Learner Name:

Learner Guide

Earthmoving Course

RIIMPO326E Conduct Civil Construction Water Vehicle Operations

Learner Guide

National Courses Pty Ltd

1.1 Introduction to Water Vehicles

This unit may be used to demonstrate competency in the following industries:

- Coal mining
- Extractive industries
- Metalliferous mining
- Civil construction

1.1.1 What is a Water Vehicle?

A water vehicle is a purpose built vehicle or plant platform used to load, carry and distribute water on roads or worksites. This guide covers water carts in the civil construction industry.
Water carts include:

- Diesel-mechanical
- Diesel-electric
- Rigid or articulated steering vehicles.

Articulated steering means the front of the truck bends behind the cab and the rear tank can move independently. Rigid trucks can't do this, and steer using the front wheels.

Articulated body	**Rigid body**
	

Note:
In this Learner Guide, the terms **water cart** and **water vehicle** are used to mean the same type of

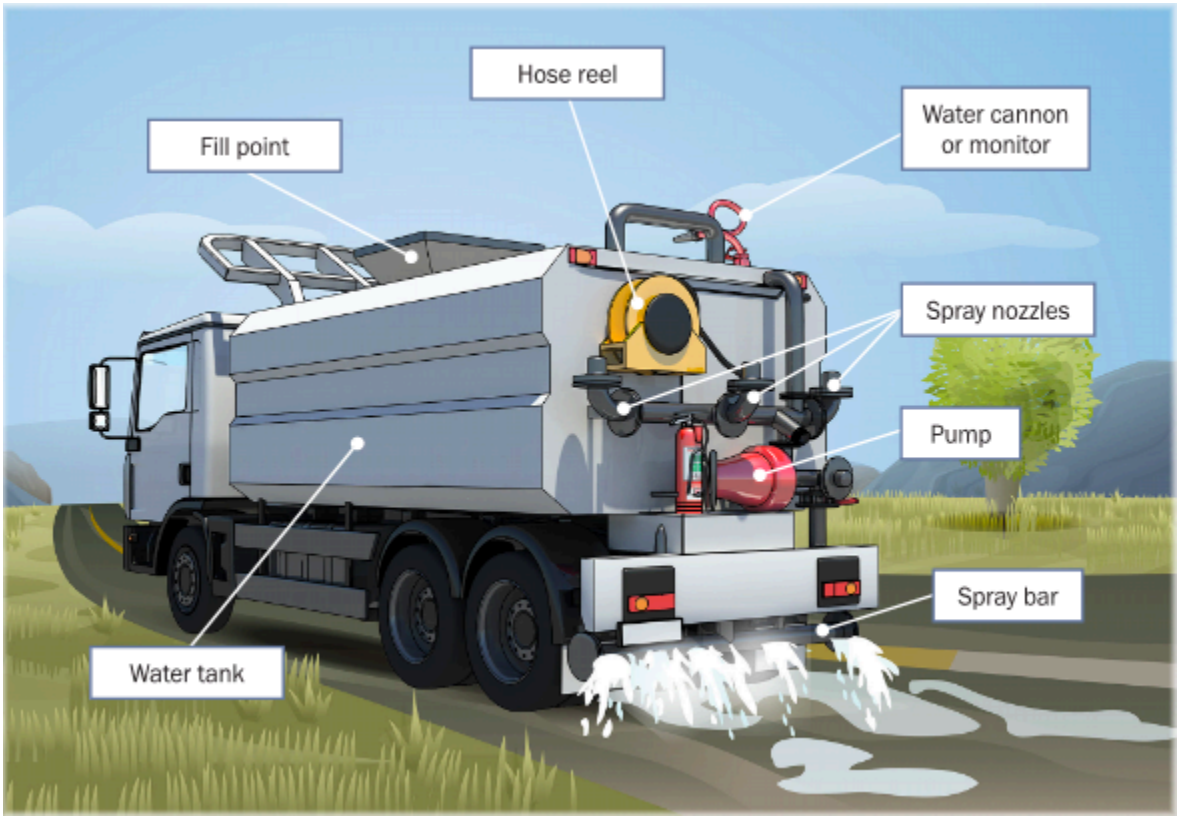
1.1.2 Water Vehicles and Their Uses (Civil Construction)

In civil construction, water carts are used for dust control, and to make sand, gravel or other materials easier to work with. The type of water cart you will drive depends on the ground conditions and access to the site. For example, if you are working on a small country road you may use a road water cart, or smaller water cart with a slip-on tank. However, if you were working on a large civil construction site you would use a much bigger bulk water cart.

Water carts can hold a large amount of water and usually have spray nozzles or spray bars and pumps, which spray water on roads or other surfaces. Some have large water cannons which can spray long distances. Some spray water on the road as they drive. Water carts have different types of spraying equipment and pump systems. For example, most are fitted with spray nozzles or bars at the rear of the vehicle. These can spray water on to the surface using a pressure pump or gravity feed. Water is sprayed to help with soil compaction. It is also used for dust suppression, or to wash down roads to help keep them clean. Some carts have water cannons that are used for directional spraying. They can also be used to help with fighting a fire.

Example of a water vehicle with a slip-on tank

An example of a water vehicle (civil construction)



1.1.3 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.
	

1.1.3.1 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.**

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

1.2 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 (scope) 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.

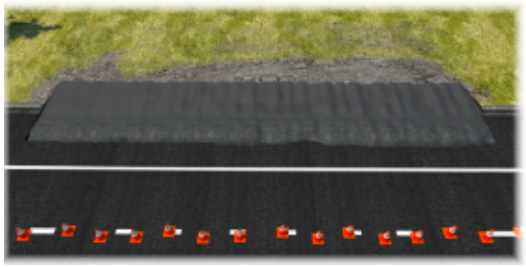
When the road base is thick enough, and is compacted properly, the road is finished.

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.

1.2.1 Calculation

1.2.1.1 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 × W = Square metres

4 m × 20 m = 80 square metres

This can also be written as:

80 m^2 or 80 square metres

Step 2:

Convert the layer thickness from millimeters to metres.

To do this divide the layer thickness by 1000

150 mm ÷ 1000 = 0.15 m

Step 3:

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

80 square metres × 0.15 m

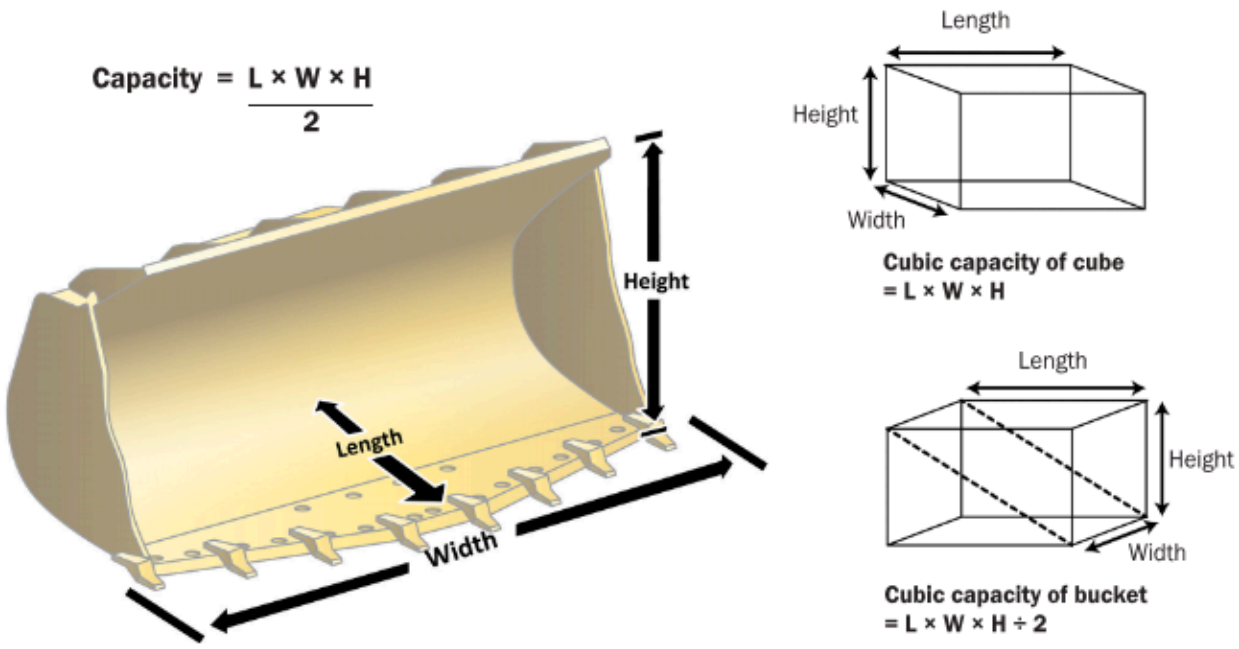
= 12 cubic metres

This can also be written as:

12 m^3 or 12 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.

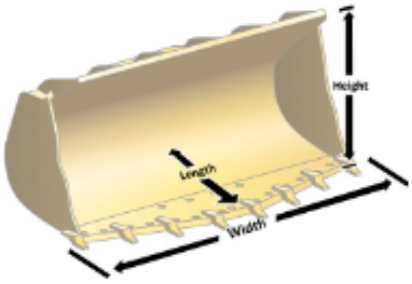
1.2.1.2 How to Find the Cubic Capacity of A Bucket



Cubic capacity is ÷ 2 because of the shape of the bucket (a triangular prism)

1.2.1.3 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:	Step 2:	Step 3:	Step 4:
To calculate the capacity of the bucket, use the formula: L × W × H ÷ 2 2 × 1 × 1 ÷ 2 = 1 cubic metre Capacity of the bucket = 1 cubic metre	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)	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 × 2 = 2 tonnes Each full bucket of dry beach sand weighs 2 tonnes.	Truck load capacity is 8 tonnes. 8 tonnes (truck) ÷ 2 tonnes (per bucket) = 4 buckets

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.

2.1.3 Worksite Requirements

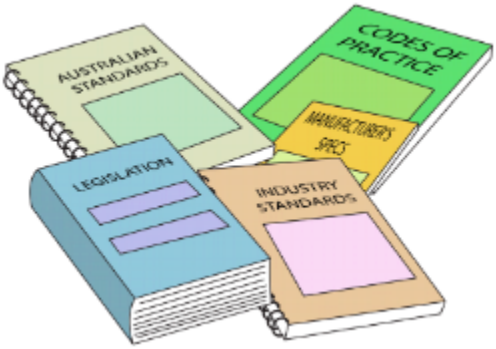
Examples of documents your employer should provide include:

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

2.1.4 Chemical Solvent

Chemicals should always be labelled so that you can easily tell what chemical you are working with. Chemicals should be stored in a safe place where someone cannot accidentally come into contact with them. Always check the Safety data sheet (SDS) before handling any chemicals. The SDS must be provided to, and understood by, a person using chemicals in the workplace. The SDS will tell you how to safely handle the chemicals. If you are not sure, put the chemicals in a safe, isolated area and talk to your supervisor.

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?

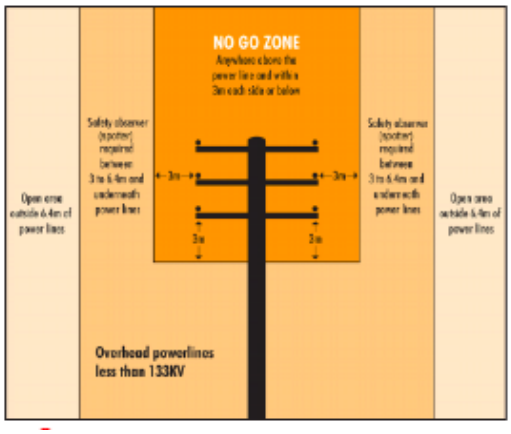
You must work in a way that is safe. You must not risk the health and safety of yourself or others.

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 some examples of documentation you may need to read before working with a water vehicle?

