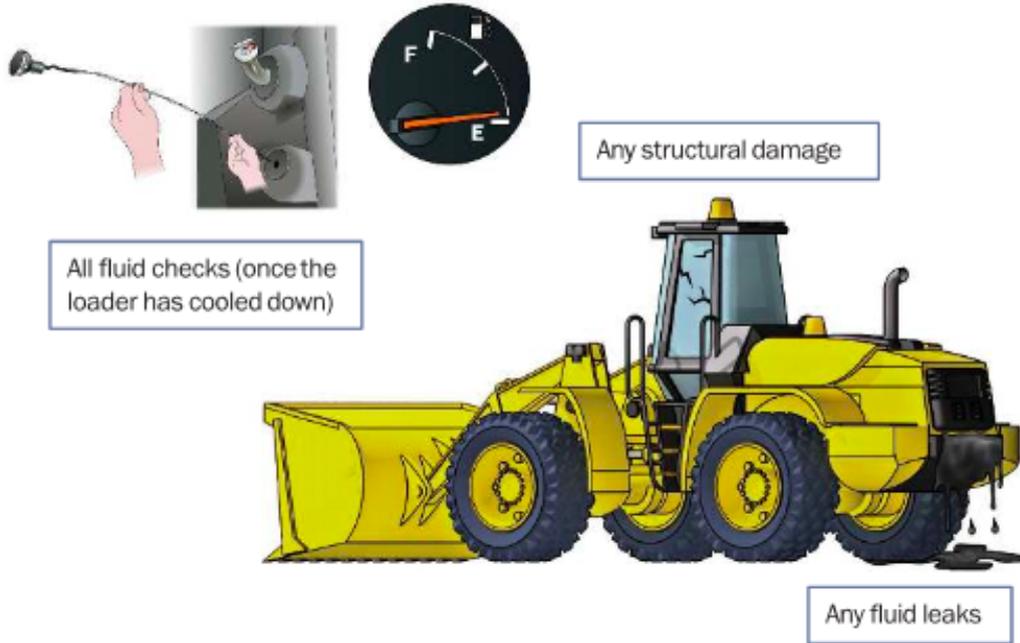


Cracked or split hydraulic hoses.

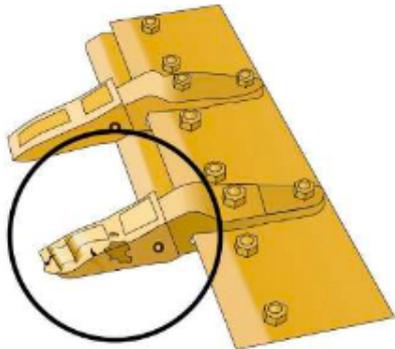
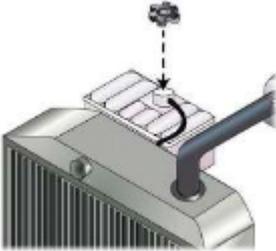


You've finished using the front end loader. What post-operational checks do you do?

Check for:

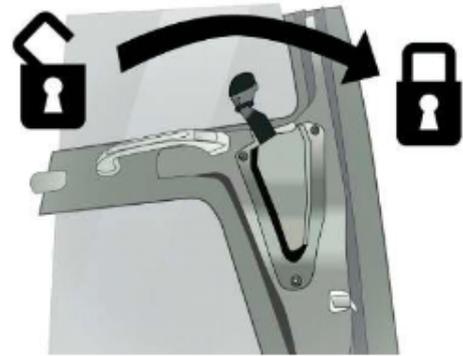


What are some common parts that wear or get damaged on a front end loader?

| | | |
|---|--|--|
| <p>Teeth on the bucket or attachment</p>  | <p>Wheels/tyres</p>  | |
| <p>Engine might use too much oil or coolant</p>  | <p>Check battery condition and fluid level</p>  | <p>Radiator hoses.</p>  |

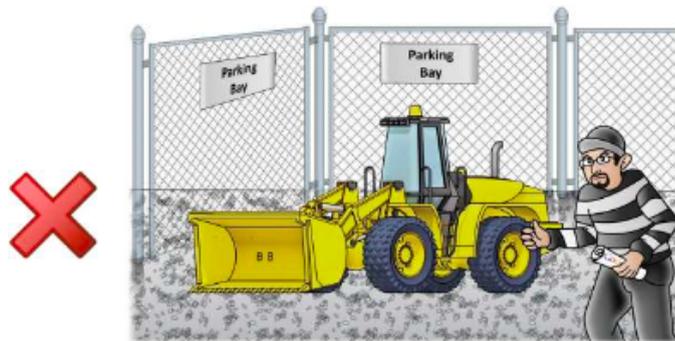
What do you do before leaving the loader unattended?

Remove the keys and lock the doors.



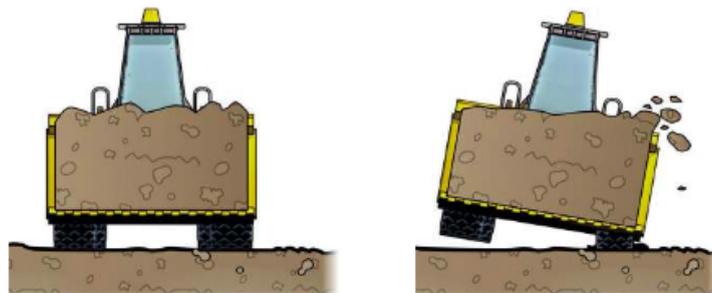
Why should you remove the keys from the loader when leaving it parked?

To stop unauthorised people using the machine.



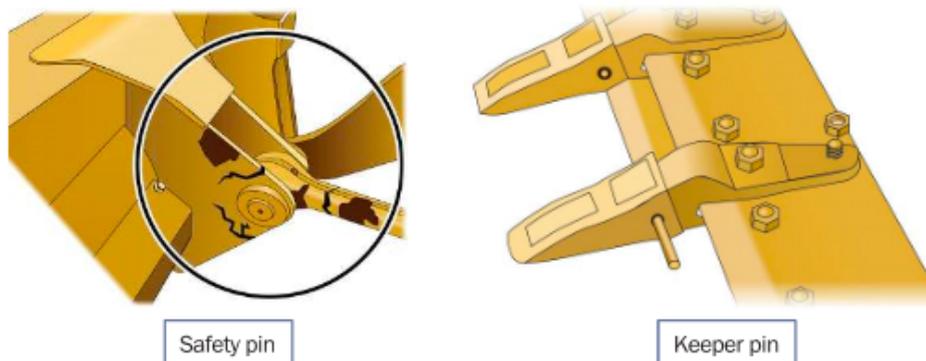
Why do the front tyres on a front end loader need to be equal pressure?

If the front tyres are not equal pressure, the front end loader could tip over sideways and injure you or someone else.



How do you make sure the bucket is properly attached to the loader?

Check the safety pins and keepers are properly inserted.



What must you do if you find a problem with the power arms or connections?

You must:

| | |
|--|---|
| <p>1. Tag out the equipment and DO NOT USE IT.</p>  | <p>2. Remove the key</p>  |
| <p>3. Record the problem in the logbook.</p>  | <p>4. Report to your supervisor.</p>  |

What kinds of tests should you do before using the loader for earthmoving?

Test brakes



| | | |
|--|--|--|
| <p>Test attachment movements</p>  | <p>Test controls</p>  | <p>Test steering</p>  |
|--|--|--|

Drive the loader a short distance to make sure it's okay.



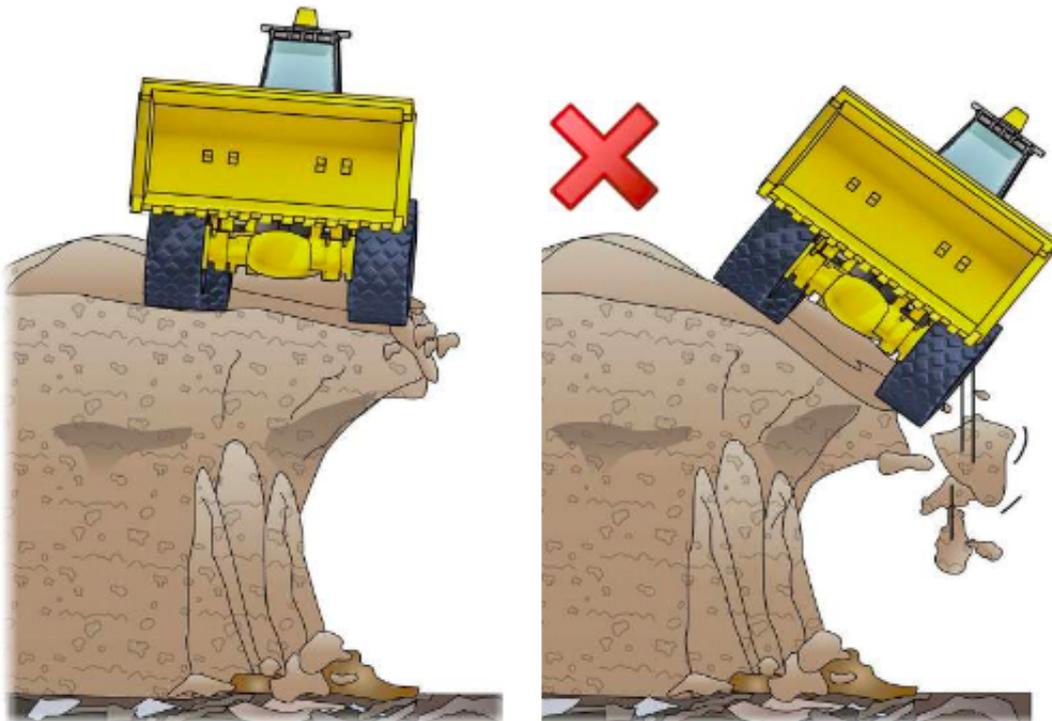
When should you refuel your loader?

At the end of the days work as this cools the fuel in the tank quickly and reduces the amount of condensation that will be drawn into the fuel tank overnight with the fuel cooling.



What is the danger of driving along a trench or excavation?

The loader might tip over and fall into the trench, or the edge of the trench might cave in.



While operating the front end loader you get a warning signal from one of the machines monitoring systems or alarms. What action do you take?

Stop operation immediately and fix the problem if possible



If the problem cannot be fixed the machine should be removed from service. It should be tagged 'Do not operate'.



Report the problem to your supervisor.



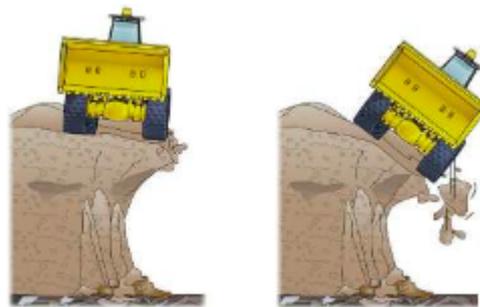
2.4 Operate/Use Equipment

How do you safely fill out a stockpile?

1. Start by filling the area closest to the back of the stockpile area.



2. Try not to fill too close to the edge. The edge of the stockpile could give way.

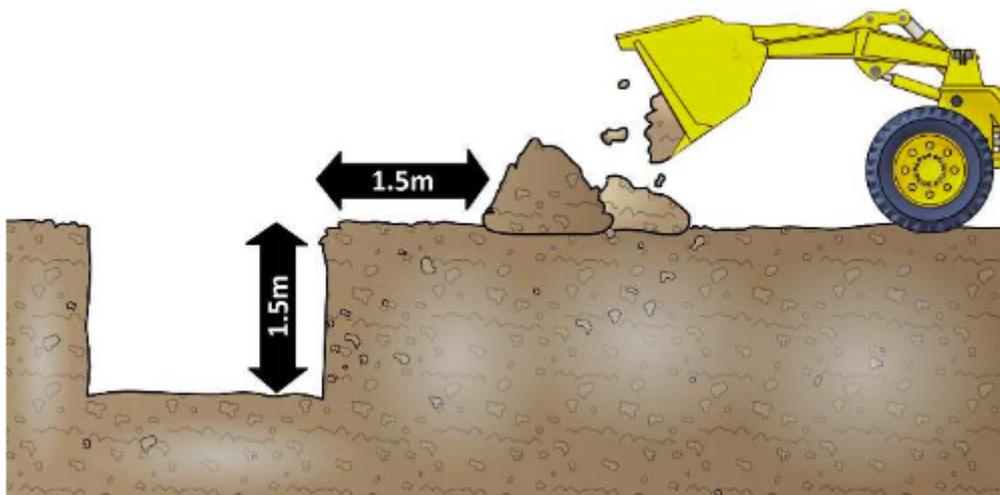


3. Keep filling out the stockpile one row at a time.

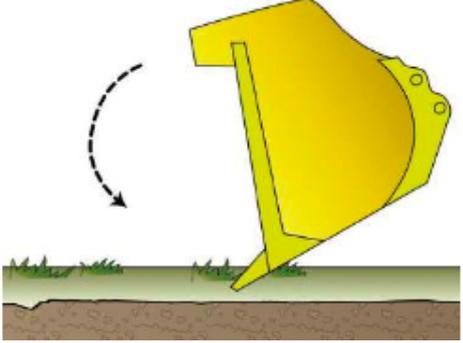
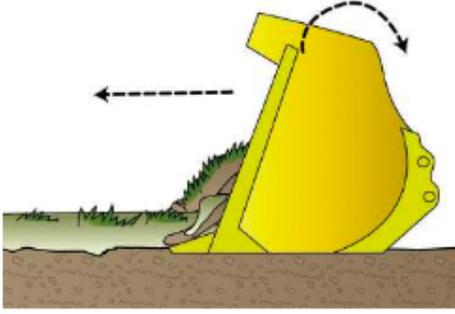
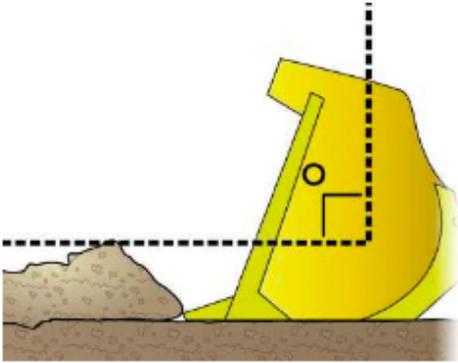
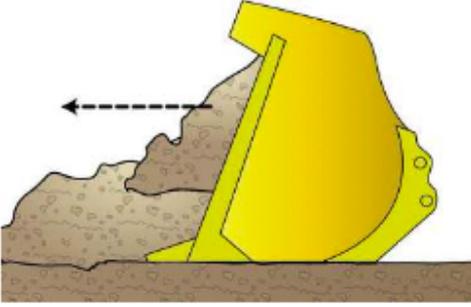
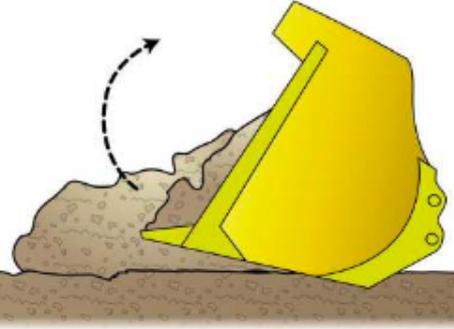
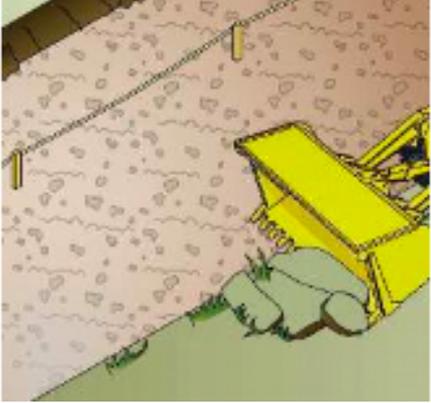
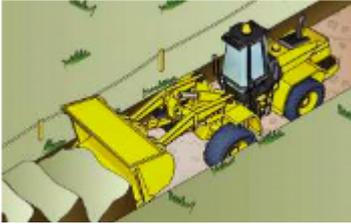


When dumping materials near an excavation, how far away from the excavation must you dump the load?