- WHS Act
- Mining Acts and Regulations (for your state/territory)
- Regulations
- Code of practices
- Australian Standards
- Manufacturer's specifications
- Operator's manual for your machine
- Site requirements and procedures
- Legislation (laws) about Equals Employment Opportunity and Disability Discrimination

Why should you check the operator's manual for your equipment before using it?

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

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.

2.1.5 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	7	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**		
Gasses/oxygen/chemicals			Overhead power	X	8	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	4	Inhalable dusts/fibres			Using EWPs		

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				Soil erosion		
Safety glasses/sun glasses	X	**Static plant/equipment:**		Hazard to flora/fauna		
Full face shield				Other:		
Hearing protection	X					
Hard hat	X	**Mobile plant/equipment:**				
Dust gas mask		Excavators, Loaders,	X			
Breathing apparatus		Trucks, Machine	X			
Welding face shield		**Safety/emergency equipment:**				
Fall protection and access						
Safety harness						
Fall protection equipment						
Fall arrest equipment		**Isolation and warnings**				
Other:		Barricades	X			
		Group isolation				
		Personal locks or lock out tags				
		Warning signs	X			
		Area lighting				
		Other:				
		Traffic controllers	X			

Risk Rating Table: *Use the following table to rate the risk.*
• 1-2 = Low • 3-4 = Medium
• 5-6 High • 7-8 Extreme

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

6. PERMITS (Attach and record number)					
Hot work		Excavation		Hazardous work	
~~Access to work area~~		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 9am-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, MSDS, isolation plants etc.					
Name	**Signature**	**Date**	**Name**	**Signature**	**Date**
Dick Osborne	Dick Osborne	2/4			
Leon Boracs	Leon Boracs	2/4			
Sal Boncero	Sal Boncero	2/4			
Noel Scarbo	Noel Scarbo	2/4			

9. FINAL APPROVAL/SIGN OFF			
	Name	**Signature**	**Date**
Approved by:	Mark Alabaster	Mark Alabaster	2/4/15
Approved by:	Duncan Morton	Duncan Morton	2/4/15
Customer/Client	N/A		

What kinds of information do you need before starting work?

You might need:

- Plans - 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
- Job paperwork - for example Job Safety and Environment analysis (JSEA) or Safe Work Method Statement (SWMS)

2.1.6 Dust Suppression Theory

Understanding dust suppression theory will help you to meet the quality requirements of the job. Dust is small particles of dirt or soil which are carried in the air.

Suppressing dust means to spray the dust with a liquid or cover the dust.

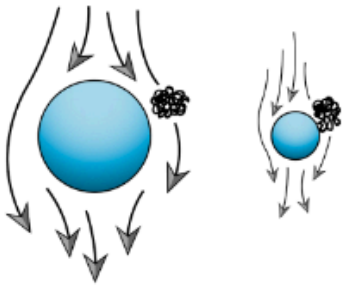
When you spray a liquid onto dust, the soil particles and the water join together. This stops the particles from rising into the air.

This creates a layer of wet soil. The layer of wet soil stops the dry soil underneath from causing more dust.

You must be careful how much water you use to suppress dust. If you use too much the soil becomes very wet and goes muddy or slushy. This makes the soil harder to work with.

Water trucks have spray nozzles which spray a fine mist. The mist makes the water droplets smaller which bond better to the dust particles. If the water particles are too big the dust particles move around the water droplet instead of clinging to it.

Water droplets bond to dust particles

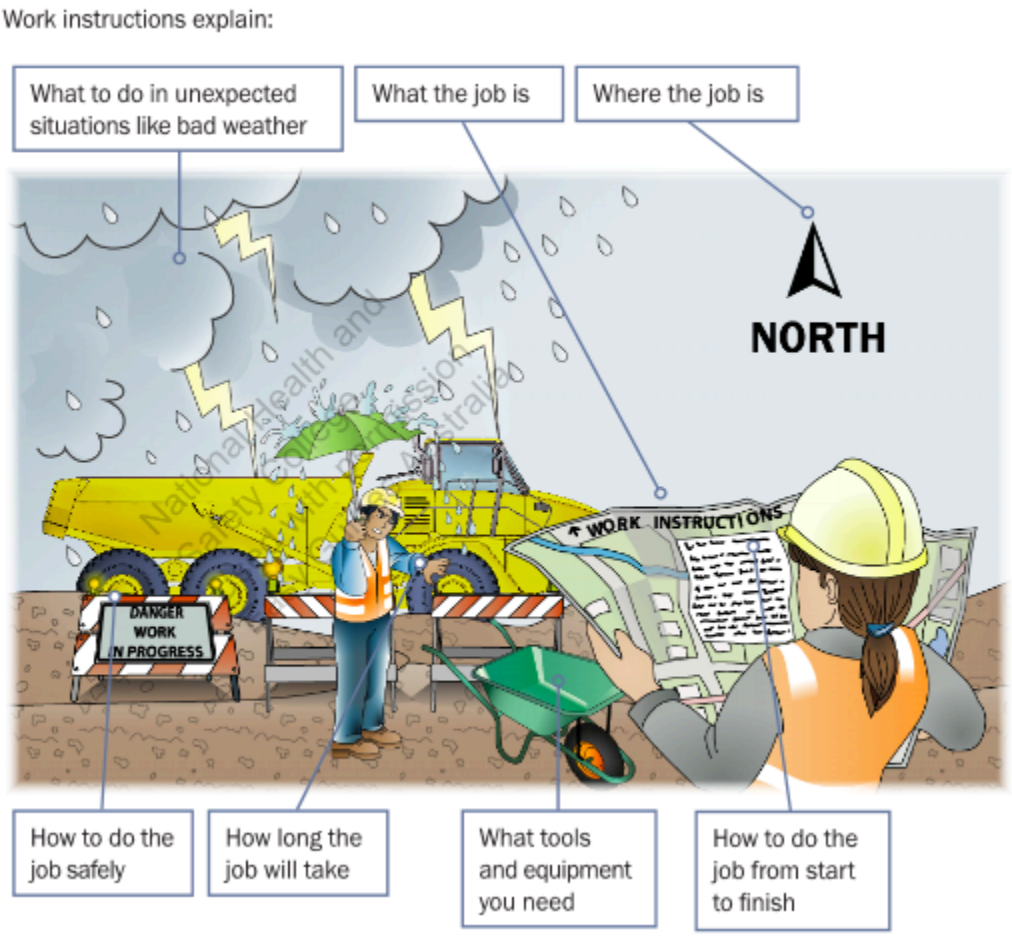


If you follow the instructions for the job, will you meet the quality requirements?

Yes. The quality requirements tell you the standards you must meet when driving a water vehicle. 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.

For example, in this job only half the road needs to be sprayed.

What do the job's work instructions explain?



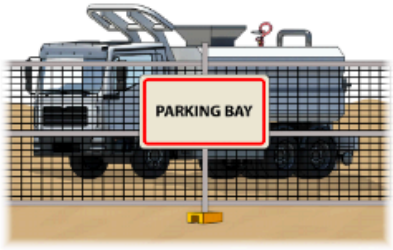
Before you can start working on a new site, what must you do so you can start work?

Under state/territory Mining Acts, you must be familiar, authorised and signed off by your supervisor on that site before you can operate a water truck.
To get signed off, you might:

- Do site training
- Read site plans
- Drive around the site to get familiar with it.

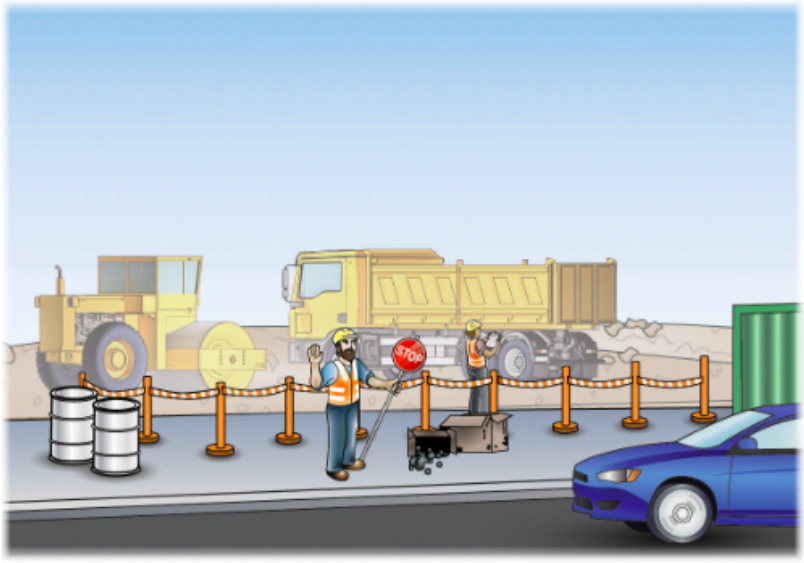
What does the safety plan tell you?

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

<table>
<tr><td colspan="2">What personal protective equipment (PPE) to wear
 
</td></tr>
<tr><td>How to use tools, plant and equipment safely
  </td><td>Emergency procedures and exits
 
</td></tr>
<tr><td>How to park safely and where to park
 
</td><td>How to control hazards and risks
  </td></tr>
</table>

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.



How do you work with your supervisor to get the most out of the water truck?

You need to know what your water vehicle can do and what each attachment can do. Talk to your supervisor about what the truck can do when you are getting your work instructions.

Which plans do you follow so you know how to do the job properly?

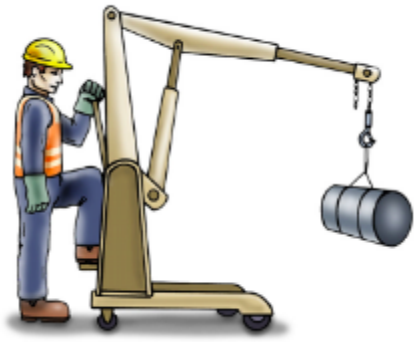
The site's standard operating procedures and/or work instructions.

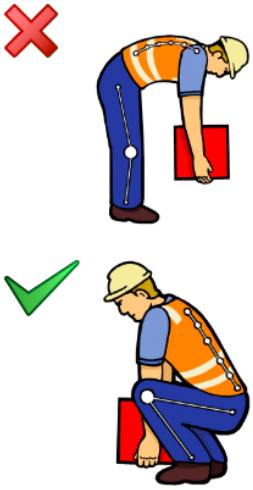
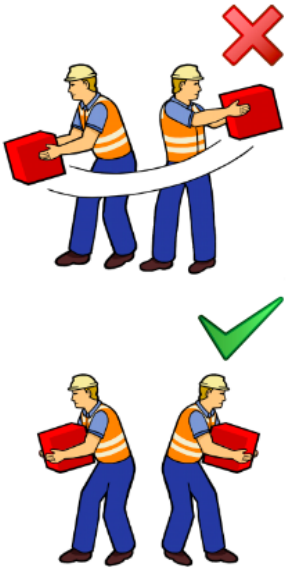
2.1.7 Manual Handling

Manual handling is any activity where you use force to:

- Lift
- Lower
- Push
- Pull
- carry or move a load.

Any manual handling activity that is done incorrectly can result in injuries, such as muscle strain and back and neck injuries. Manual handling injuries are very serious and can stop you enjoying things you like doing. For example, playing sports or walking the dog.

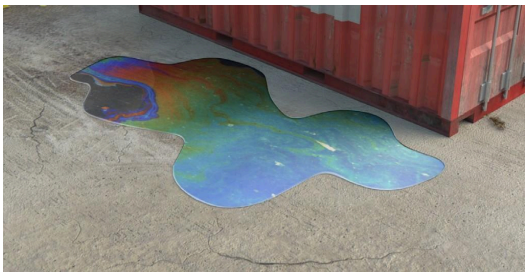
Before you start any manual handling activity, check to see if there are any mechanical aids or equipment that you can use to make the job safer and easier. 	If the load is big, heavy or an awkward shape get someone to help you move it. 

Bend your legs, keep your back straight 	Keep your back straight 	Move your feet 

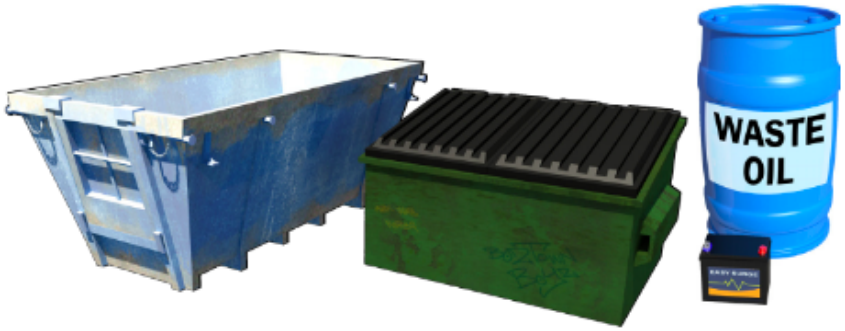
2.1.8 Environmental Management Plan (EMP)

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.

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.



The EMP also tells you how the worksite meets all environmental protection laws and what to do with waste.



2.1.8.1 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

2.1.8.2 Working 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?

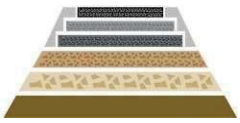
You can use the following table to rate how likely it is that an environmental incident may happen.

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.**

2.1.9 Principles of Soil Technology for Civil Works

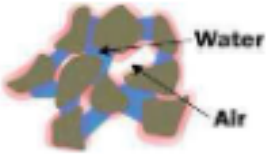
One of the most important jobs you will do, as a machine operator, is to help lay foundations. Foundations are the base for roads, railway lines, swimming pools and buildings. If you do not have a solid foundation, you cannot build something solid on top of it.

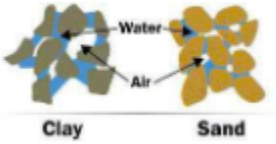
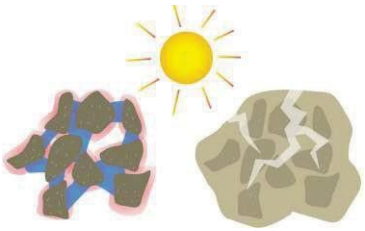
When soil is firmly compacted it has an increased density, this provides a stronger foundation to build on.



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.

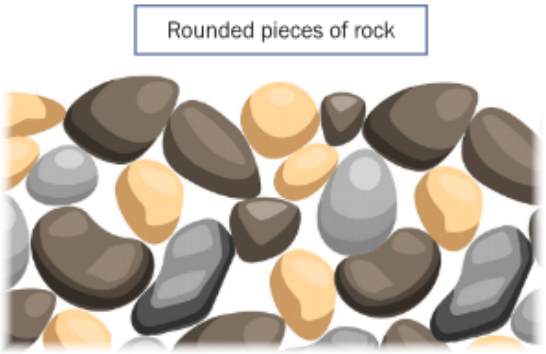
The amount of water in soil affects its viscosity. Viscosity is how thick the soil is. For example dry loose soil has a low viscosityand is easy to work with. Wet muddy soil has a higher viscosity and can be more difficult to work

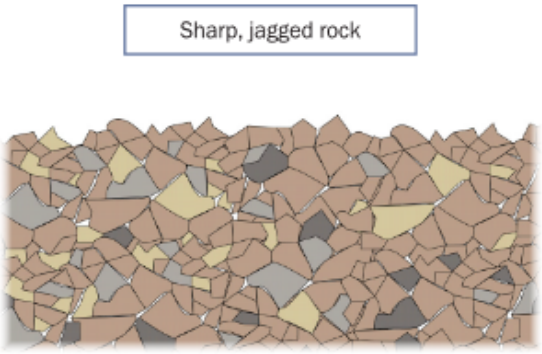


	with.
All soils usually contain moisture. How much moisture the soil has depends on many things. The weather, drainage, and the soil's ability to hold water all affect the moisture in a soil. Retention properties mean how much water a soil can hold. Different soils can hold different amounts of water. Sometimes you can treat a soil to change its moisture content. To do this you mix a chemical with the soil. 	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. 
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. 	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. 
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. 	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. 

2.1.9.1 About Compaction (Mechanical Interlock)

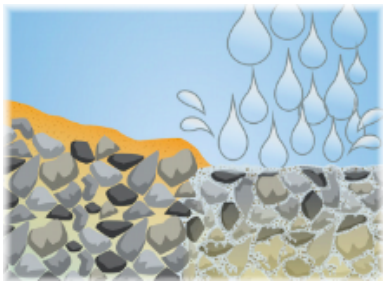
When laying a road base or laying asphalt, mechanical interlock becomes important. Mechanical interlock means how the pieces of rock (aggregate) grip together to form a base. For example, if the road base you were compacting was made up of rounded pieces of rock they would not link together very well. If they were sharp, jagged and more varied they would link together better.





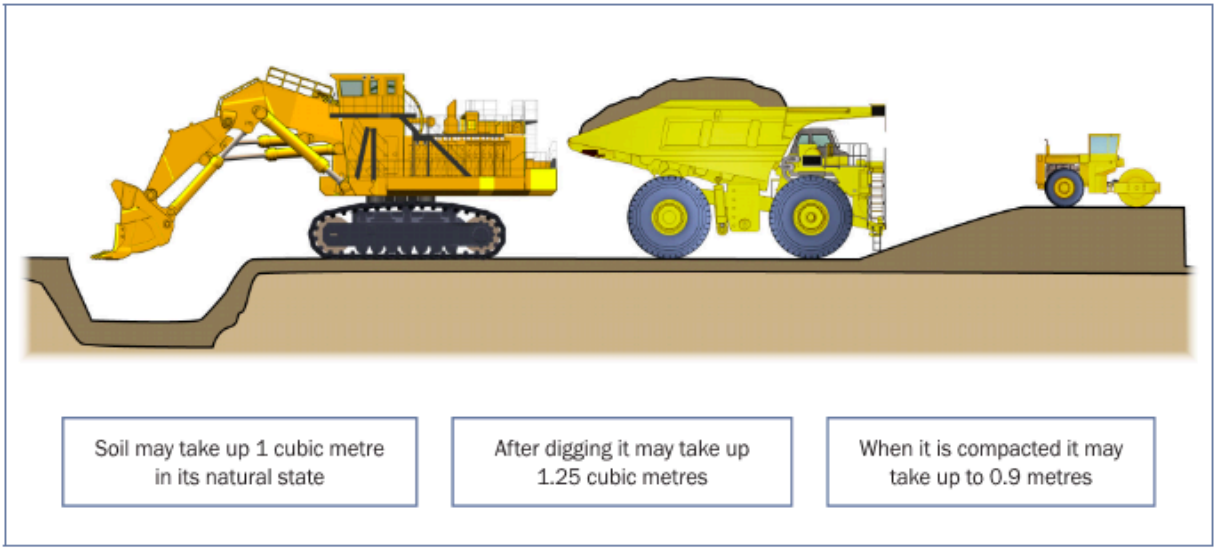
If you use the wrong aggregate, there will be gaps left during compaction. This means the road base will not be as solid or strong. Using the right type of aggregate is only one aspect of good mechanical interlock.

Another aspect is moisture. Moisture helps small particles in the aggregate mix in and fill the gaps. This is why water trucks often wet down the road base before the compactor or roller compacts the road base.



2.1.9.2 Soil Compaction

Soil can have different volumes in different conditions. For example:



2.1.9.3 Soil Volumes and Soil Swell

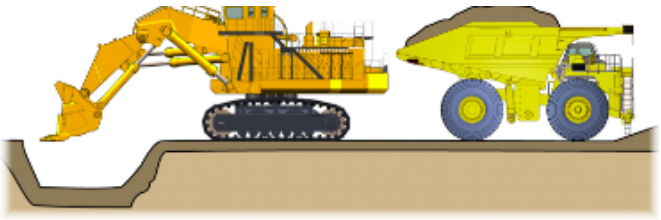
This table shows some examples of common materials and their various volumes.

Soil type	Loose	Compacted
Gravel & Gravelly soil	1.20	0.95
Sand & Sandy soil	1.20	0.95
Cohesive soil	1.30	0.90
Boulder	1.20	1.00
Soft rock	1.30	1.15
Medium rock	1.60	1.25

Most soils or materials swell as they are removed from their natural resting place. The rate of swell depends on the material. The following table shows a range of materials and their percentage of swelling.

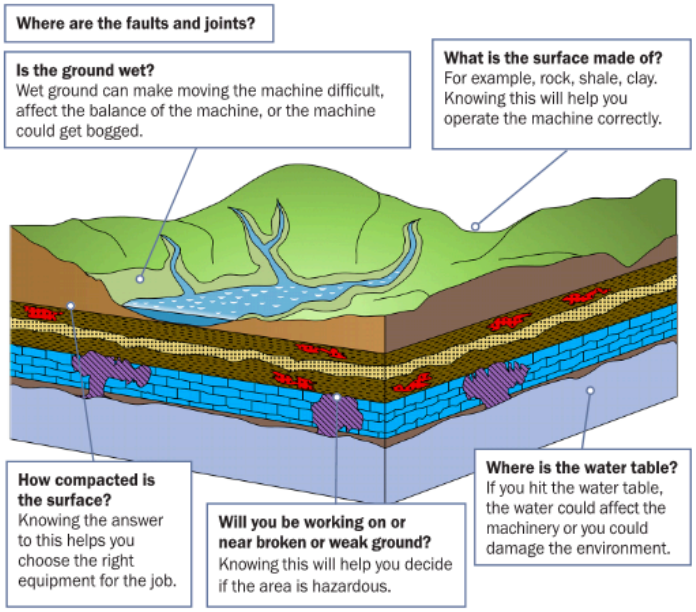
Material type	Swell (percent)
Clay, dry or wet	40
Earth (loam or silt), dry or wet	15 to 35
Gravel, dry or wet	10 to 15
Sand, dry or wet	10 to 15
Shale (soft rock)	65
Trap rock	50

You need to be aware of this when you are working with these soils. For example, if you were digging and loading clay, every 1 cubic metre of soil dug, would be 1.4 metres loaded into the truck.



What kinds of geological data do you need before starting work with the water vehicle?

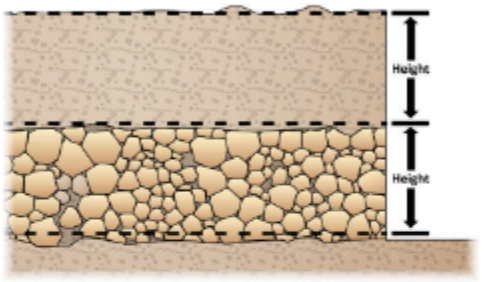
You need to know about the kind of surface you will be working on. For example:



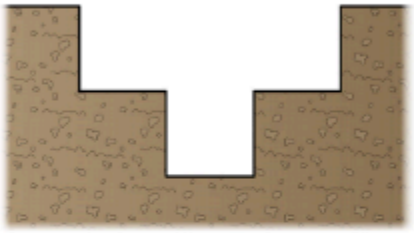
What survey data do you need before you start with the water vehicle?

You need to know:

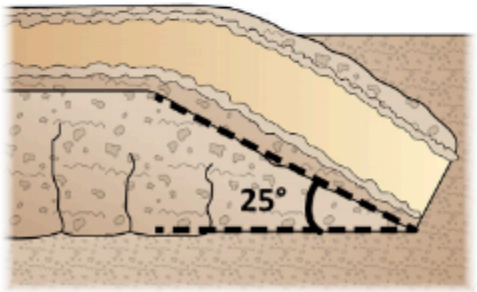
What are the floor heights?
You need to know how stable and solid the ground is underneath the work area. Weak ground could collapse.



What are the bench widths and heights?
Benches are like cuttings which let you go in and out of the work area. The benches must be well looked after because there is a risk they could cave in.



What are the grades of ramps and floors?
Knowing this information can help you choose the right machine and work safely.