As a general rule of thumb, you should dump the load the same distance away as the depth of the hole. For example:

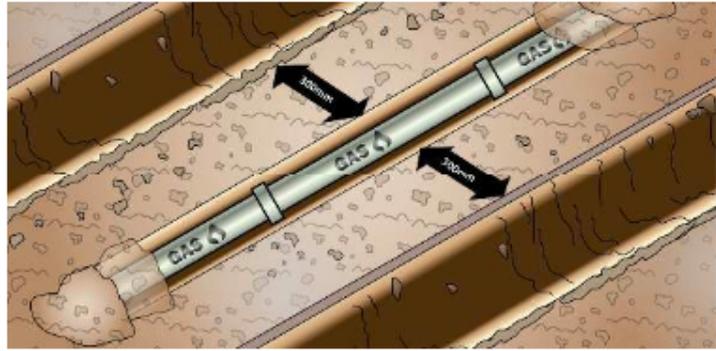


How do you strip topsoil? Explain the steps.

| | |
|---|--|
| <p>1. Tilt the bucket forward so the front of the cutting edge is in contact with the ground.</p>  | <p>2. Drive forward to dig.</p>  |
| <p>3. Roll the bucket back to level at the correct depth.</p>  | <p>4. Move forward until the bucket is full.</p>  |
| <p>5. Crowd the bucket when it is full.</p>  | <p>6. Raise the bucket and move to the stockpile or truck.</p>  |
| <p>7. Empty the bucket.</p>  | <p>9. Use about half to three quarters of the bucket on the previously dug area to maintain a level base.</p>  |
| <p>8. Return to the dig area.</p>  | |

How do you safely excavate around a water or gas pipe?

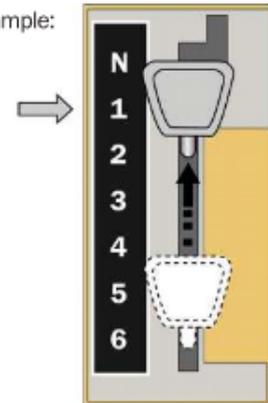
Excavate around the pipe and keep 300 mm of clearance around it. Hand dig to expose the service. Use a spotter to guide digging.



When travelling down a steep slope, which gear do you use?

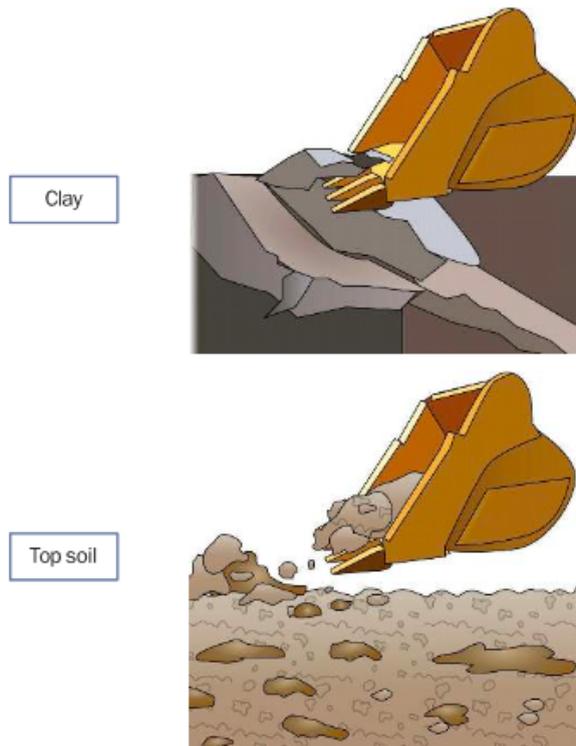
Use the lowest gear you can.
Change into low gear before you drive on the slope.

For example:



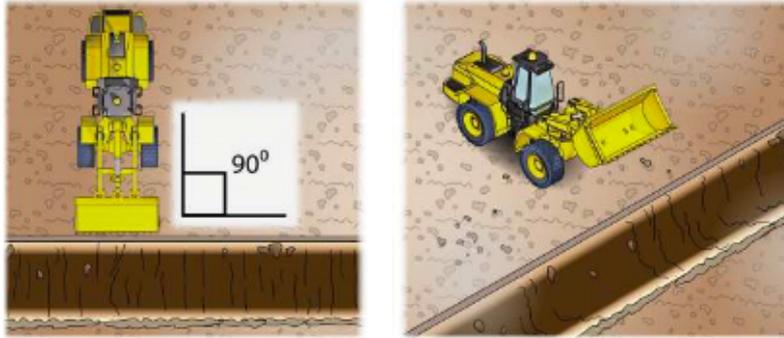
Which is harder to excavate, top soil or clay? Why is this?

Clay as it is denser and does not break up as easily as top soil.

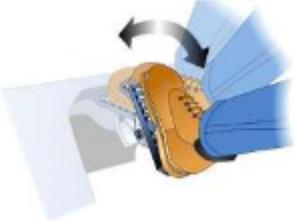
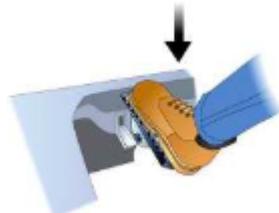


You are filling a trench with a front end loader. In which direction should you move towards the trench?

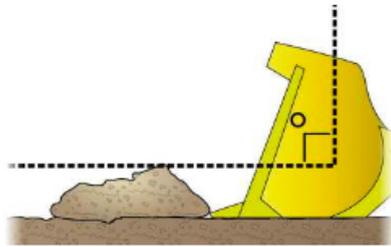
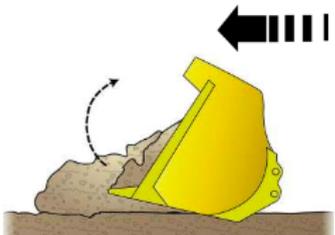
Move towards the trench at a 90 degree angle (straight). This helps keep the loader well-balanced.

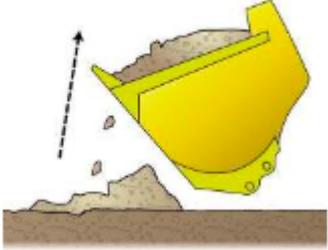
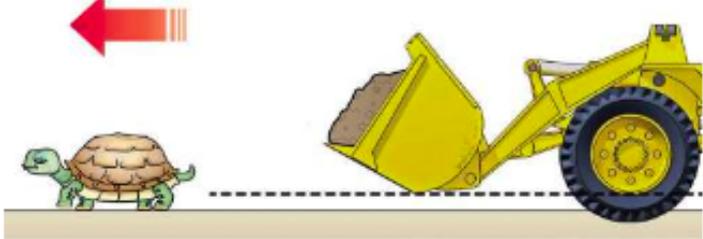
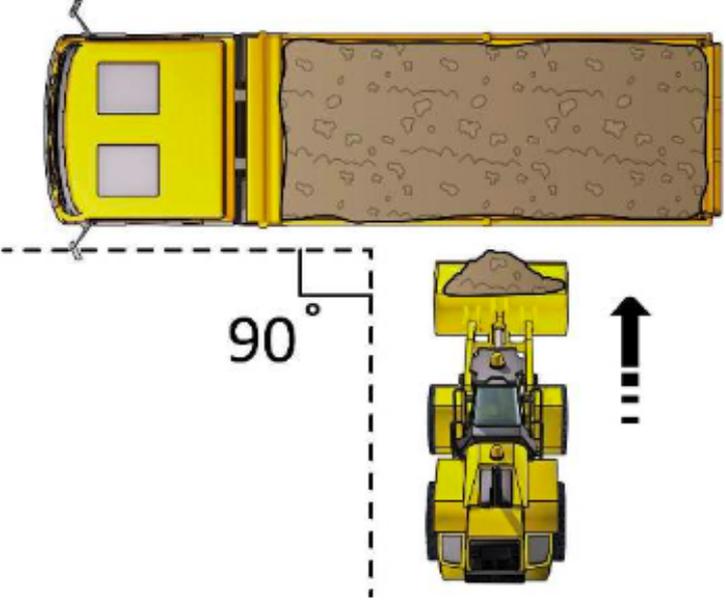
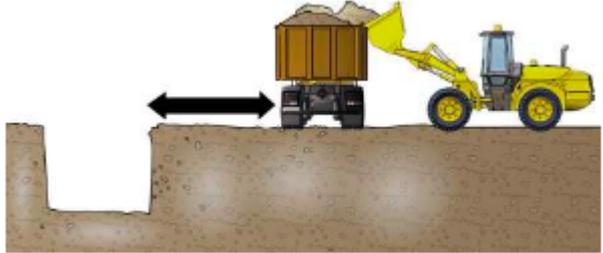
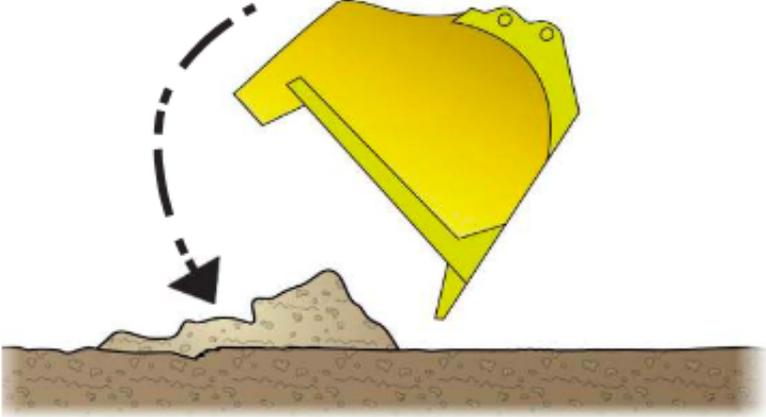


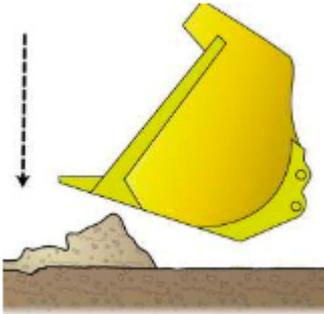
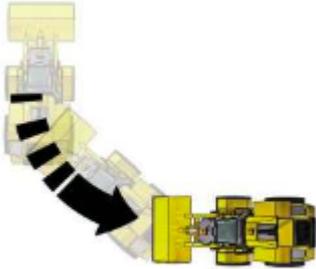
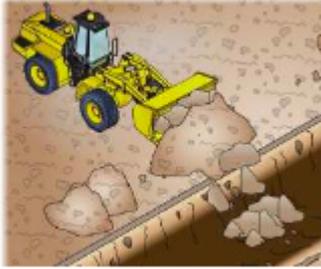
If your front end loader uses air brakes, how do you use air brakes safely?

| | |
|---|--|
| <p>1. Check that the right air pressure is there and stays there. For example:</p>  | <p>2. Don't pump air brakes.</p>  |
| | <p>3. Press the brake pedal firmly in one go.</p>  |

What steps do you take to safely pick up, move, and dump materials?