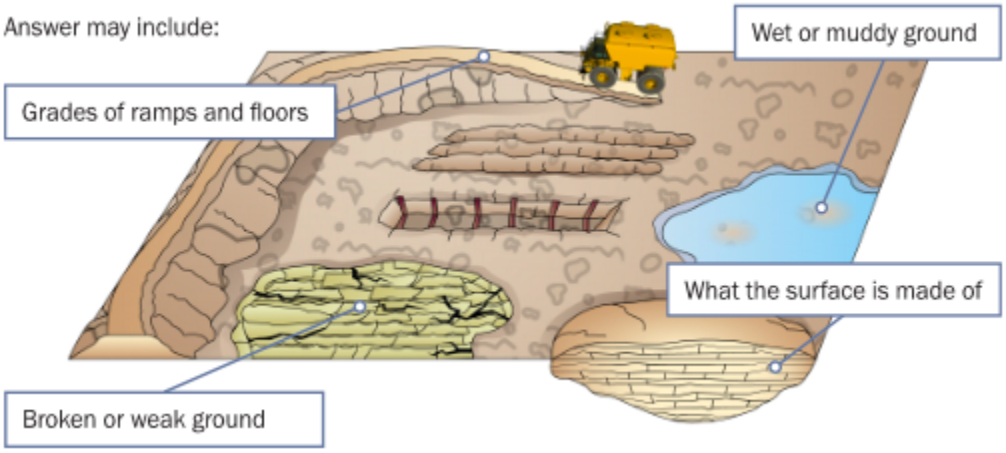
The location of survey pegs, temporary bench marks and permanent bench marks.

How can you find information about the geology of your worksite?
Geology includes:

- **What is on the ground**
- **What is in the ground**
- **What is under the ground**

Your supervisor should have maps of the geology of the worksite. You should look at these maps before working. Your worksite may use software that checks the geology of the area.

What are some examples of geological or survey data that apply to water trucks?



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?

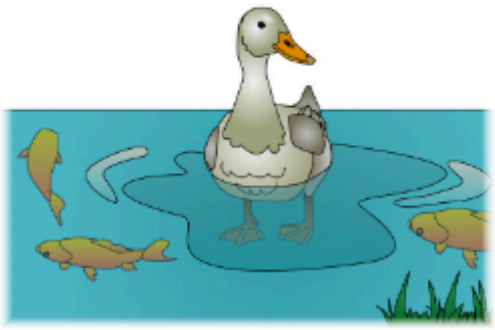
1. **Elimination:** If possible, remove (take away) the hazard.
2. **Substitution:** Use a safer method if you can't remove the hazard.
3. **Isolation:** Stop access to the hazardous (dangerous) area.

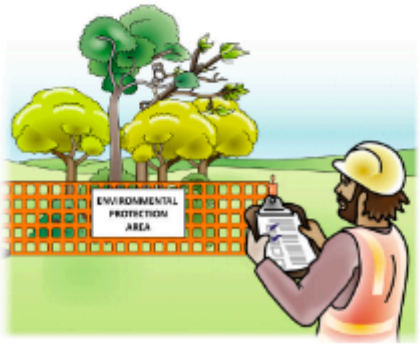
4. **Engineering Control Measures:** Change the tools, equipment or environment to make it safer.
5. **Administrative Practices:** Reduce the time the worker is exposed to the hazards by using training, job rotation, the timing of jobs, etc.
6. **Personal Protective Equipment (PPE):** Use PPE as your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

Memory aid: Every **S**aturday **I E**at **A P**ie

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

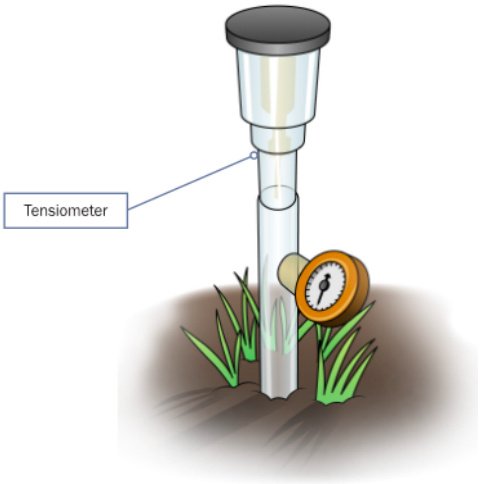
The EMP tells you:

Possible risks to the environment on the worksite 	How to work in a way that reduces damage to the environment 
How the worksite meets all environmental protection	Who is responsible for each part of the environmental

laws	management plan (EMP)
	

What field test can you use to find the moisture content of soil?

You can test how much moisture is in a soil by using a tensiometer. A tensiometer is a small tube you push into the ground. It reads how much tension is in the soil. The reading on the tensiometer will indicate the moisture content of the soil.



What kinds of PPE might you wear when using a water vehicle? Explain what you use the PPE for.

You might use:

Non-slip boots that cover your whole foot. Some sites require steel-capped, lace-up boots to protect your feet	Safely vest/hi-vis clothing - to show people where you are	Hard hat/helmet - to protect your head from falling objects
		

		
Glasses/googles - to protect your eyes 	Ear muffs - to protect your hearing 	Gloves - to protect your hands when you are doing things such as checking engine coolant, brake fluid or refueling. 

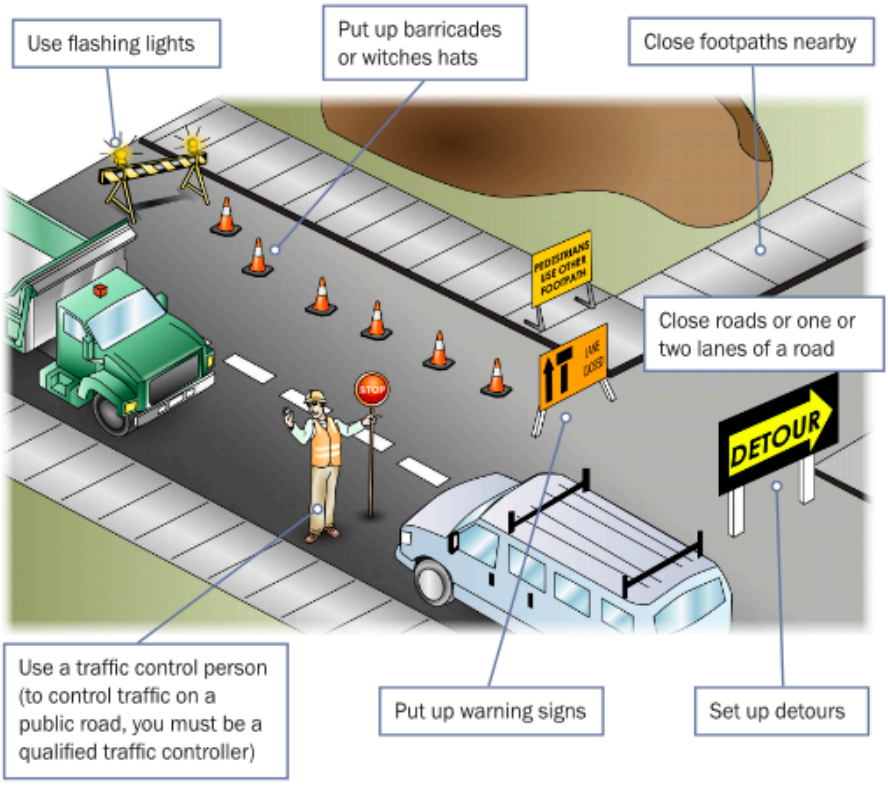
What kind of personal protective equipment (PPE) must you wear when working with a water vehicle?

You must wear any PPE that the law, regulations and your workplace policies and practices tell you to.

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?



Where do you put up warning signs?

Near underground services	Near dangerous places
	
In places you need to control traffic	**On the site fencing**
	

2.1.10 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

Maintenance equipment

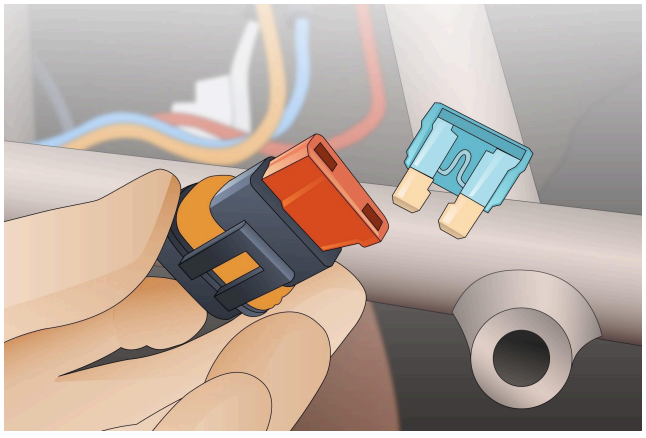
- Grease gun
- Tyre pressure gauge

Lifting equipment

- Slings
- Chains
- Shackles

2.1.11 Defective Parts

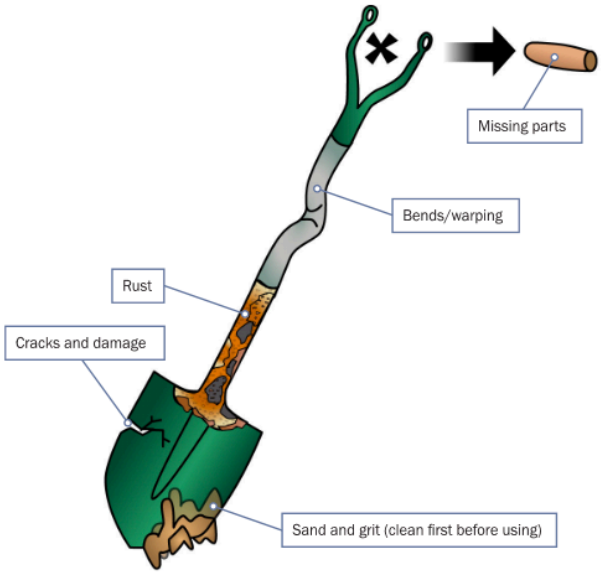
If you notice a defective part, for example a fuse is blown or not working, you should arrange to have replaced immediately. You must check the rules for your site and your state or territory. In some states only licensed mechanics are allowed to do any repairs.



it

What kinds of faults do you check hand tools for?

You check 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 would you choose an articulated water vehicle?

You choose an articulated water truck when you have long drives over muddy or soft ground. Because they are 4 or 6-wheel drive, they have a good grip. They are also more stable on steep terrain.

When would you choose a rigid water truck?

They are best on flat roads travelling longer distances.

2.1.12 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).

2.2.12.1 Reporting Incidents

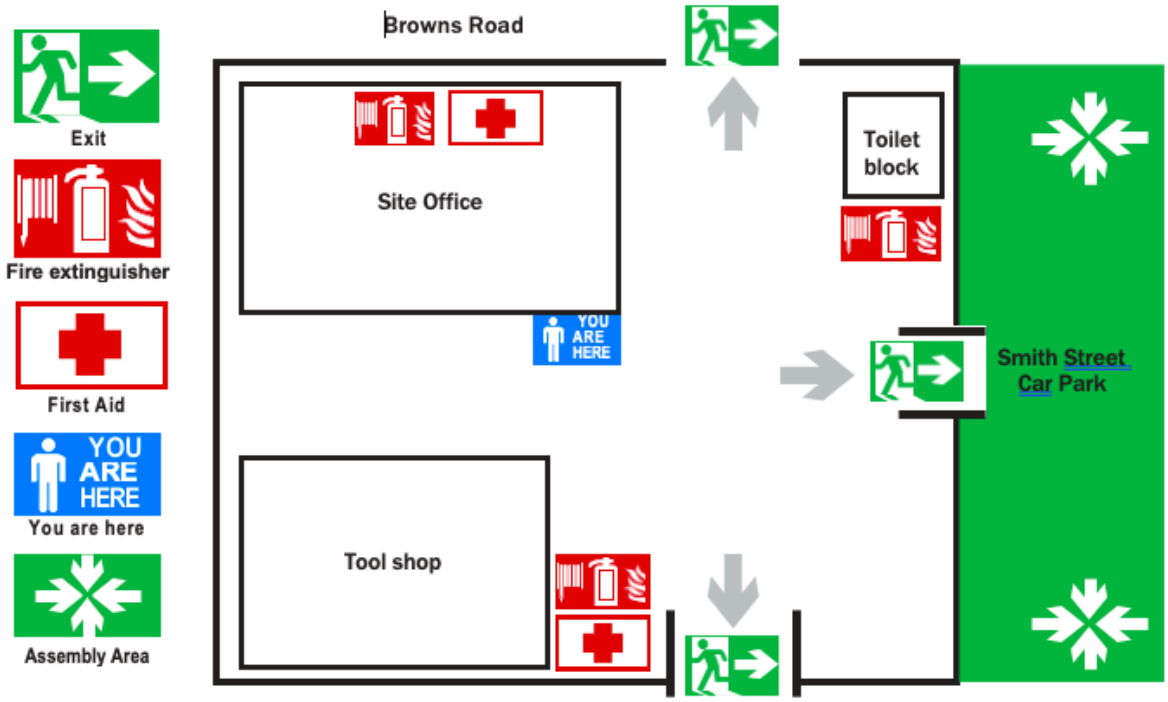
As a PCBU, employer or self-employed person you must report serious incidents to the SafeWork authority in your state. You must give a written report within 48 hours if any of the following happen on a site you are controlling:

2.1.13 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.

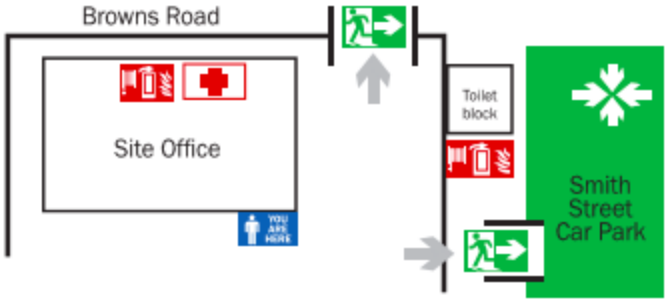
2.1.13.1 Site Evacuation Plan (Example)



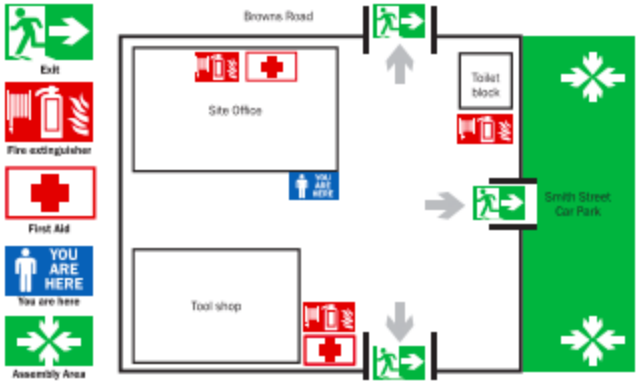
There is a site evacuation plan on the noticeboard. How do you make sure you can understand it?

Look at the site evacuation plan.
Find the 'You are here' sticker.

Note how nearby areas are shown on the plan.
For example, is the first aid station nearby?
Is the name of a road that is nearby marked on the plan?

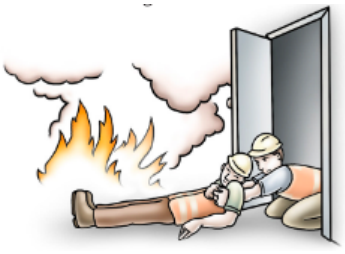


Now you know where you are on the plan, work out where the emergency exit is – on the plan and in real life.



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

1. Remove any person from immediate danger.



2. Alert others nearby (and your supervisor if possible) to call the fire services.

3. Control and extinguish (put out) the fire if possible.

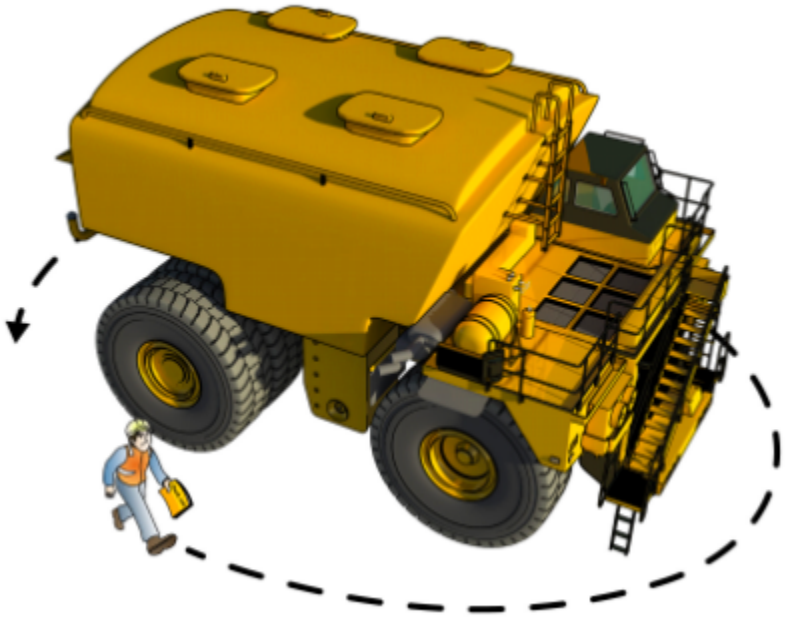
4. Evacuate the area if the fire cannot be controlled.

3.1 Operate Water Cart

What is the first check you do on the water vehicle?

Do a visual inspection. Walk around it and check for obvious problems including:

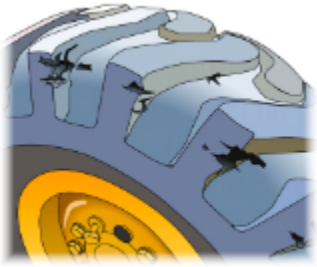
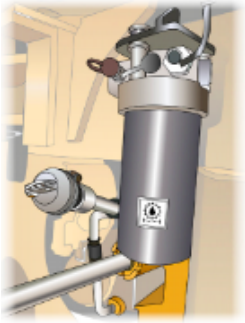
- Safely guards and covers
- Loose nuts and bolts
- Warning signs are in good condition
- Grease points and nipples
- Any water or oil leaks

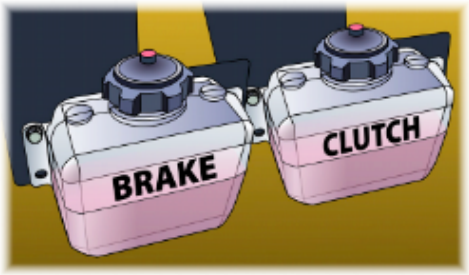
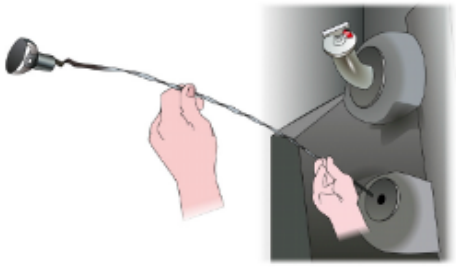
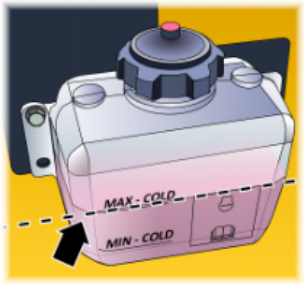
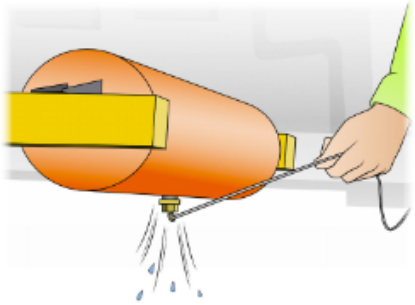
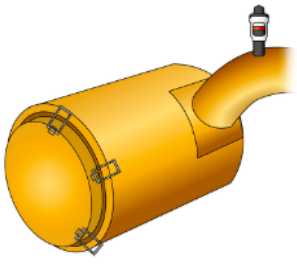
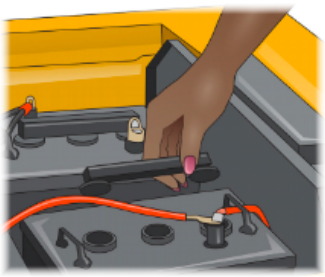


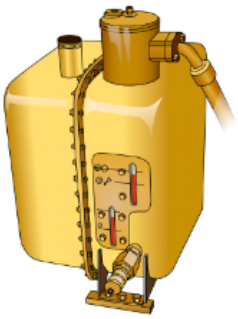
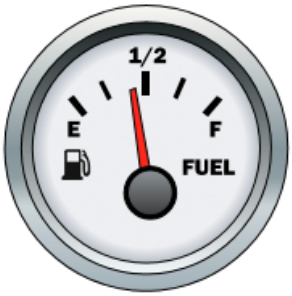
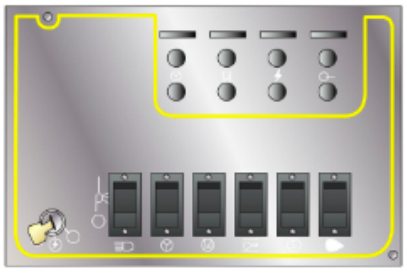
What are some pre-operational checks you do before using the water vehicle?

Note: On some work sites, an authorised mechanic will do some of these checks.

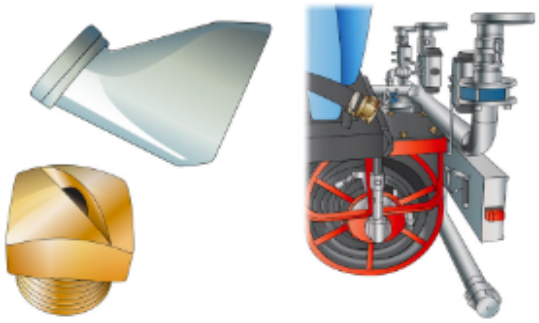
Checks may include:

Do a visual check of tyre condition and pressure. Remember to check the wheel nuts. 	Look for leaks under the water truck 	Look for leaks under the water truck 

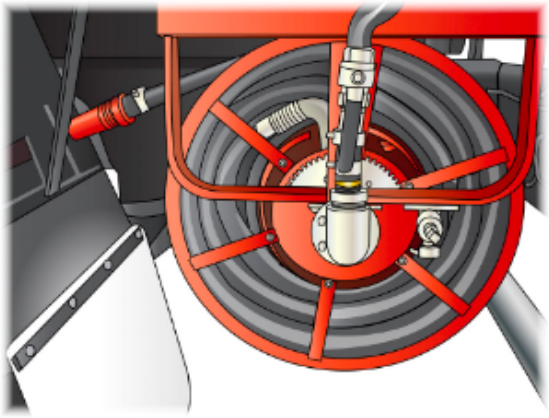
Check hydraulic fluid (brakes and clutch) 	Check engine oil 
Check engine coolant 	Check the air tank (if fitted) and drain condensation 
Check air filter indicator 	Check battery water level 

Check power steering fluid 	Check the fuel gauge to make sure the water vehicle has enough fuel 
Check instruments and gauges 	Some trucks have an electronic monitoring system in the cabin. It automatically alerts the driver if something is wrong with the trucks operating systems. 

What other checks are important before starting work?

Check the attachments. There are many types of valves and sprays for water vehicles including rear sprays, front sprays and V-jets. Check that none of the spray nozzles are clogged. 	Make sure the spray controls work. 

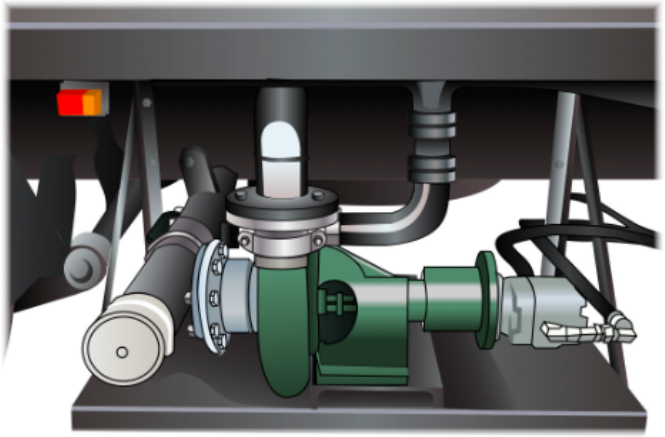
Why is it important to check your hose and hose reel before and during work?