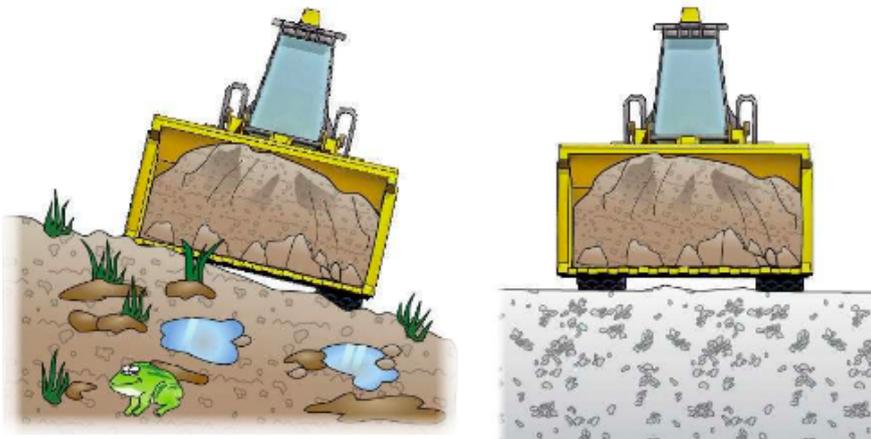
| | |
|--|--|
| <p>1. Build up engine RPM and correct speed.</p>  | <p>2. Make sure the bucket is at the right level and angle.</p>  |
| <p>3. Crowd the bucket upwards while moving forward.</p>  | <p>4. Try not to spin the wheels.</p>  |

| | |
|--|---|
| <p>5. Pick up the load.</p>  | <p>6. Move the load at low speed and with the bucket low.</p>  |
| <p>7. Approach the truck or trench from a 90 degree angle.</p> |  |
| <p>8. Raise the load slowly.</p> | <p>9. If dumping the load into a truck make sure you are on a flat level surface away from trenches and excavations.</p>  |
| <p>10. Tilt the bucket to dump.</p>  | |

| | | |
|--|--|---|
| <p>11. Look behind you.</p>  | <p>12. Reverse away from the truck.</p>  | |
| <p>13. Lower the bucket.</p>  | <p>14. Turn.</p>  | <p>15. Move back to the stockpile</p>  |

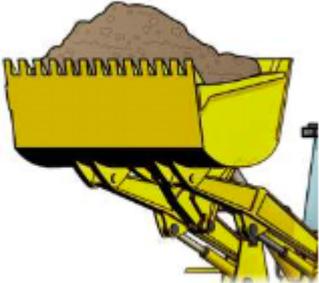
You are driving on uneven or soft ground. Does this reduce the load capacity?

Yes, the load capacity is less when you are driving on uneven ground. You can carry more on hard, even ground because the load is more stable.



What safety precautions should you take when dumping a load into a truck?

| | |
|--|--|
| <p>The load must not pass over the truck's cabin</p>  | <p>The load must not be heavier than the SWL of the loader's rated capacity</p>  |
|--|--|

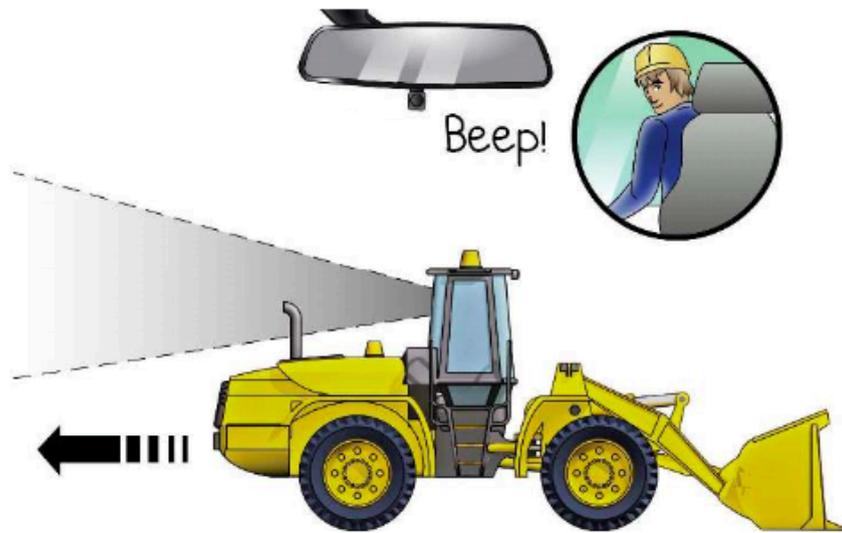
| | | |
|---|--|---|
| <p>The bucket must hold the load completely</p>  | <p>Put a layer of soil in the truck before dumping large rocks</p>  | <p>Position the truck safely.</p>  |
|---|--|---|

How can you communicate and share information with your workmates?

| | |
|---|--|
| <p>Talk and ask questions</p>  | <p>Use radios</p>  |
| <p>Share instructions</p>  | <p>Put up warning and information signs</p>  |
| <p>Toolbox meetings</p>  | <p>Use hand signals</p>  |

What do you do before starting to move a loader from a stationary position?

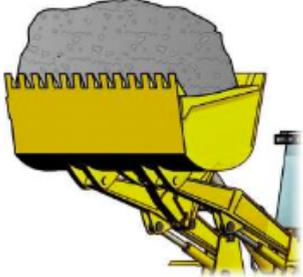
1. Sound the horn once.
2. Look behind.



On mining sites:

- Beep/sound horn once (×1) to start the engine (wait 5 seconds)
- Beep/sound horn once (×1) to start the engine (wait 5 seconds)
- Beep/sound horn three times (×3) to reverse (wait 5 seconds).
- Do this even if you have reversing alarms. Check mirrors. Look over your shoulder and check for a clear path.

How can you find out the weight of a load?

| | |
|---|--|
| <p>Check the weighbridge note, consignment note, or other information.</p>  | <p>Read the weight marked on the load</p>  |
| <p>Estimate the weight of the load. For example, 1 cubic metre of concrete = 2.4t</p>  | <p>Check the machine load scales if it has them fitted.</p>  |

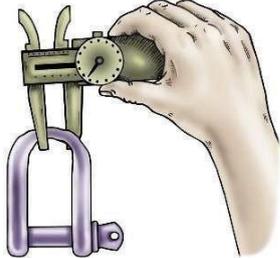
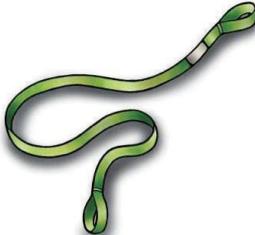
2.4.1 Table of Weight of Common Materials

1000 kilograms = 1 tonne

| Examples of the approximate weight of different materials: |
|--|
| 1 cubic metre of water = 1 metric tonne |
| 1 cubic metre of earth = 1.9 metric tonnes |
| 1 cubic metre of clay = 1.9 metric tonnes |
| 1 cubic metre of dry beach sand = 2.0 metric tonnes |
| 1 cubic metre of concrete = 2.4 metric tonnes |
| 1 cubic metre of coal ash = .08 (8/10) of a metric tonne |
| 25 bags of cement (40 kg each) = 1 metric tonne |
| 1000 common bricks = 4 metric tonnes |
| 1 cubic metre of steel = 7.3 metric tonnes |
| 1 cubic metre of copper = 9 metric tonnes |
| 1 cubic metre of lead = 11.4 metric tonnes |



What lifting equipment checks do you do?

| | |
|---|---|
| <p>Check lifting lugs</p>  | <p>Check chain slings for wear. Make sure tag is attached.</p>  |
| <p>Check shackles for wear. No more than 10%.</p>  | <p>Check other lifting gear</p>  |

What must a lifting sling have?

The sling must have SWL marked. The SWL tag tells you how much weight the sling can hold.



Note: Flexible steel wire rope slings can have SWL/WLL stamped on the ferrule.

What if the sling has no tag or it cannot be read?

Do not use it! Send it to the manufacturer for retagging or throw it away.



2.4.1 Chain Slings

A chain sling must have a metal tag attached, stating the chain grade and chain size. It must also show the safe working load (SWL) when using the sling in different configurations such as a straight sling or an angled sling.



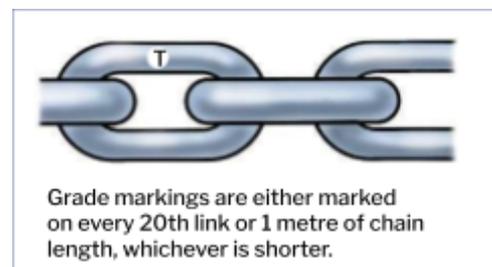
Note:

Slings with missing or unreadable load tags should not be used. Tag out and remove the sling from the work area.

2.4.2 Grades of Chains

There are different types (grades) of lifting chain. The grade refers to the strength rating of the chain

- High Tensile and Very High Tensile (Grade T. 80 and 100, 120) are used most often for lifting.
- Low-grade chain (Grade L = 30) is rarely used for lifting
- Low-grade chain (Grade M = 40)
- Low-grade chain (Grade P = 50)



Higher tensile, quenched and tempered chain

Grade 80 chain

Branded: T. 8, 80, 800 or PWB, or CM and HA800 alternately. This is the common grade used for lifting purposes.

Grade 100 chain carries the mark 10 or 100, VIS200-10 or MA10

Grade 120 chain carries the mark 12 or 120 depending on the manufacturer.

| Grade (T) 80 Working Load Limits (tonnes) | | | | | | | | | | | | | |
|---|-------------------|------------------|--------------|---------------------------|------|------|--------------|------|------|----------------|------|------|--------------|
| Chain | Single leg slings | | | Slings of 2, 3, or 4 legs | | | | | | Endless slings | | | |
| Diameter mm | Straight sling | Adjustable sling | Reeved sling | Straight sling | | | Reeved sling | | | Basket sling | | | Reeved sling |
| | | | | 60° | 90° | 120° | 60° | 90° | 120° | 60° | 90° | 120° | |
| 6 | 1.2 | 0.95 | 0.95 | 1.9 | 1.6 | 1.1 | 1.6 | 1.3 | 0.95 | 1.6 | 1.3 | 0.95 | 1.9 |
| 7 | 1.6 | 1.2 | 1.2 | 2.6 | 2.1 | 1.5 | 2.0 | 1.7 | 1.2 | 2.0 | 1.7 | 1.2 | 2.4 |
| 8 | 2.0 | 1.5 | 1.5 | 3.5 | 2.8 | 2.0 | 2.6 | 2.1 | 1.5 | 2.6 | 2.1 | 1.5 | 3.0 |
| 10 | 3.2 | 2.4 | 2.4 | 5.5 | 4.5 | 3.2 | 4.1 | 3.4 | 2.4 | 4.1 | 3.4 | 2.4 | 4.8 |
| 13 | 5.4 | 4.0 | 4.0 | 9.4 | 7.6 | 5.4 | 7.0 | 5.7 | 4.0 | 7.0 | 5.7 | 4.0 | 8.1 |
| 16 | 8.2 | 6.1 | 6.1 | 14.2 | 11.6 | 8.2 | 10.6 | 8.7 | 6.1 | 10.6 | 8.7 | 6.1 | 12.3 |
| 20 | 12.8 | 9.6 | 9.6 | 22.2 | 18.1 | 12.8 | 16.6 | 13.6 | 9.6 | 16.6 | 13.6 | 9.6 | 19.2 |
| 22 | 16.0 | 12.0 | 12.0 | 27.8 | 22.7 | 16.0 | 20.8 | 17.0 | 12.0 | 20.8 | 17.0 | 12.0 | 24.1 |
| 26 | 20.6 | 15.5 | 15.5 | 35.8 | 29.2 | 20.6 | 26.8 | 21.9 | 15.5 | 26.8 | 21.9 | 15.5 | 31.0 |
| 32 | 32.8 | 24.6 | 24.6 | 56.8 | 46.3 | 32.8 | 42.6 | 32.7 | 24.6 | 42.6 | 34.7 | 24.6 | 49.2 |

Maximum Safe Working Loads in tonnes of 1000 kg under general conditions of use.

- DO NOT EXCEED SAFE WORKING LOAD
- DO NOT EXCEED 120°
- SWL at 60° must never be exceeded, even at smaller angles

IMPORTANT INSTRUCTIONS ON THE USE OF ALLOY GRADE T(80) CHAIN SLINGS

SAFETY WARNING OF HAZARDOUS CONDITIONS
Extreme care should be taken when using the Grade T(80) Chain Slings in close proximity of high temperature. It is therefore recommended that the user make ample provisions for reduced Safe Working Loads.

TEMPERATURE CONTROL
-30°C to 200°C No reduction in SWL
200°C up to 300°C Reduce SWL by 10%
300°C up to 400°C Reduce SWL by 25%
Do not use above 400°C

ACIDIC CONDITIONS
Alloy Grade T(80) slings should not be used in acidic solutions nor in any other corrosive environment.

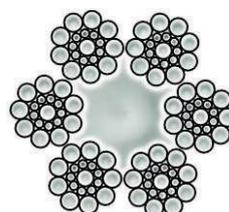
GALVANISING
Alloy chains and fittings should not be hot-dip galvanised nor electro-plated as the Safe Working Load is reduced by 20% after galvanising.

| Grade (T) 100 Working Load Limits (tonnes) | | | | | | | | | | | | | | |
|--|-------|-------------------|------------------|-------------|---------------------------|------|------|--------------|------|------|----------------------------|-------|------|--------------|
| Chain | Grade | Single leg slings | | | Slings of 2, 3, or 4 legs | | | | | | Endless slings | | | |
| Chain Diameter mm | Grade | Straight Sling | Adjustable Sling | Choke Hitch | Direct Load | | | Reeved Sling | | | Endless Sling Basket Hitch | | | Reeved Sling |
| | | | | | 60° | 90° | 120° | 60° | 90° | 120° | 60° | 90° | 120° | |
| 4 | 100 | 0.63 | 0.63 | 0.47 | 1.09 | 0.89 | 0.63 | 0.82 | 0.66 | 0.47 | 0.82 | 0.66 | 0.47 | 0.94 |
| 6 | 100 | 1.5 | 1.5 | 1.1 | 2.6 | 2.1 | 1.5 | 1.95 | 1.6 | 1.1 | 1.95 | 1.6 | 1.1 | 2.2 |
| 8 | 100 | 2.5 | 2.5 | 1.9 | 4.25 | 3.55 | 2.5 | 3.15 | 2.65 | 1.9 | 3.15 | 2.65 | 1.9 | 3.75 |
| 10 | 100 | 4.0 | 4.0 | 3.0 | 6.70 | 5.6 | 4.0 | 5.0 | 4.0 | 3.0 | 5.0 | 4.0 | 3.0 | 6.0 |
| 13 | 100 | 6.7 | 6.7 | 5.0 | 11.2 | 9.5 | 6.7 | 8.5 | 7.1 | 3.0 | 8.5 | 7.1 | 5.0 | 10.0 |
| 16 | 100 | 10.0 | 10.0 | 7.5 | 17.0 | 14.0 | 10.0 | 13.2 | 10.6 | 7.5 | 13.2 | 10.6 | 7.5 | 15.0 |
| 19 | 100 | 12.5 | 12.2 | 9.5 | 22.4 | 18.0 | 12.5 | 16.0 | 13.2 | 9.5 | 16.0 | 13.25 | 9.5 | 19.0 |
| 20 | 100 | 16.0 | 16.0 | 12.0 | 27.7 | 22.5 | 16.0 | 20.8 | 16.9 | 12.0 | 20.8 | 16.9 | 12.0 | 24.0 |
| 22 | 100 | 19.0 | 19.0 | 14.0 | 33.5 | 26.5 | 19.0 | 25.0 | 20.0 | 14.0 | 25.0 | 20.0 | 14.0 | 28.0 |
| 28 | 100 | 31.5 | 31.5 | 23.6 | 54.5 | 44.4 | 31.5 | 41.0 | 33.4 | 23.6 | 41.0 | 33.4 | 23.6 | 47.2 |

2.4.3 Flexible Steel Wire Rope (FSWR) Slings

For FSWR to be used as a sling it should have a minimum construction of 6 strands with 19 wires in each strand (6×19 or 6/19).