If the hose reel is rusting or sticking, or your hose is leaking, it can slow down the work on the jobsite. You must also make sure the hose is secured – for safety.

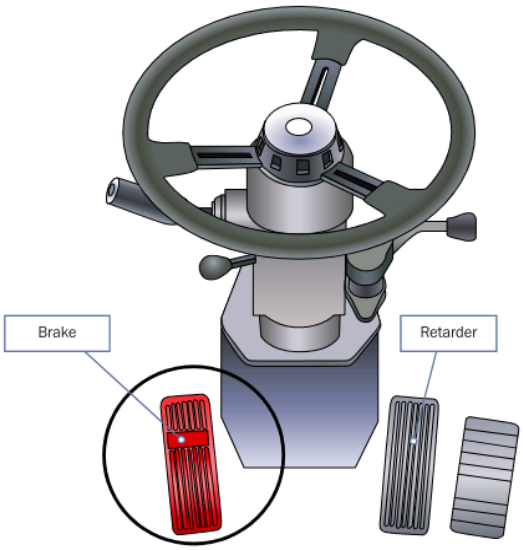
Is it important to check the water pump before and during work?

Yes. The water pump is one of the most important pieces of equipment on your water truck. Water pumps provide the pressure for the water flow and for the sprayers and water cannons. They need to work reliably in hot and dusty conditions. They can be used for both filling the tank and distributing water. Pumps can be used to drive high pressure water cannons to wash down plant and equipment in the field. Always check that the water pump is in good condition before starting work.



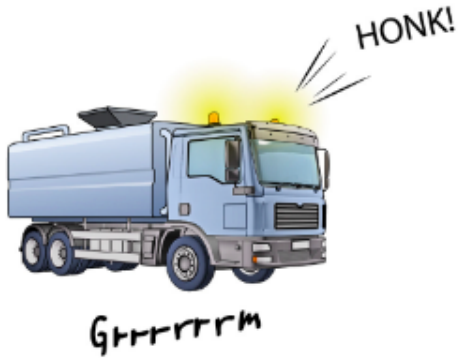
What controls do you check after start-up to make sure you can stop the water vehicle?

Test the brake functions, such as the braking control levers and retarder. You should also test the emergency brake.



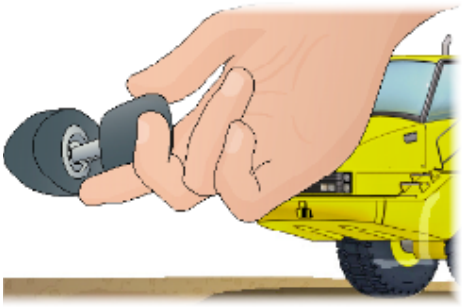
You've done the pre-operational checks. Before you can move off, what else do you need to do?

1. Beep the horn once



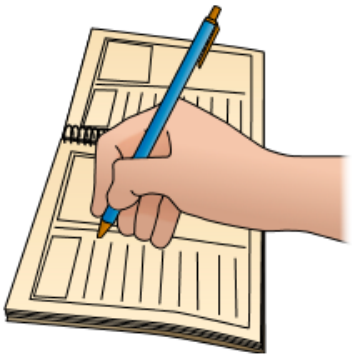
2. Wait 5 seconds.

3. Start the engine and wait 3-5 minutes.



4. Check the gauges

5. Record all checks you did in the daily logbook before you start driving the wat.



6. Move off.

You are checking the tyre pressure. Why should you do this when the tyres are cold?

If you test the pressure when the tyres are hot, the pressure will read higher than if the tyres are cold. You will get the wrong pressure reading.

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

What is the danger when pumping up a flat tyre on a split rim wheel?

The locking rim could fly off and hit you. You could be injured or killed.

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

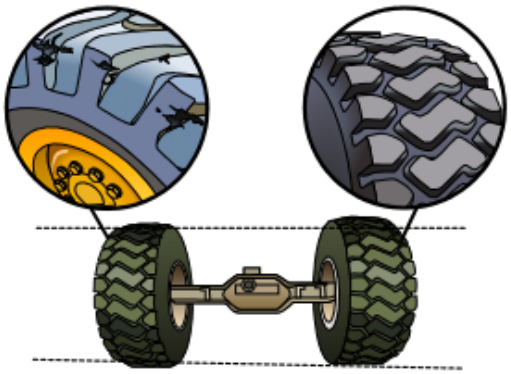
How can you pump up the flat tyre on a split rim wheel safely?

Never stand in front of the wheel. Pump up the wheel in a cage if you can.

You are checking the tyres and the wear is uneven. What does this mean?

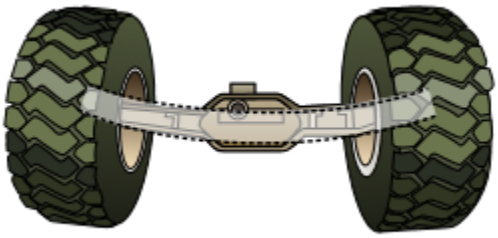
It might mean:

The water truck needs a wheel alignment



The tyre pressure is uneven

The water truck has a bent axle



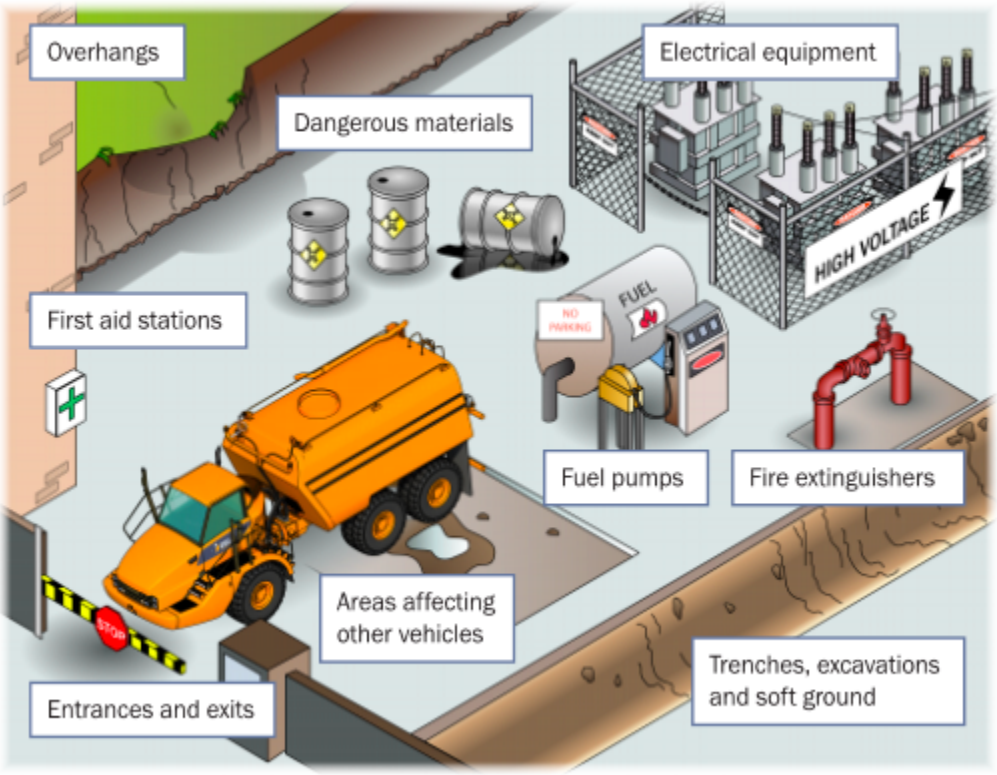
You take out the oil dipstick and the oil looks milky.
What does this mean?

There may be water leaking into the engine oil. There may be water in the sump or the engine may need repairs. Check with your supervisor. The engine should not be operated.

Where should you park the water vehicle?

Always park on firm, level ground and away from hazards. If you can, try to have the front wheels parked in a small ditch to stop the truck rolling away.

Where should you not park the water truck?

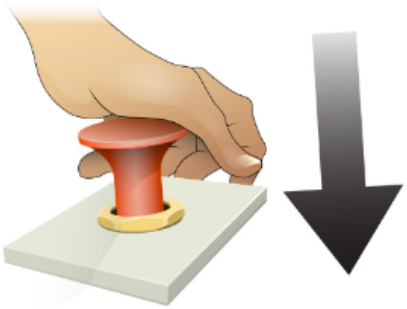


You may have to park the water vehicle on a slope. In which direction do you park it?

Park across the slope

How do you shut down the water vehicle?

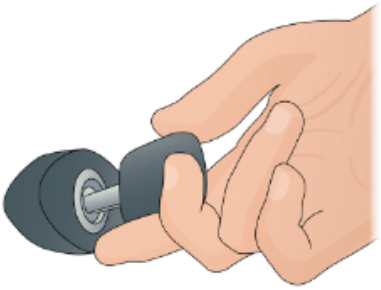
1. Put the park brake on



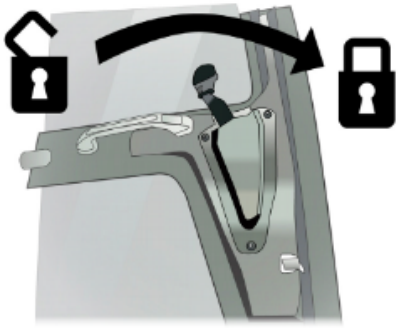
2. Put the gear shifter in neutral or park

3. Idle the engine for 2 minutes before turning it off.

4. Remove the key so unauthorised people cannot use the machine.



5. Lock the cabin.



6. Isolate the machine using the switch.

What must you do if you find any dangerous faults with the water vehicle?

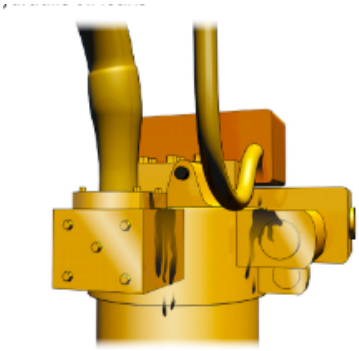
Follow these steps:

1. Stop using the water vehicle and remove the key. 	2. Tag out the equipment and DO NOT USE IT. 
3. Record the fault in the logbook. 	4. Report the problem to your supervisor. 

Why must you remove the keys when you're finished with the vehicle?

To stop unauthorised people using it.

If the water vehicle is fitted with hydraulics, what problems do you look for?

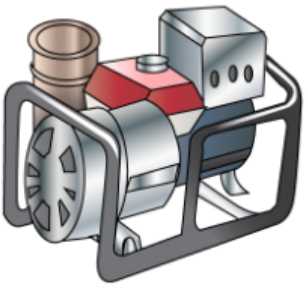
Check for: Loose connections 	Hydraulic oil leaks 
Bulging, splits or damaged hoses 	

Who might you work with or need to talk to on the job?

You might work with:

Other truck and operators of fixed plant and mobile machinery 	
Other workers 	Contractors 

What equipment might you see on the job?

Light vehicles 	Hoses and pumps 
Loading units 	

How can you communicate and share information with your workmates?

Talk and ask questions

Use two-ways radios

Share instructions

Put up warning and information signs

Toolbox meetings

Use hand signals. Use the vehicle horn and warning lights to warn of truck movements.

Which hand signals do you use with other operators while operating a water vehicle?

Stop. Your site may also use hand signals for forward and reverse.

What horn signals do you use before:

a) Starting the engine?
b) Moving forwards?
c) Reverse?

a) Starting the engine: 1 beep of the horn

b) Moving forwards: 2 beeps of the horn

c) Reverse: 3 beeps of the horn

Always wait 5 seconds after beeping the horn before moving off

Why is it important to use a spotter when reversing a water vehicle?