- 6 mm is the smallest diameter FSWR you can use
- 6 mm is not commonly made and 8 mm is used



It could also have these parts:

| | |
|---|---|
| <p>Swaged fitting</p> <p>Swaged fittings are machine pressed to form a soft eye in a FSWR. A thimble can be inserted to make a hard eye in the FSWR.</p>  | <p>Thimble</p> <p>A thimble is a fitting used in the formed eye of a rope and is designed to protect the eye of the sling from chafing and distortion.</p>  |
|---|---|

2.4.4 Flexible Steel Wire Rope (FSWR) Slings Table

| Manufactured to AS1666 | | | | | | | | | | Safety Factor 5:1 | | | | | | | | | |
|--|---------------------|---------------------------|-------------|------------------|--------------|------|------------|-----------------------|-----------------------|-------------------|---------------|------|-------------|-------------|-------------|-----------------------|-------------|--|--|
| Wire rope slings | | | | | | | | | | | | | | | | | | | |
| Method of loading | | Direct load | Choke hitch | | Basket hitch | | | | | | Direct loaded | | | Choke hitch | | | | | |
| | | | Round load | Rectangular load | Round load | | | Other than round load | | | | | | Round load | | Other than round load | | | |
| Rope | Nominal diameter mm | Minimum breaking force kN | Round load | | Round load | | Round load | | Other than round load | | Single Wrap | | Double Wrap | | Single Wrap | | Double Wrap | | |
| | | | 0° | 60° | 90° | 120° | 0° | 60° | 90° | 120° | 0° to 60° | 90° | 120° | 0° to 45° | 0° to 60° | 0° to 45° | 0° to 60° | | |
| Safe working loads in tonnes | | | | | | | | | | | | | | | | | | | |
| Safe working loads under general use with 1570 grade wire and fibre core with ferrule-secured eyes | | | | | | | | | | | | | | | | | | | |
| 8 | 28.2 | 0.55 | 0.41 | 0.27 | 1.09 | 0.94 | 0.77 | 0.55 | 0.55 | 0.48 | 0.39 | 0.27 | 0.94 | 0.77 | 0.55 | 0.71 | 0.48 | | |
| 9 | 35.6 | 0.69 | 0.52 | 0.34 | 1.38 | 1.19 | 0.97 | 0.69 | 0.69 | 0.60 | 0.49 | 0.34 | 1.19 | 0.97 | 0.69 | 0.90 | 0.60 | | |
| 10 | 44.0 | 0.85 | 0.64 | 0.43 | 1.70 | 1.47 | 1.20 | 0.85 | 0.85 | 0.74 | 0.61 | 0.43 | 1.47 | 1.20 | 0.85 | 1.11 | 0.74 | | |
| 11 | 53.2 | 1.03 | 0.77 | 0.52 | 2.1 | 1.78 | 1.45 | 1.03 | 1.03 | 0.90 | 0.73 | 0.52 | 1.78 | 1.45 | 1.03 | 1.34 | 0.90 | | |
| 12 | 63.3 | 1.23 | 0.92 | 0.61 | 2.5 | 2.1 | 1.73 | 1.23 | 1.23 | 1.07 | 0.87 | 0.61 | 2.1 | 1.73 | 1.23 | 1.59 | 1.07 | | |
| 13 | 74.3 | 1.44 | 1.08 | 0.72 | 2.9 | 2.5 | 2.0 | 1.44 | 1.44 | 1.25 | 1.02 | 0.72 | 2.5 | 2.0 | 1.44 | 1.87 | 1.25 | | |
| 14 | 86.2 | 1.67 | 1.25 | 0.83 | 3.3 | 2.9 | 2.4 | 1.67 | 1.67 | 1.45 | 1.19 | 0.83 | 2.9 | 2.4 | 1.67 | 2.2 | 1.45 | | |
| 16 | 113 | 2.2 | 1.64 | 1.09 | 4.4 | 3.8 | 3.1 | 2.2 | 2.2 | 1.90 | 1.55 | 1.09 | 3.8 | 3.1 | 2.2 | 2.8 | 1.90 | | |
| 18 | 143 | 2.8 | 2.1 | 1.38 | 5.5 | 4.8 | 3.9 | 2.8 | 2.8 | 2.4 | 1.97 | 1.38 | 4.8 | 3.9 | 2.8 | 3.6 | 2.4 | | |
| 20 | 176 | 3.4 | 2.6 | 1.70 | 6.8 | 5.9 | 4.8 | 3.4 | 3.4 | 3.0 | 2.4 | 1.70 | 5.9 | 4.8 | 3.4 | 4.4 | 3.0 | | |
| 22 | 213 | 4.1 | 3.1 | 2.1 | 8.3 | 7.1 | 5.8 | 4.1 | 4.1 | 3.6 | 2.9 | 2.1 | 7.1 | 5.8 | 4.1 | 5.4 | 3.6 | | |
| 24 | 253 | 4.9 | 3.7 | 2.5 | 9.8 | 8.5 | 6.9 | 4.9 | 4.9 | 4.3 | 3.5 | 2.5 | 8.5 | 6.9 | 4.9 | 6.4 | 4.3 | | |
| 26 | 297 | 5.8 | 4.3 | 2.9 | 11.5 | 10.0 | 8.1 | 5.8 | 5.8 | 5.0 | 4.1 | 2.9 | 10.0 | 8.1 | 5.8 | 7.5 | 5.0 | | |
| 28 | 345 | 6.7 | 5.0 | 3.3 | 13.4 | 11.6 | 9.4 | 6.7 | 6.7 | 5.8 | 4.7 | 3.3 | 11.6 | 9.4 | 6.7 | 8.7 | 5.8 | | |
| 32 | 450 | 8.7 | 6.5 | 4.4 | 17.4 | 15.1 | 12.3 | 8.7 | 8.7 | 7.6 | 6.2 | 4.4 | 15.1 | 12.3 | 8.7 | 11.3 | 7.6 | | |

2.4.5 Webbing Slings

There are a number of types of webbing slings used in lifting.

Terminal attachment

This type of sling has a triangle fitting on each end. These slings are used in vertical and basket hitches. Some have a choker fitting on either end for choker hitches.



Endless slings

Endless slings are very versatile. They can be used in all three types of hitches. When used in a choker or basket hitch the legs can be spread for improved load control and balance.



Flat eye sling

Flat eye slings can be used in vertical, choker, and basket hitches.



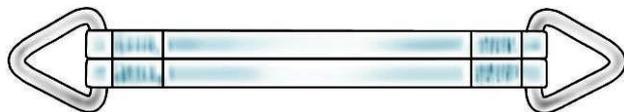
Reversed eye sling

Reversed eye slings have eyes that are twisted 90 degrees to form a better choker hitch. This type of sling also sits better in the crane hook.



Wide load sling

A wide load sling is an endless sling that has been joined together down its length. The eyes can be flat or reversed.



DO NOT

use nylon slings when working with acids as they can damage the sling.



DO NOT

use polyester slings when working with alkaline like caustic soda as they can damage the sling.



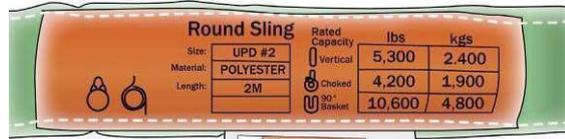
2.4.5 Synthetic webbing slings — working load limits (WLL)

There are two ways to find out the working load limit (WLL) for synthetic webbing slings:

1. Colour coding to Australian standards.

| FLAT WEBBING SLINGS MANUFACTURED TO AS 1353 SAFETY FACTOR 8:1 | | ROUND SLINGS MANUFACTURED TO AS4497 SAFETY FACTOR 7:1 | | | | | | | | |
|---|-------------|---|---|---|---|---|--|---|---|---|
| Flat Webbing & Round Slings | | | | | | | | | | |
| Webbing Slings & Round Slings 8.1 Safety Factor | |  |  |  |  |  |  |  |  |  |
| Lifting Mode Capacity | | Vertical SWL | Choke SWL | Basket SWL | 30° SWL | 60° SWL | 90° SWL | 120° SWL | 60° SWL | 60° Choke SWL |
| Kg | Colour Code | Kg | Kg | Kg | Kg | Kg | Kg | Kg | Kg | Kg |
| 1000 | Violet | 1000 | 800 | 2000 | 1900 | 1700 | 1400 | 1000 | 1700 | 1400 |
| 2000 | Green | 2000 | 1600 | 4000 | 3800 | 3400 | 2800 | 2000 | 3400 | 2800 |
| 3000 | Yellow | 3000 | 2400 | 6000 | 5700 | 5100 | 4200 | 3000 | 5100 | 4200 |
| 4000 | Grey | 4000 | 3200 | 8000 | 7600 | 6800 | 5600 | 4000 | 6800 | 5600 |
| 5000 | Red | 5000 | 4000 | 10000 | 9500 | 8500 | 7000 | 5000 | 8500 | 7000 |
| 6000 | Brown | 6000 | 4800 | 12000 | 11400 | 10200 | 8400 | 6000 | 10200 | 8400 |
| 8000 | Blue | 8000 | 6400 | 16000 | 15200 | 13600 | 11200 | 8000 | 13600 | 11200 |
| 10000 | Orange | 10000 | 8000 | 20000 | 19000 | 17000 | 14000 | 10000 | 17000 | 14000 |

2. The label or tag attached to the sling.



2.4.6 Load Factors

| Methods of attachment | | | Methods of attachment | | |
|-----------------------|---|---|-----------------------|---|---|
| Type of attachment | Load shape | Load factor | Type of attachment | Load shape | Load factor |
| Basket |  | = 2 NB: a single sling with vertical legs doubles the load factor on a round load. | Single sling |  | = 1 NB: the load factor is one. |
| Basket |  | = 1 NB: the corners of the load creates a nip point which reduces the capacity of the sling by 50%. Thus 50% of a load which originally had a load factor of 2 (see round load above) is now reduced to a load factor of 1 | Reeve/choke |  | = 0.5 NB: the lifting capacity of the sling is reduced by 50%. |
| | | | Reeve/choke |  | = 0.75 NB: the lifting capacity of the sling is reduced by 25% |

2.4.7 Angle Factors When Using A Sling

Tension increases in each sling leg as the angle between the legs increase. For example: two 6 mm grade T chain slings lifting together in a straight lift 0° angle between the slings can lift 2.2 tonnes, if the angle between the slings is 90° then the lift capacity of the two slings together is equal to the capacity of 1.41 slings or 1.6 tonnes.

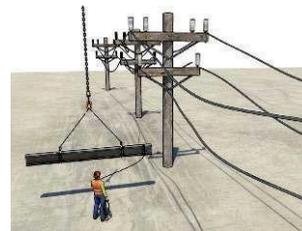
For general work

90 degrees is the recommended maximum angle between two legs of a sling for general work. The table on the right shows an example.

| Alloy Grade T 80 Chain Sling | | | |
|---|---|-----|-----|
| 2, 3 or 4 Leg Slings | | | |
|  |  | | |
| Chain size (mm) | Straight Sling | | |
| | 60 | 90 | 120 |
| 6.0 | 1.9 | 1.6 | 1.1 |
| 7.0 | 2.6 | 2.1 | 1.5 |
| 8.0 | 3.5 | 2.8 | 2.0 |
| 10.0 | 5.5 | 4.5 | 3.2 |

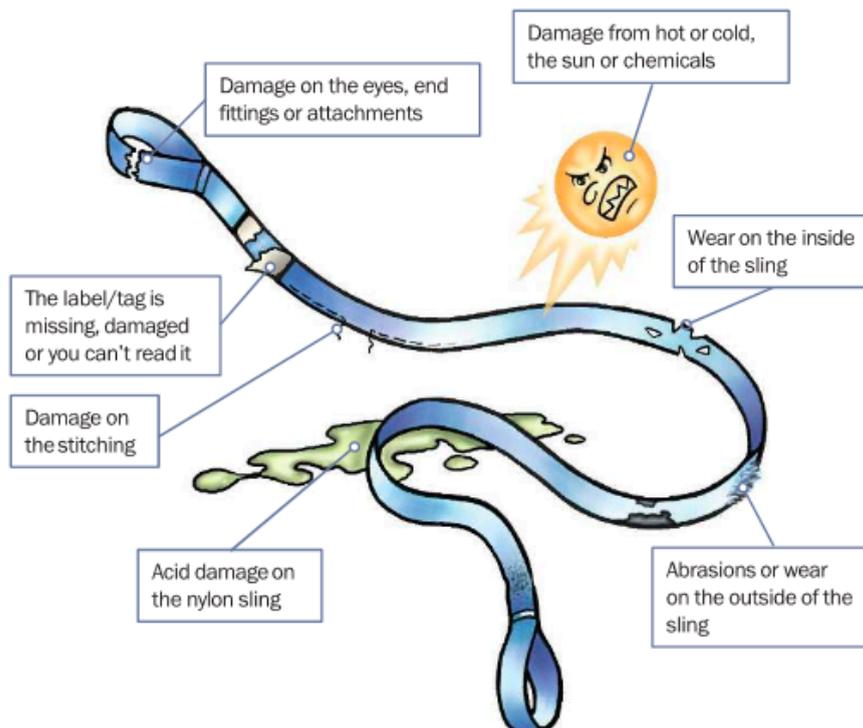
2.4.8 Dry Natural Fibre Rope

You can use dry natural fibre rope to control a load near powerlines. A fibre rope used as a tagline should be at least 16 mm in diameter.