The spotter can see what's behind the truck better than you.

3.1.1 Earthmoving Hazards and Risks

The most common hazards and risks with earthmoving work are:

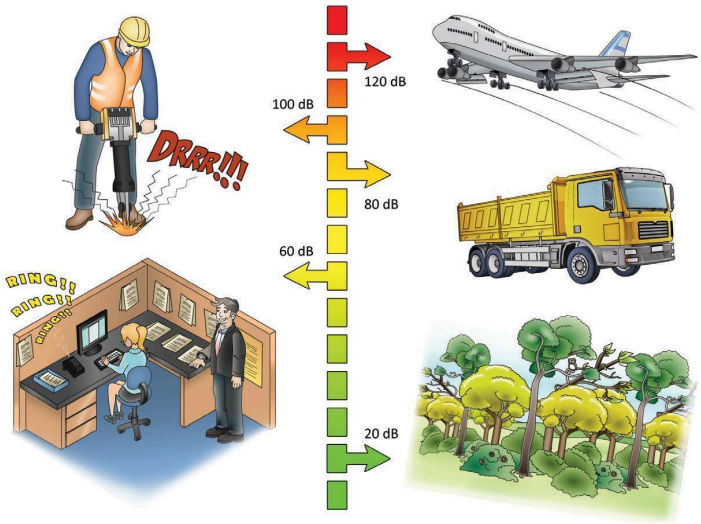
Falls from plant or machinery 	Traffic and other mobile plant 	Overhead or underground power 
Underground gas lines 	Water and sewage piping 	Rollovers 
Noise 	Dust 	Manual handling 
Contaminated soil 	Falling into trenches or excavations 	UV rays (radiation) from working in the sun 

3.1.2 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.

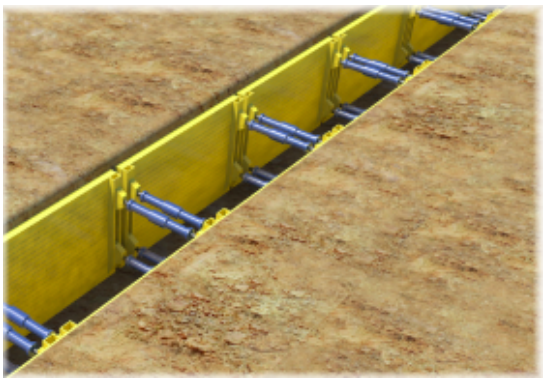
- A forest has about 20 db of noise
- In an office there might be around 60 db
- Standing outside a truck generates about 80 db
- A jackhammer generates around 100 db
- A jet taking off generates about 120 db

3.1.3 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.

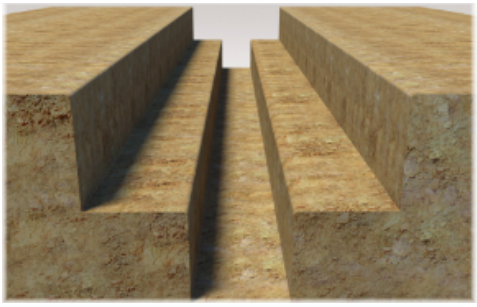
3.1.3.1 Trench Shields and Shoring

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.



3.1.3.2 Benching

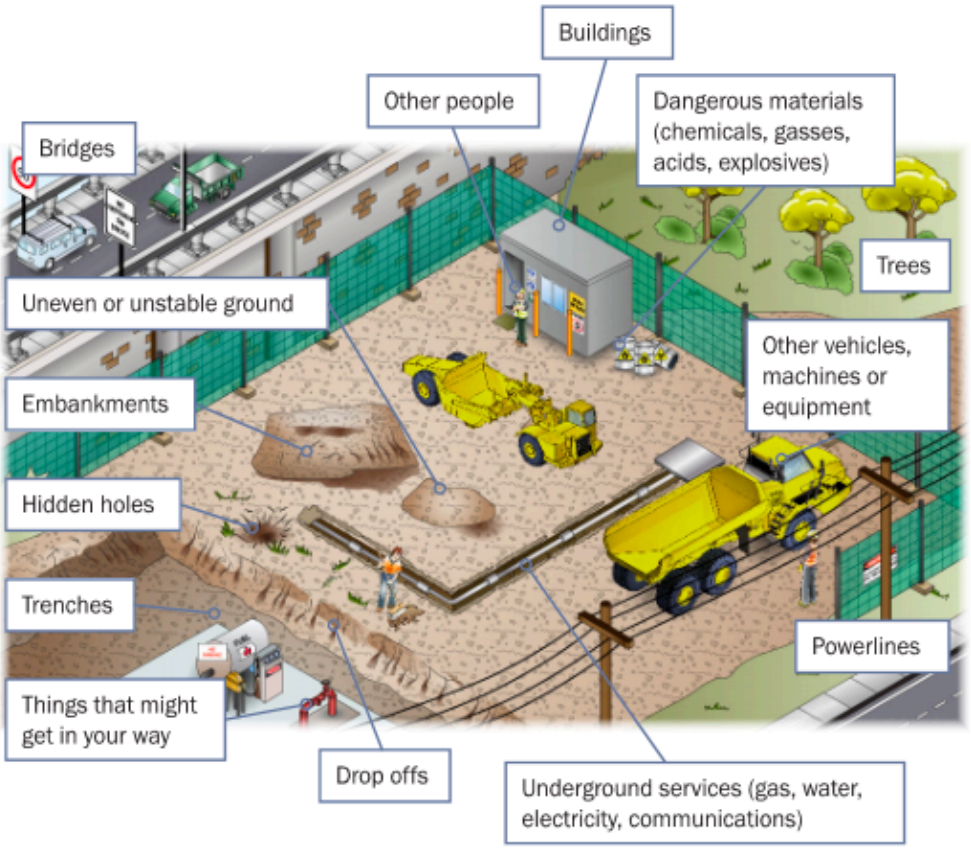
Benching is where you cut levels in the soil to reduce the fall risk. For example, instead of having a single 2 metre trench, this area is excavated in two (2) levels. The first level is a 1 metre drop and is 3 metres wide. The second level is 1 metre × 1 metre.



3.1.3.3 Battering

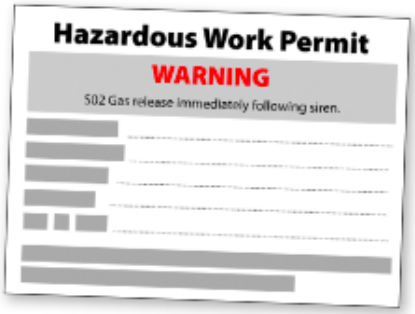
Battering is where the edges of a trench are 'tapered' back on a gentle slope. Battering means that instead of a straight drop off, you have a more gentle slope. In this example, the drop off has been 'battered' back so the fall hazard is reduced. Benching and battering reduce both the fall risk and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

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



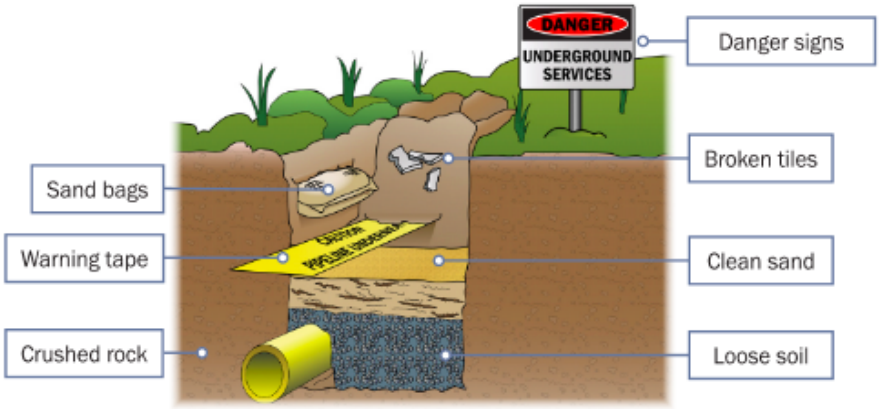
You will work in a hazardous area, for example, a confined space. What type of permit might you need to get?

You might need to get a hazardous work permit.



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.

Who can you ask about underground services on the worksite?

You can:

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

3.1.4 Overhead Powerlines on Poles (National Standard)

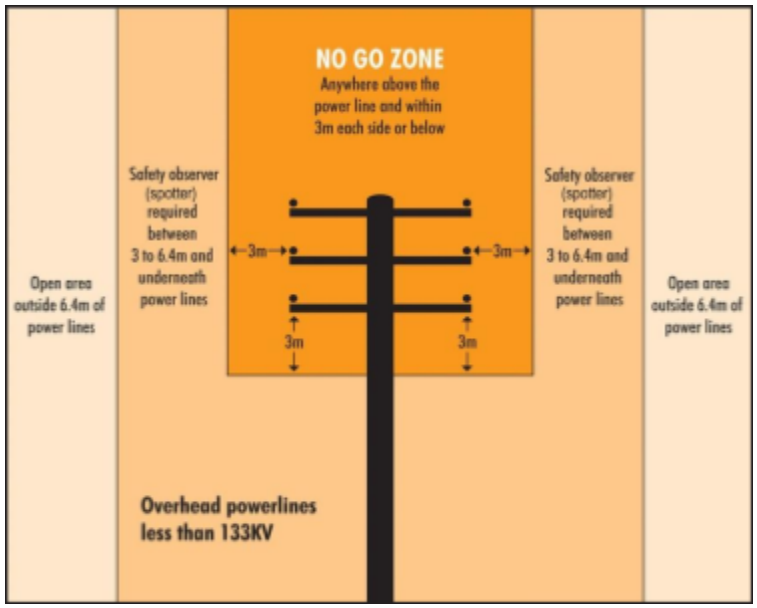
These are usually 'Low Voltage'. This means powerlines of less than 133KV. The information below is taken from the National Standard.
Always check the distances for your state or territory, as they may be different.

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).

3.1.5 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.

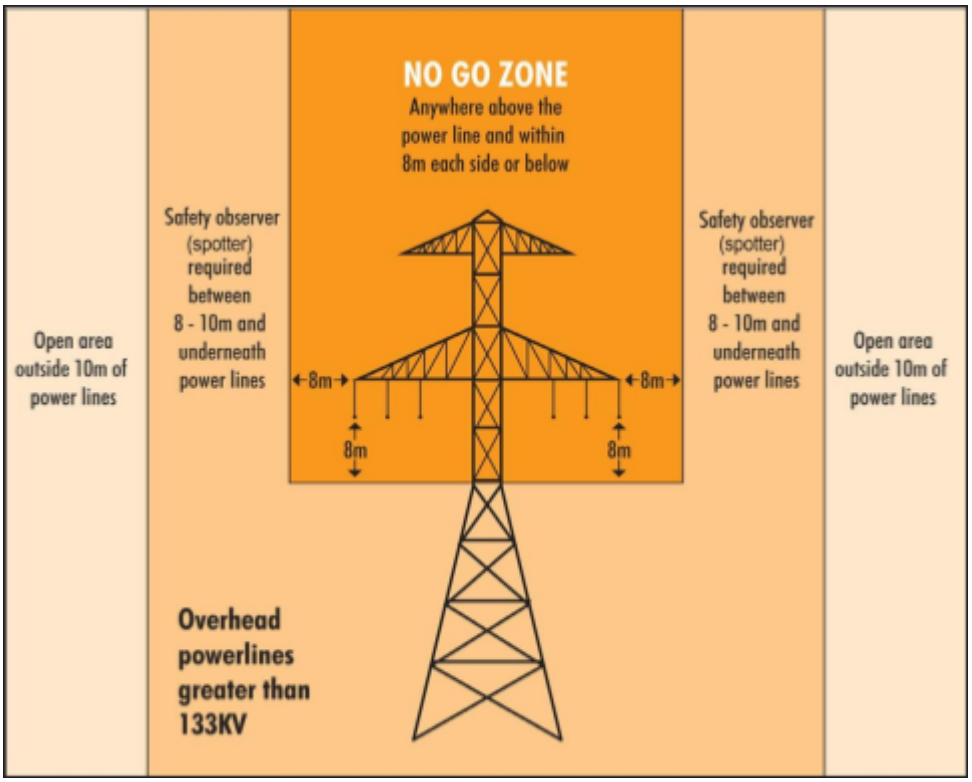
Always check the distances for your state or territory, as they may be different.