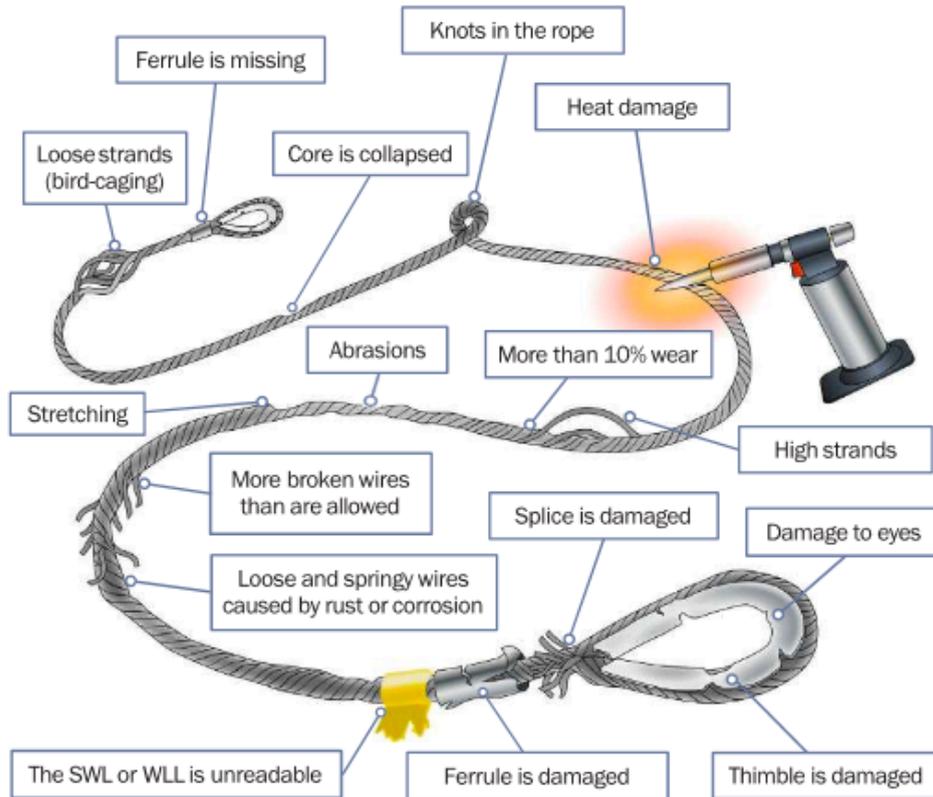
What are some defects (problems) that stop you using a synthetic sling for lifting?

Do not use the sling if you can see:



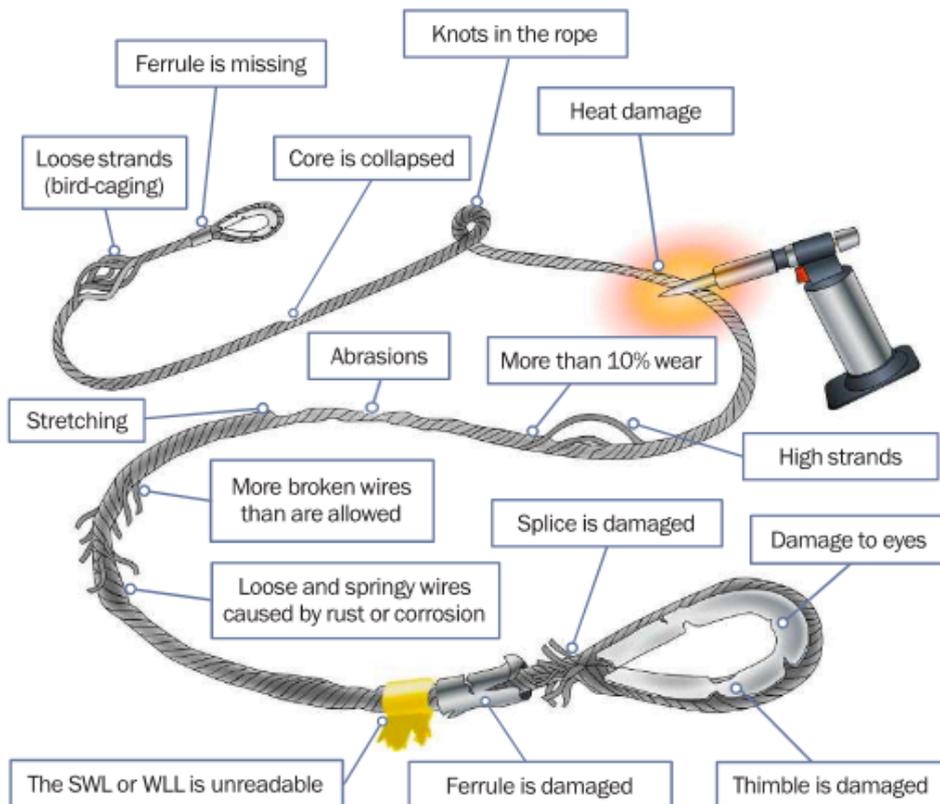
What are some problems that stop you using a flexible steel wire rope (FSWR) for lifting?

Do not use the FSWR if you can see:



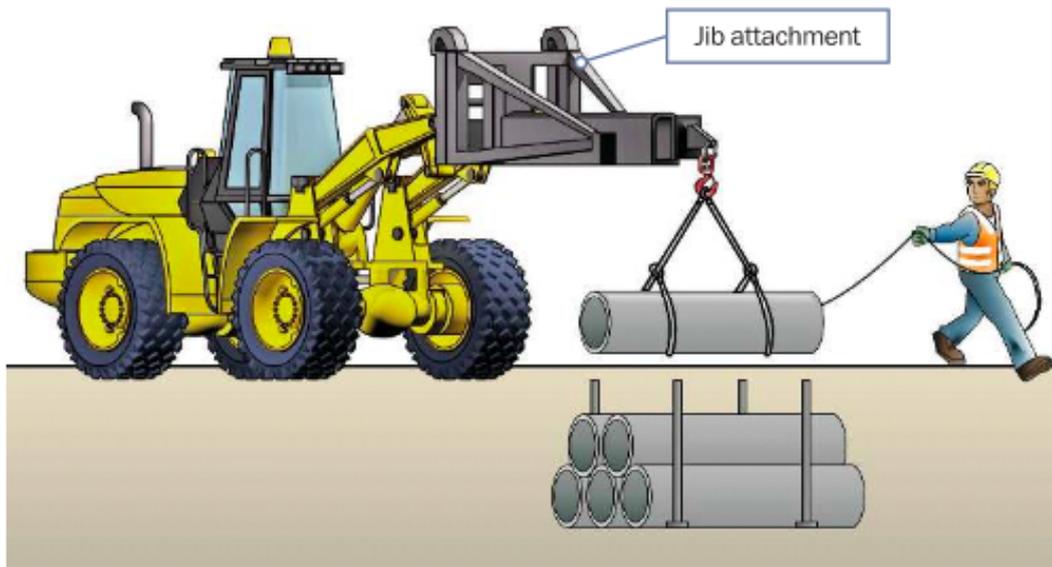
What are some problems that stop you using a lifting chain for lifting?

Do not use the FSWR if you can see:



Not all front end loaders can be used to sling a load. You want to use the front end loader for slinging a load. What must the loader have?

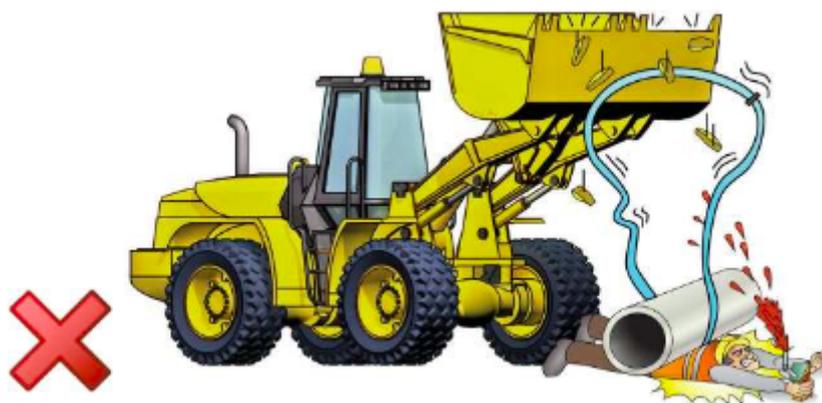
The front end loader must have a lifting lug with a safe working load or be fitted with a jib attachment.



What could happen if you attach slings to the bucket's teeth?

This is very dangerous!

- The sling can slip off the teeth
- The teeth can come off
- The load can fall and injure or kill someone.



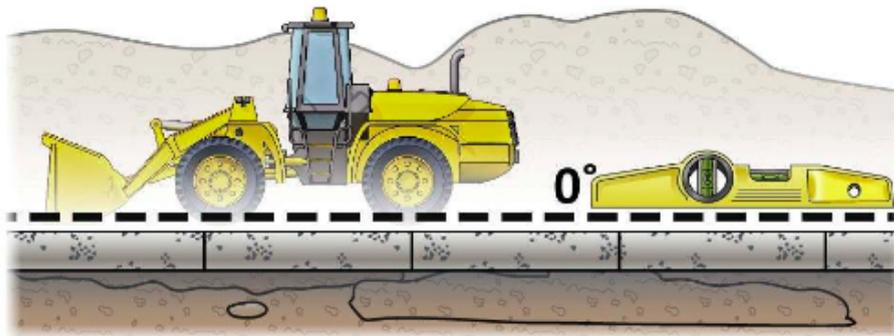
What could happen if you use the loader on uneven or sloping ground?

The loader might overturn and injure you or a workmate. You should use the loader on an even surface.



When travelling with a load, what kind of ground is the safest to travel on?

Firm, level ground because it gives the best stability.



What should you plan for before using the front end loader for lifting?

| | |
|--|--|
| <p>1. Your path of travel.</p> | <p>2. Ground condition.</p> |
| <p>3. How you will control other traffic and people on the site.</p> | <p>4. Check lifting lug.</p> |
| <p>5. Check lifting gear.</p> | <p>6. Check for overhead services.</p> |

You will lift and move a load of pipes. What steps do you take?

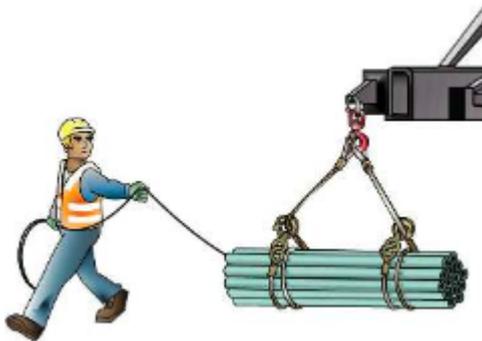
1. Check the SWL of the front end loader and slings to make sure you can lift the load.



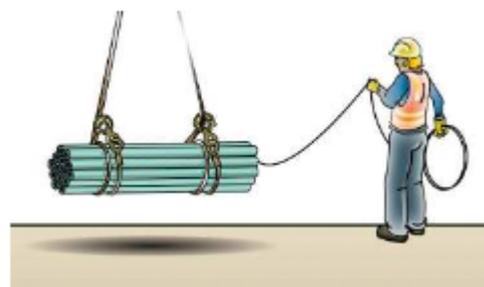
2. If your loader has a lifting lug on the bucket, connect to the lug. If not, fit a jib attachment and use it.



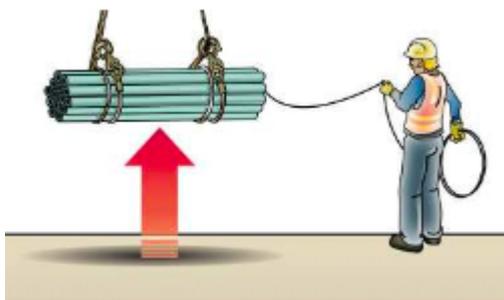
3. Attach a tag line to help control load swing and ask a dogger to help you.



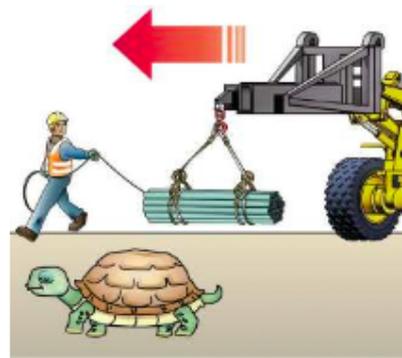
4. Lift the load clear of the ground, stop and check the load balance and sling attachment.



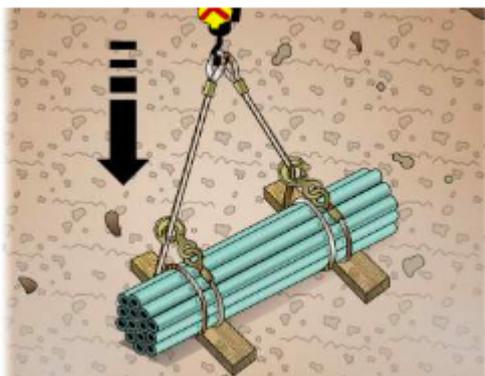
5. Continue the lift.



6. Move or travel slowly with the load.



7. Place and secure the load in a safe area.



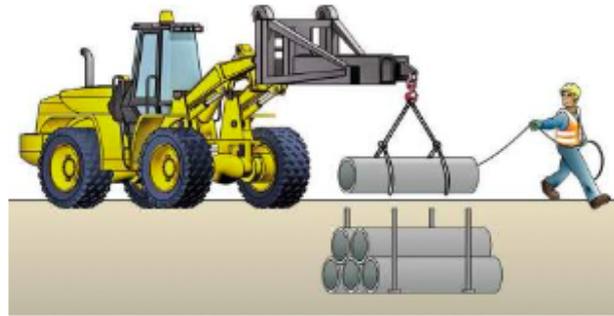
8. Remove the slings and tagline and store equipment.



What are some things you should think about before placing a load on the ground?

Make sure:

- it will stay where you place it
- it will not cause hazard
- the ground is firm and level
- place the load so the lifting slings can be easily removed.



One of your workmates is in a trench over 1.5 metres deep. How do you lower pipes safely into the trench?

Put in shoring. Never lower or pass the load directly over someone.



Some of the standard hand signals are shown here. What does each of these signals mean?

| Stop | | Boom up | |
|-----------|-------------|---|-------------|
| Motion | Hand signal | Motion | Hand signal |
| | | | |
| Boom down | | Travel and traverse | |
| Motion | Hand signal | Motion | Hand signal |
| | | Indicate the direction you want the machine to go | |

Some of the standard hand signals are shown here. What does each of these signals mean?

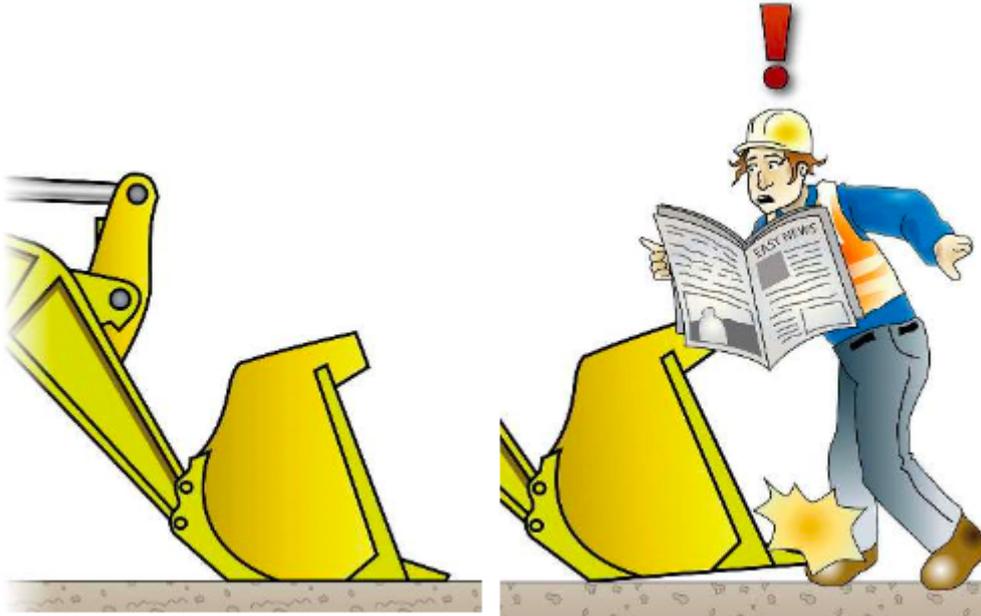
Use a two-way radio or whistle signals.



2.5 Shut Down and Store Equipment

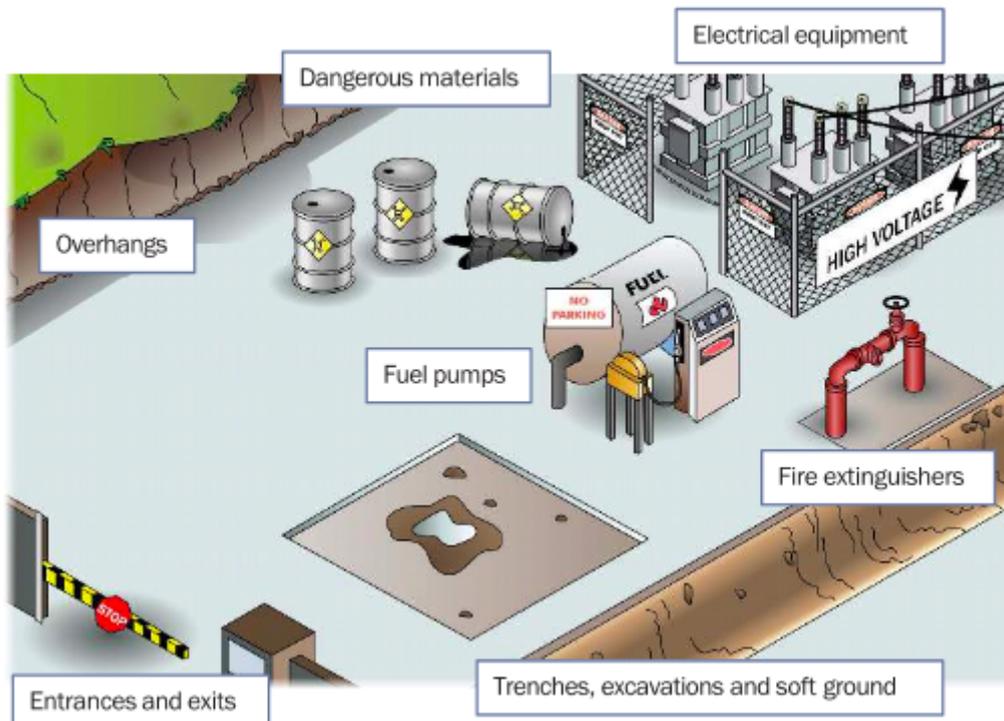
What do you do with the bucket before parking the loader?

Lower the bucket and make sure the cutting edge is touching the ground. If the cutting edge is too high, it might injure someone if they walk into it.



Where would you not park a front end loader?

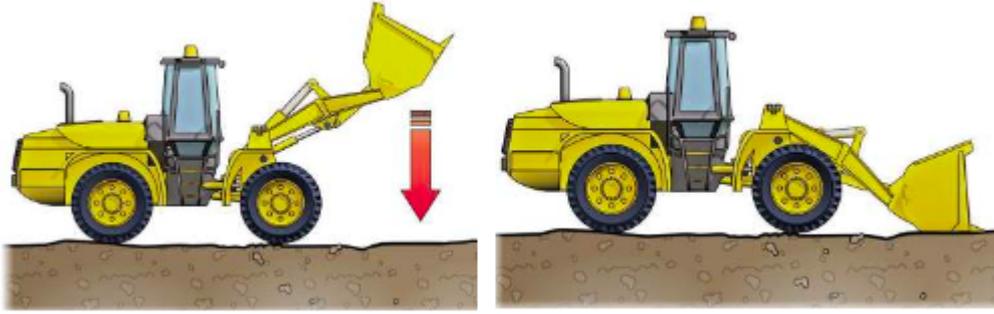
Always park in a safe place on firm, level ground. Do not park near:



What do you do with hydraulic attachments before shutting down the loader?

Follow these steps:

1. Lower the attachment so the cutting edge touches the ground.



2. Put the lever in float position.

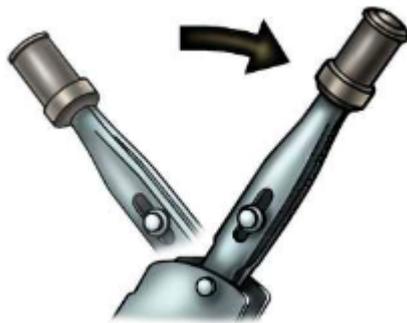


3. Remove hydraulic pressure.

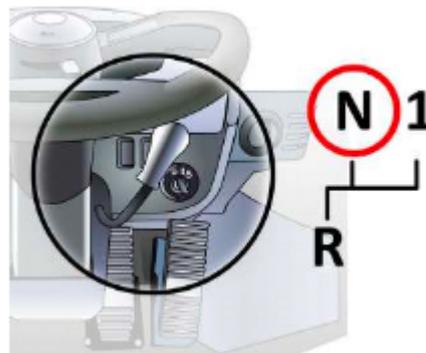


How do you shut down the loader?

1. Make sure the park brake is on.



2. Make sure the transmission is in neutral or park.



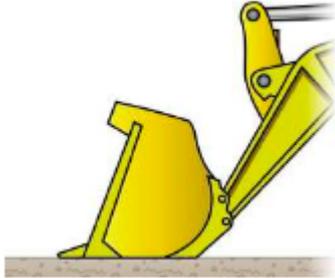
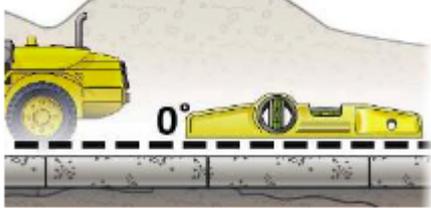
3. Turn off the ignition and remove the key.

Note:
Idle the engine first to let it cool down.
If you don't idle a turbocharged engine, the turbocharger will wear faster.



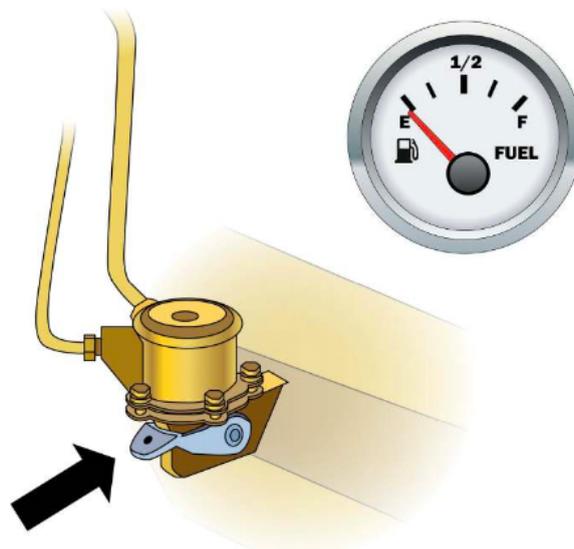
2.6 Maintain Equipment

What steps do you take when preparing the loader for maintenance?

| | |
|--|---|
| <p>1. Lower the bucket so the cutting edge is on the ground.</p>  | <p>2. Park the loader on flat ground in a place it won't cause a hazard.</p>  |
| <p>3. Stop the engine. Idle the engine before you turn it off.</p>  | <p>4. Release hydraulic pressure.</p>  |
| <p>5. Remove the keys.</p>  | <p>6. Prevent unintended movement.</p> <ul style="list-style-type: none"> • Pull the control lock out lever to locked position • Stop engine.  |

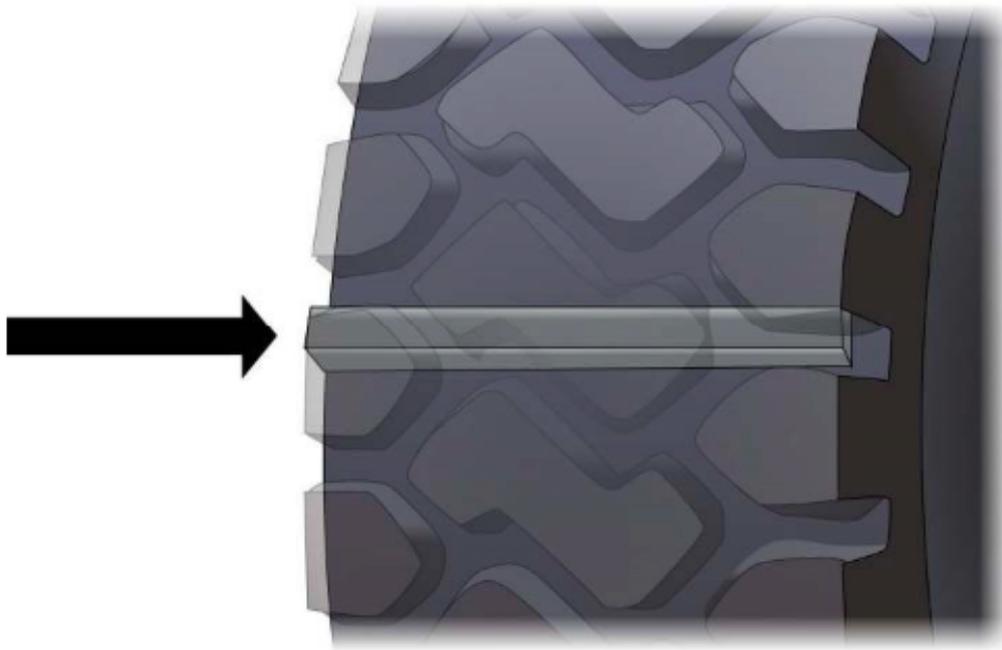
You are using the loader and it runs out of fuel. You fill the tank again but it still won't start. Why is this?

Air might have entered the fuel system. You may need to bleed the fuel system.



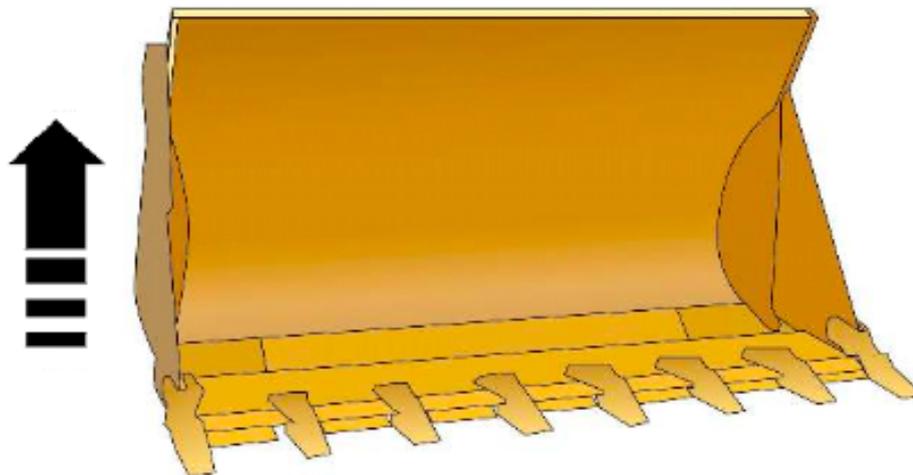
How do you know if the tyres are too worn?

Check and see if they are down to the wear bar. Look for bulges and cracks.

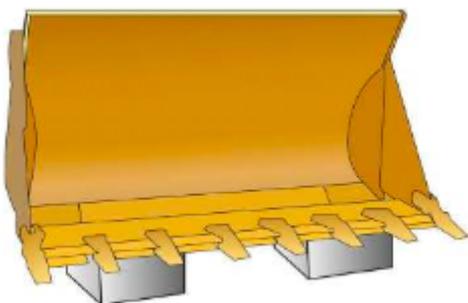


What steps do you take to replace damaged or worn bucket teeth?

1. Raise the bucket.

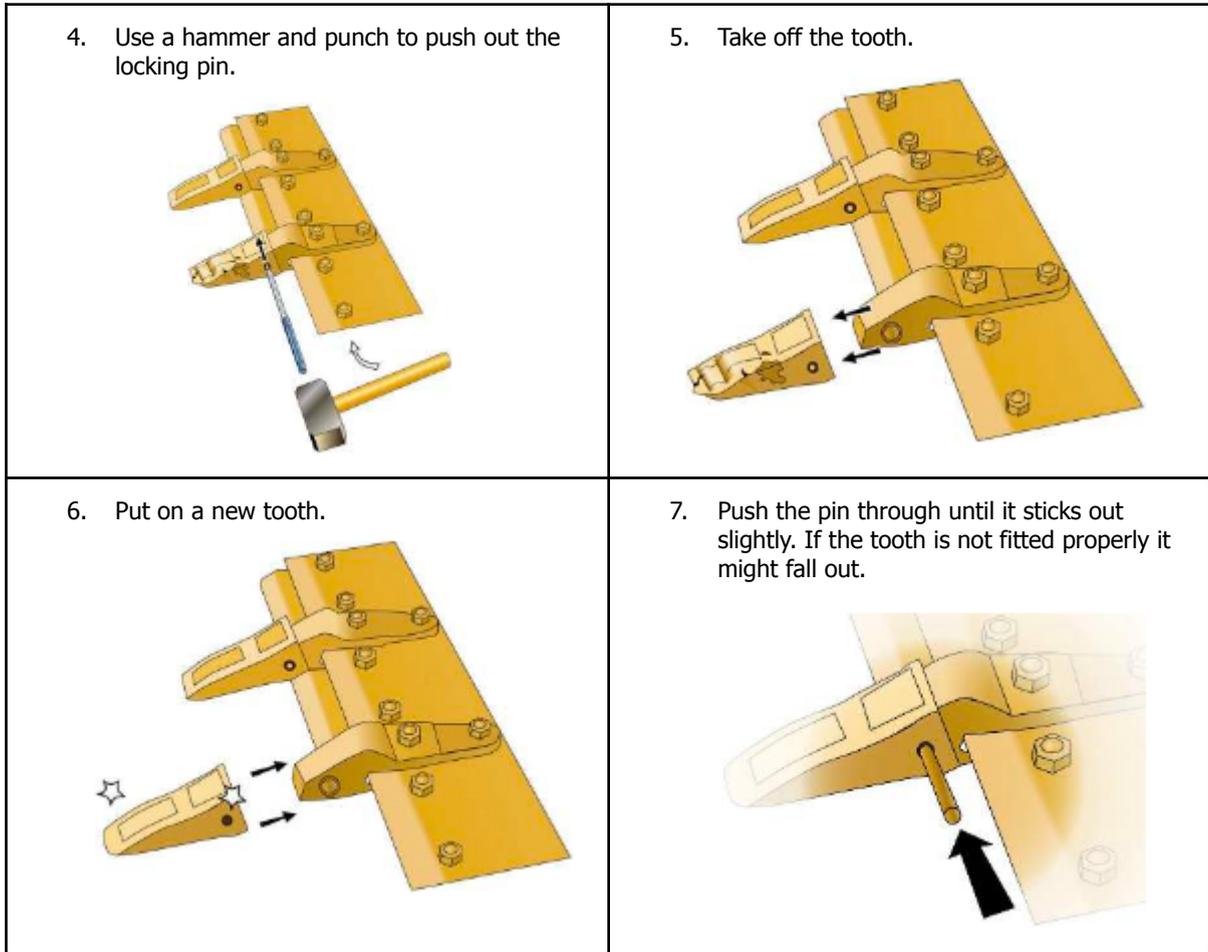


2. Put blocks under the bucket to hold it up.



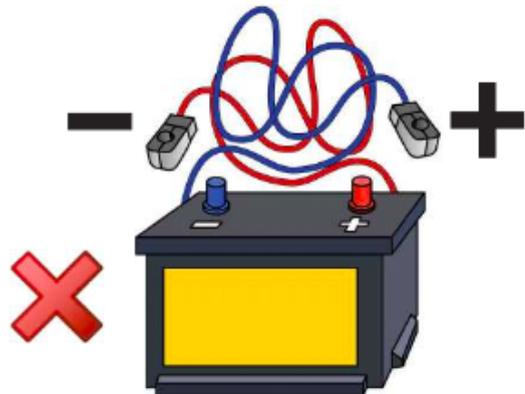
3. Stop the engine.



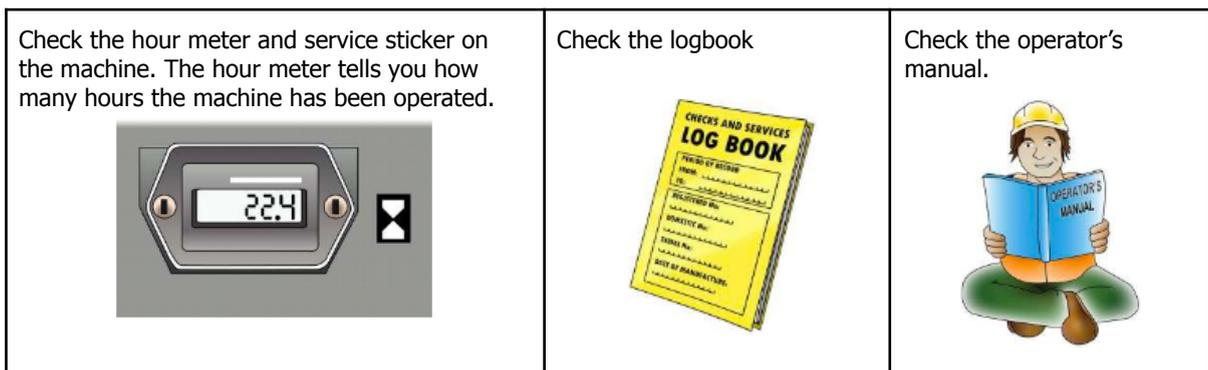


What should you be careful of when replacing the battery?

Do not get the cables around the wrong way when you connect to the terminals.
 If you connect the positive (+) cable to the negative (-) terminal and vice versa, you will damage the alternator.



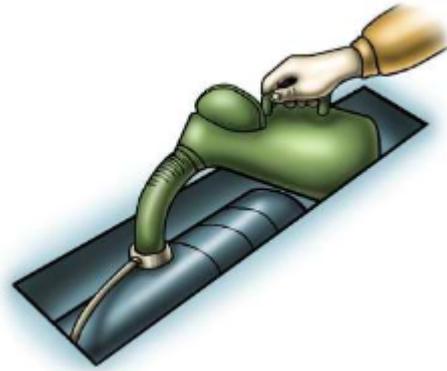
How do you know when and what to service on the loader?



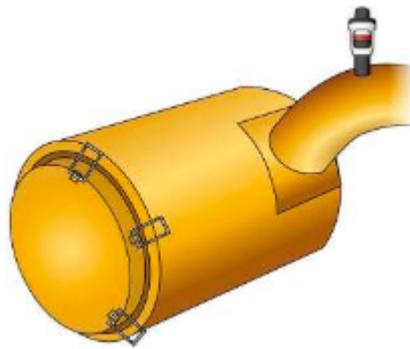
What are some examples of maintenance you would do every 10 service hours?

Check your manual. Some examples may include:

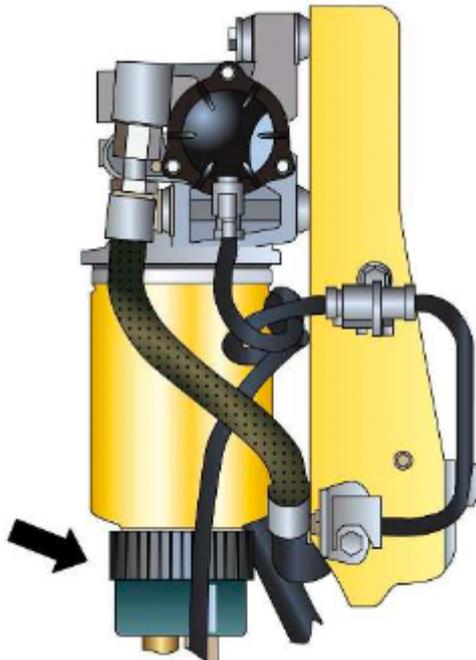
Check the coolant level



Check air filter indicator



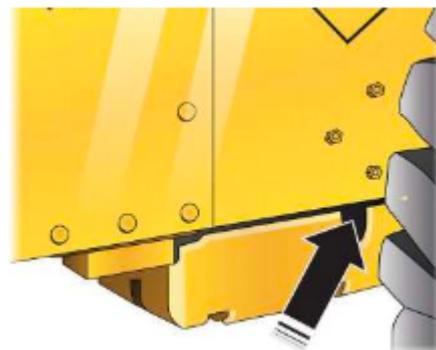
Check fuel sediment bowl for contamination



Check oil level

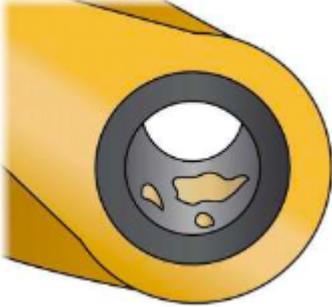
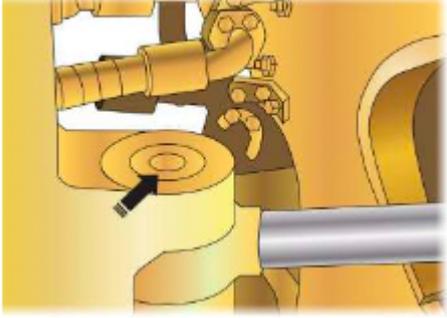
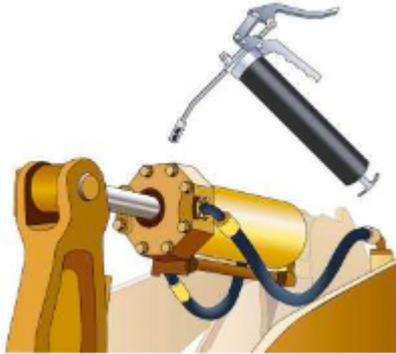


Drain condensation tanks (wheeled loaders only) if your loader has air brakes.



When should you lubricate/ grease the necessary parts on your loader?

You should lubricate/grease the following parts daily or as recommended in your operator's manual.

| | |
|--|--|
| <p>Bucket linkage and loader cylinder bearings</p>  | <p>Steering cylinder bearings</p>  |
| <p>Lift arm and bearings</p>  | <p>Bucket control cylinder.</p>  |

What do you have to clean on the front end loader?

| |
|---|
| <p>Clean the windows and cabin</p>  |
| <p>Clean the mirrors.</p>  |

2.7 Housekeeping

After you've finished the job, what should you do?

Tell people who live in the area that the work is finished



Clean the job site

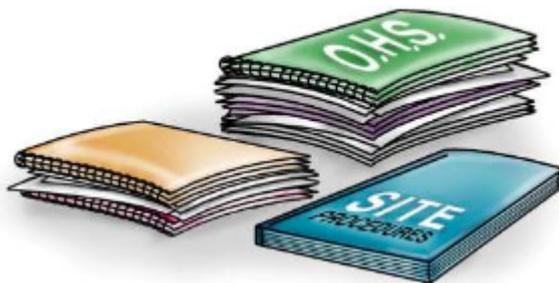


Put any rubbish in the correct bin and recycle what you can



What instructions do you follow when cleaning up?

The environmental management plan and site procedures.



What is the danger of leaving earth and rocks around the work site?

Someone might trip on a rock and be injured. Rocks left on the road can damage cars.



What do you do with other equipment and tools you've used?

Clean tools and equipment, and put them back in their place.



What must you do with waste oil and grease when performing maintenance?

Follow the site environmental plan for the safe disposal of waste oil, grease etc.



During housekeeping activities quantities of hazardous and non-hazardous materials may be recycled or disposed of. How do you keep track of what has been done?

By completing any required documentation. This may include hazardous/dangerous waste disposal forms, general waste disposal forms or entering information onto a records keeping system.



2.8 Record Keeping

Where do you record faults?

Record faults in the daily checklist book and report the fault to your supervisor.



Where do you record maintenance done by the operator such as refuelling, lubrication or small authorised repairs?

Write any maintenance or minor repairs in the machine logbook.



2.9 Relocate Equipment

How do you prepare a wheeled machine for travel on a public road?

Park the machine in a suitable cleaning area



Clean the machine of mud, soil, and stones. Remove any vegetation.

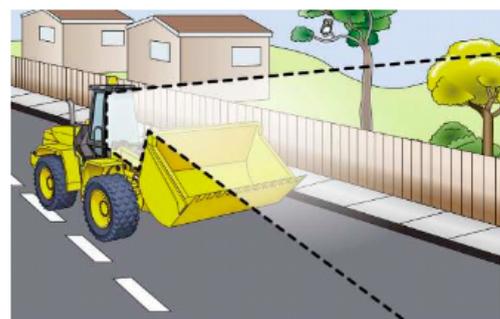


What should you do with the bucket before driving on a public road?

Make sure the bucket is rolled back and high enough above the road.

Don't raise the bucket too high otherwise you might not be able to see the road.

If the loader has rippers installed, put them in the highest position so they are not a hazard.



You need to drive the loader on a public road. The loader has very large tyres. What do you need to do?

Reduce speed to prevent bouncing. You may need to let some air out of the front tyres.

If the tyre pressure is high, the loader might bounce and be harder to control.



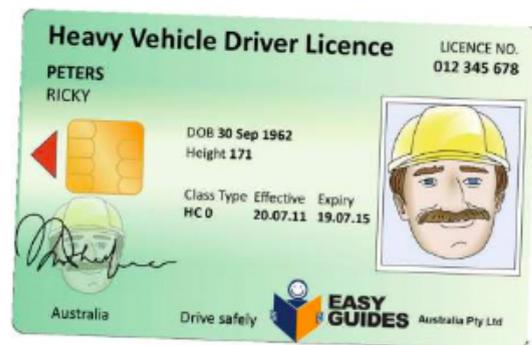
Do you need a permit to drive a front end loader on a public road?

You might if the loader is too heavy, too long or too wide. Check with your local transport authority (for example, VicRoads or the RTA).



What kind of licence do you need to drive a front end loader weighing over 4.5 tonnes on a public road?

In most states/territories you will need a heavy vehicle licence. For example, a light rigid (LR) licence for 4.5–8 tonnes (8.5 in some states). Check the rules for your state/territory.

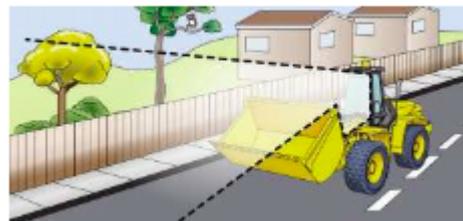


Before you drive on a public road, what checks do you make on the loader?

Make sure the loader is roadworthy, and it is registered for road use. All brake lights, indicator lights, horn etc, must be in working order.



Make sure the loader is roadworthy, and it is registered for road use. All brake lights, indicator lights, horn etc, must be in working order.



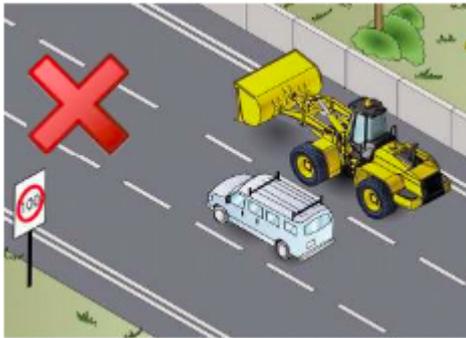
Note:

If the loader is not registered you may be able to get an unregistered vehicle permit (check with your relevant state/territory authority).

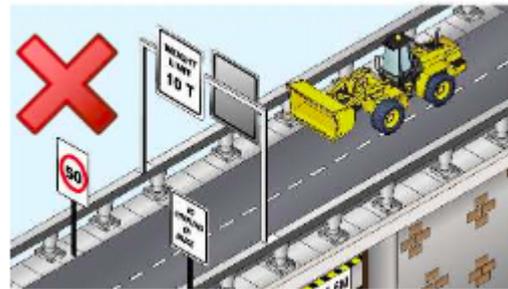
Do you have to follow the same traffic rules as other vehicles on public roads?

Yes. Sometimes larger vehicles have stricter rules. For example:

Can't drive in the right lane on freeways



Can't travel on some roads because of weight limits



Can't travel through suburban areas at night because of noise



Lower speed limits



Can't travel on some roads because of low bridges.



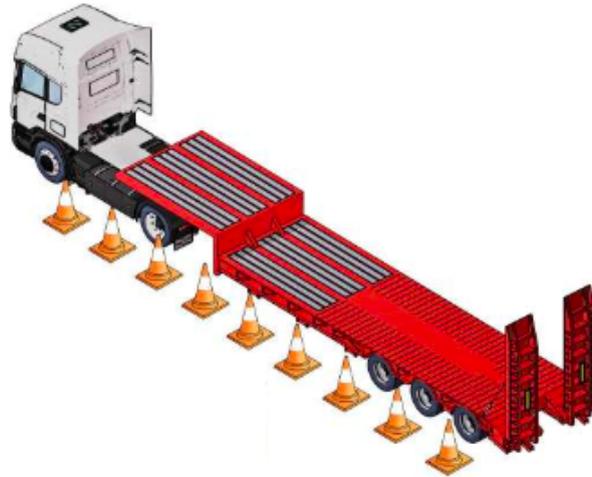
2.9.1 Loading and Unloading from Float/Trailer

As the operator of a front end load loader there may be times when you need to assist in loading or unloading the front end loader from a float or trailer. To perform this activity safely you should have completed, or be assisted in the loading/unloading by a person who has completed suitable training in loading and unloading plant. For example unit RIIHAN308F Load and Unload Plant or an equivalent unit would be suitable.

Anyone who loads or unloads a heavy vehicle is responsible for playing their part in the Chain of Responsibility which falls under Heavy Vehicle National Law. As a loader/unloader you have an influence over where and how goods are loaded and therefore have an ongoing responsibility to prevent breaches.

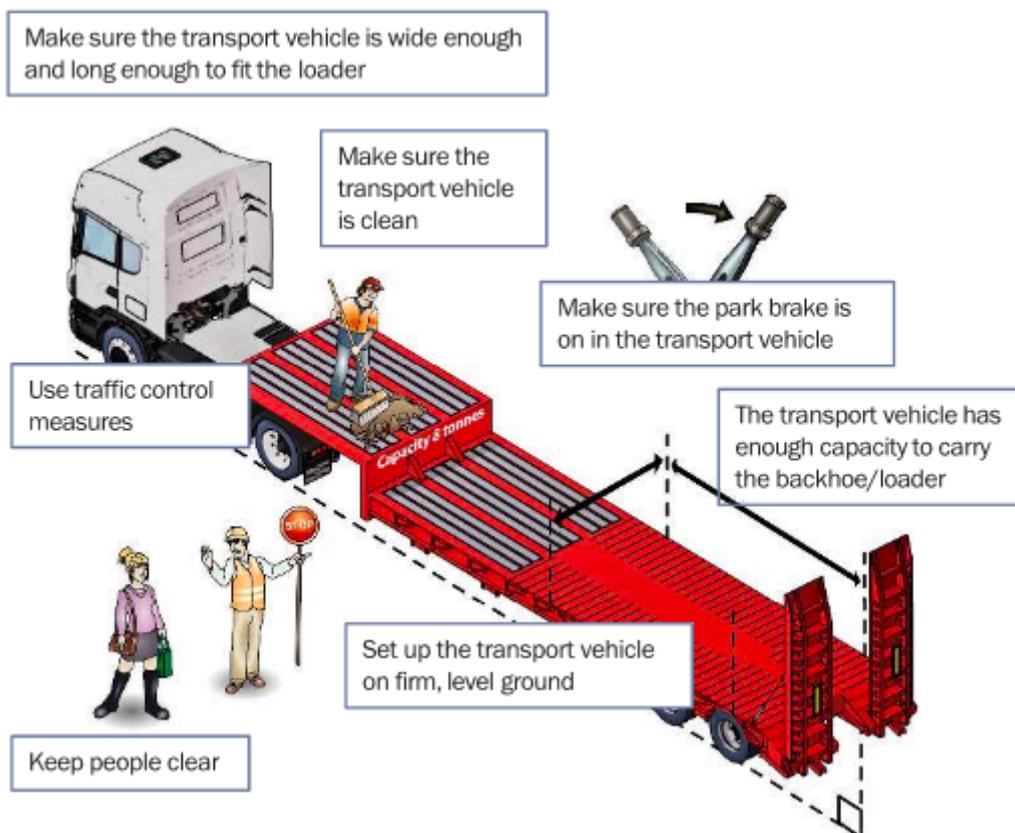
The key responsibilities of a loader/unloader may include ensuring that:

- Loads do not exceed vehicle mass or dimension limits*
- Goods carried are appropriately secured*
- You provide reliable weight information to drivers*
- Load documentation is accurate*
- Delays in loading/unloading are prevented
- Your loading/unloading do not require or encourage drivers to exceed the speed limits or regulated driving hours, fail to meet the minimum rest requirements or drive while impaired by fatigue.



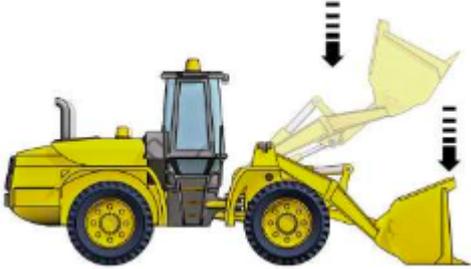
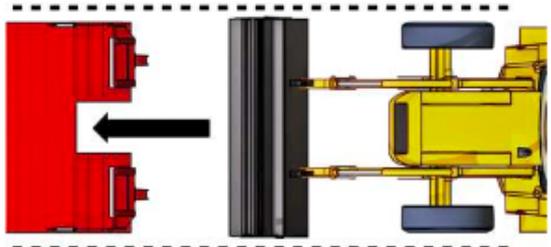
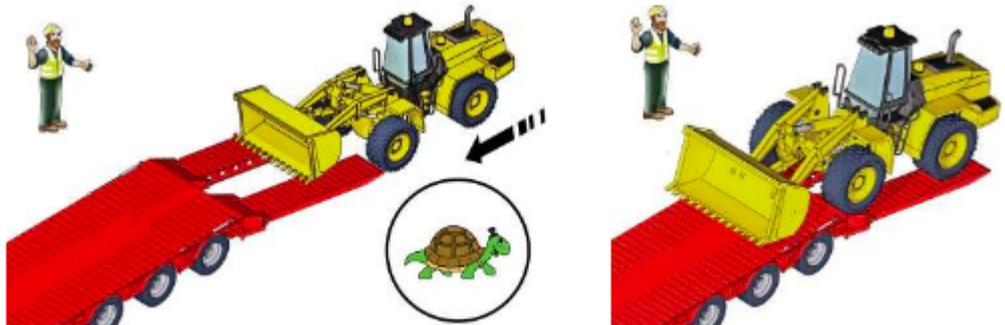
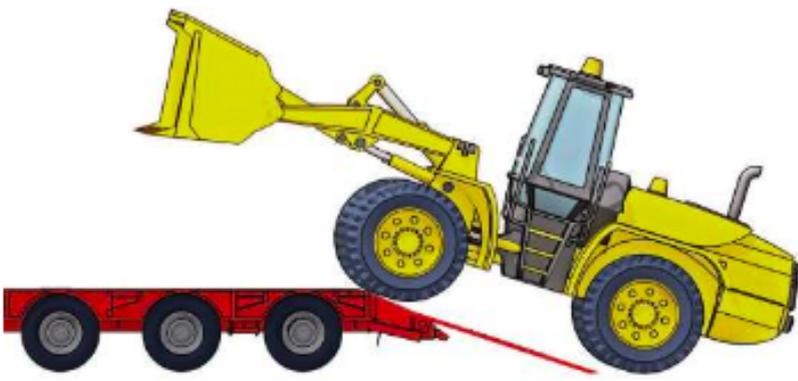
* Not relevant to an unloader

A loader is to be transported. How is the preparation done by the person responsible?



How is a loader moved on to the transport vehicle?

After the transport vehicle and the backhoe/loader have been prepared, the following steps are taken:

| | |
|---|---|
| <p>1. The bucket is lowered.</p>  | <p>2. Drive to the loading area.</p>  |
| <p>3. Line the machine up with the ramps.</p>  | |
| <p>4. Drive slowly forward until the wheels start to climb the ramp.</p>  <p>If visibility is restricted a guide may be required.</p> | |
| <p>5. Move the bucket or attachment away from the machine to help balance the machine while climbing ramps.</p>  | |

6. Lower the bucket close to the vehicle deck.



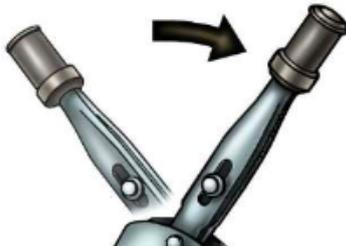
7. As the machine rocks over onto the deck, raise the bucket slowly to prevent the machine coming down hard onto the deck.



8. Raise the bucket to just clear the deck and position the machine on the vehicle to make sure the load is correctly shared by the vehicle wheels.



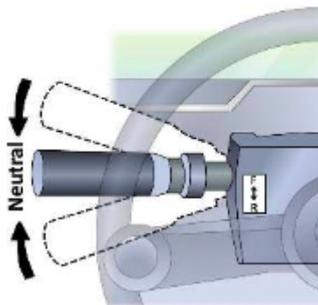
9. Switch off the machine and apply the park brake.



10. Release the hydraulic pressures



11. Apply the articulation lock by putting the forward and reverse sticks into neutral.



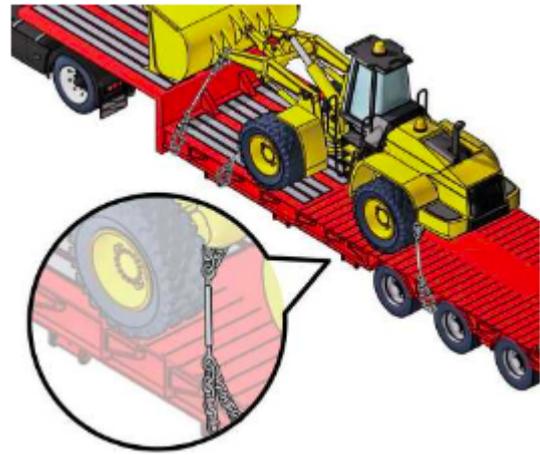
12. Secure the cabin.



13. Temporarily chock the wheels until the vehicle is secure.



14. Use chains to safely secure the backhoe/loader to the transport vehicle. Remove and stow chocks when the machine is secured.



Are there regulations about securing a load on a truck or trailer?

Yes, the load restraints must be able to hold the load from moving as shown in the table.

| Direction | Restraint needed |
|------------------|--------------------|
| Forward | 80% of load weight |
| Rearward | 50% of load weight |
| Sideway | 50% of load weight |
| Bounce or upward | 20% of load weight |