AS2550.1
Powerline distances

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

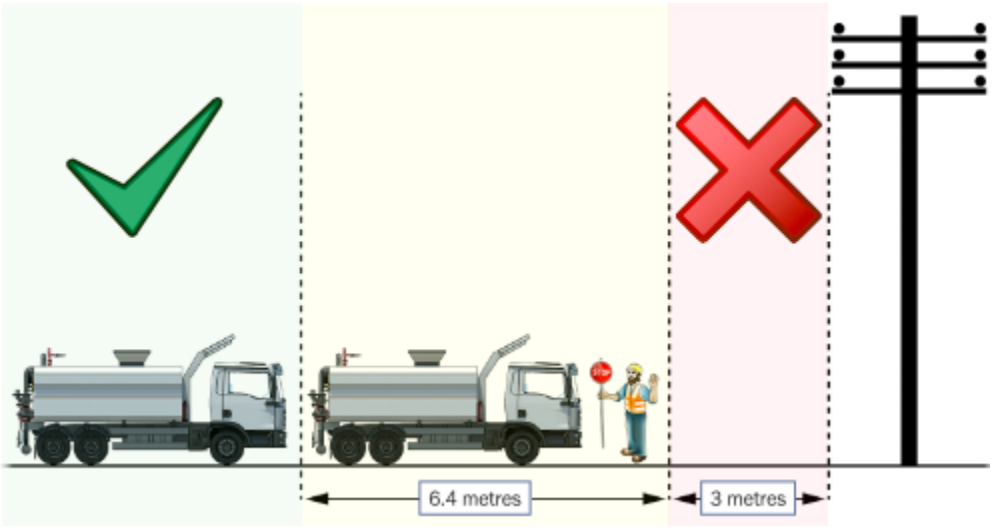
The term 'spotter' is defined as a safety observer who is a person competent for the sole task of observing and warning against unsafe approach to overhead powerlines and other electrical apparatus.

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



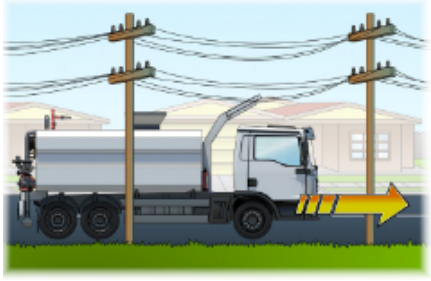
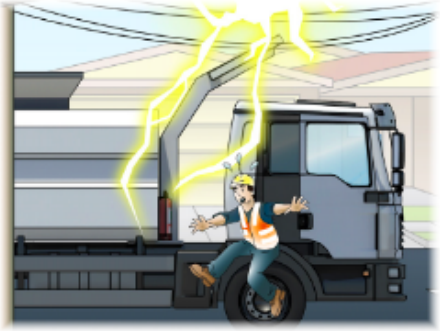
What is the minimum safe distance from powerlines?

Check the Australian Standard for low voltage powerlines on poles and towers in your state/territory.

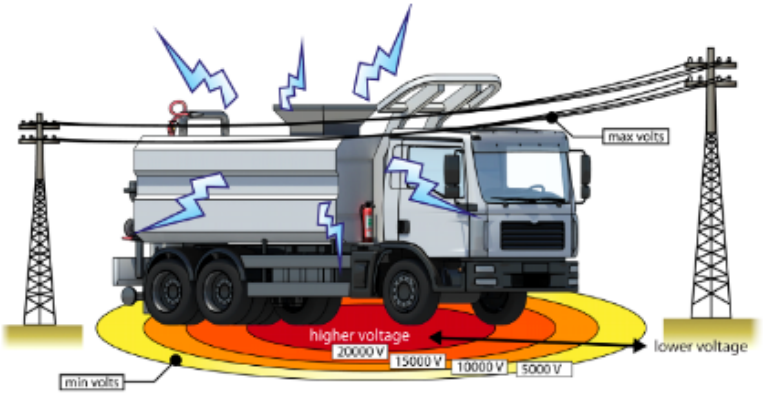


You are operating a water vehicle and it touches live powerlines. What do you do?

If you are operating a smaller water truck:

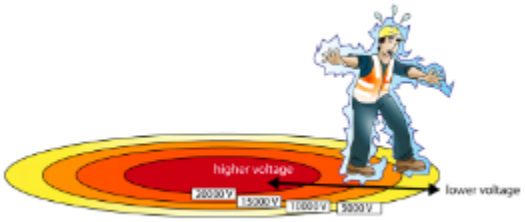
Try to stay calm. Stay in your seat if possible. Tell other people to keep away 	Try to move away from the powerlines. Ask someone to get the power turned off. 
Try to move away from the powerlines. Ask someone to get the power turned off. 	Do not touch the machine and the ground at the same time. If you do, you will be electrocuted. 

Voltages vary depending on the distances from the powerlines



Shuffle away keeping your feet closely together.

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



Stay in the truck and radio for help. Don't change anything – you are still alive. Wait for help.

If you try to get out of a large vehicle you'll have to climb down the ladder. This will expose you to more risk. If you jump off a large water truck you could be badly injured because of the height.

A thunderstorm is approaching.

a) What is the risk of working when there is lightning?
b) What should you do?

a) Lightning could strike the water truck and cause damage. 	b) Stop working when there is a lightning storm. 

What might cause the tyres on a water vehicle to catch fire and explode?

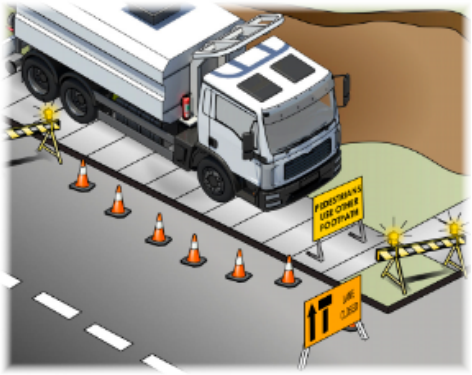
If an extremely high heat is applied to a truck tyre, it could trigger fire and an explosion. Some examples include if a truck is hit by lightning, or if the brakes become over heated.

If you suspect there is a danger of your tyres burning and exploding, what do you do?

1. Park the truck in an isolated area that is at least 300 metres away from any people or equipment.
2. Do not allow anyone to go inside the 300 metre zone for 24 hours.
3. Contact the fire service.

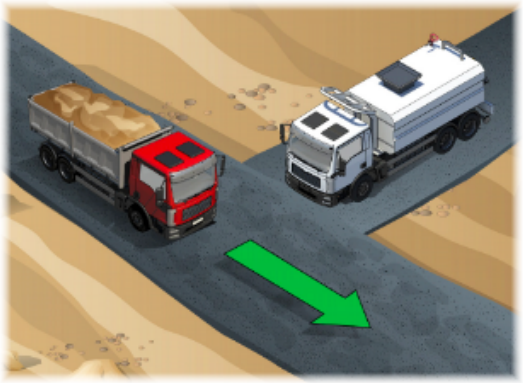
If you park the vehicle across a footpath or road, how do you warn people it's there?

Set up barricades, lights and warning signs.



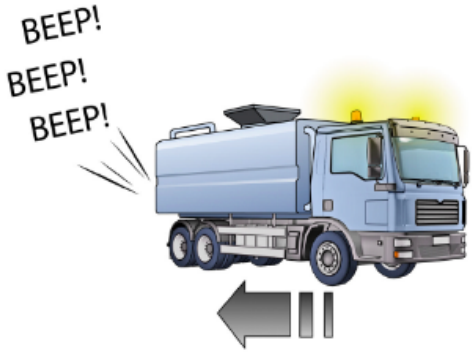
Your water vehicle is empty. Why do you have to give way to loaded trucks and scrapers?

Because you can stop and turn your empty truck more easily. This is because loaded trucks are heavier than unloaded trucks, so it takes longer for them to stop. Empty trucks need to give way to scrapers because they can turn and stop better than scrapers.



What does the water vehicle have that warns people you are going to reverse?

The water vehicle has a warning alarm that beeps.

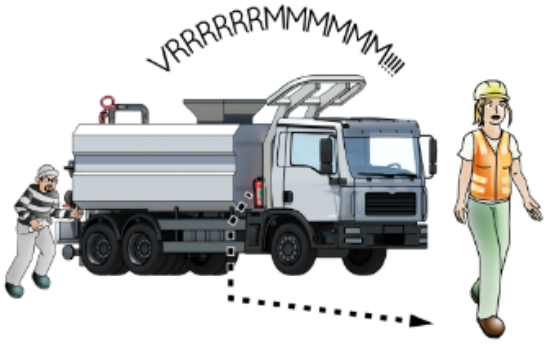


Before you reverse the water vehicle, what do you do?

Check behind you to make sure the path is clear. Beep the horn three (3) times and wait 5 seconds before reversing. Make sure you check the blindspots.

Can you leave the engine running when you're not in the water vehicle?

No. Always shut down the machine properly when you are not in it! Shut down the machine for safety and to stop unauthorised people using it.

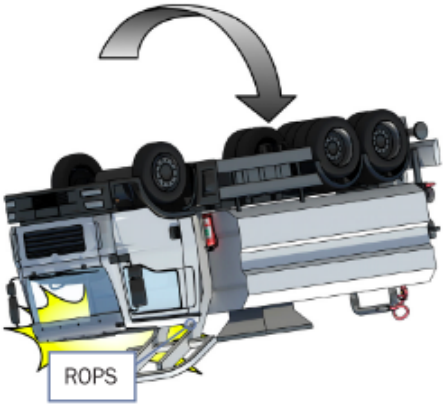


Which safety device keeps you in the seat?

The seat belt.

Which safety devices on a water vehicle protect you from being crushed if it rolls over?

The roll over protective structure (ROPS) and the seat belt. Always wear the seat belt!



What is fatigue?

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

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 hours	18 hours	8 hours	18 hours	16 hours

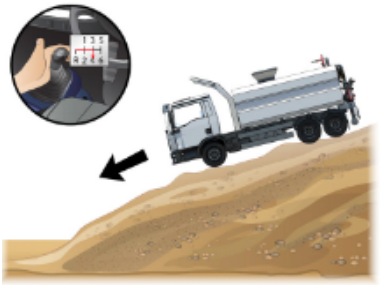
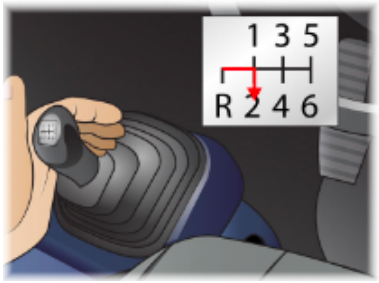
How can you tell if someone is fatigued?

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

Slowed reflexes and responses

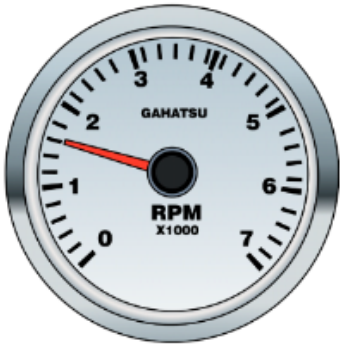
Falling asleep for less than a few seconds, and unaware they have done so.

3.1.6 Manage Engine Power

When you drive out of a loading area onto a steep slope you must use a low gear. This is because the truck is much heavier loaded, and the engine must work harder to pull you up the slope. The low gear helps you move away slowly without working the engine too hard.	When you descend (go down) a hill, you should choose the same low gear you would use to go up the hill. A common saying is: gear up = gear down.	By doing this you make the truck go slower by using the engine and gears, instead of the brakes.
		

If all of the brakes on the water vehicle fail, how can you stop the vehicle?

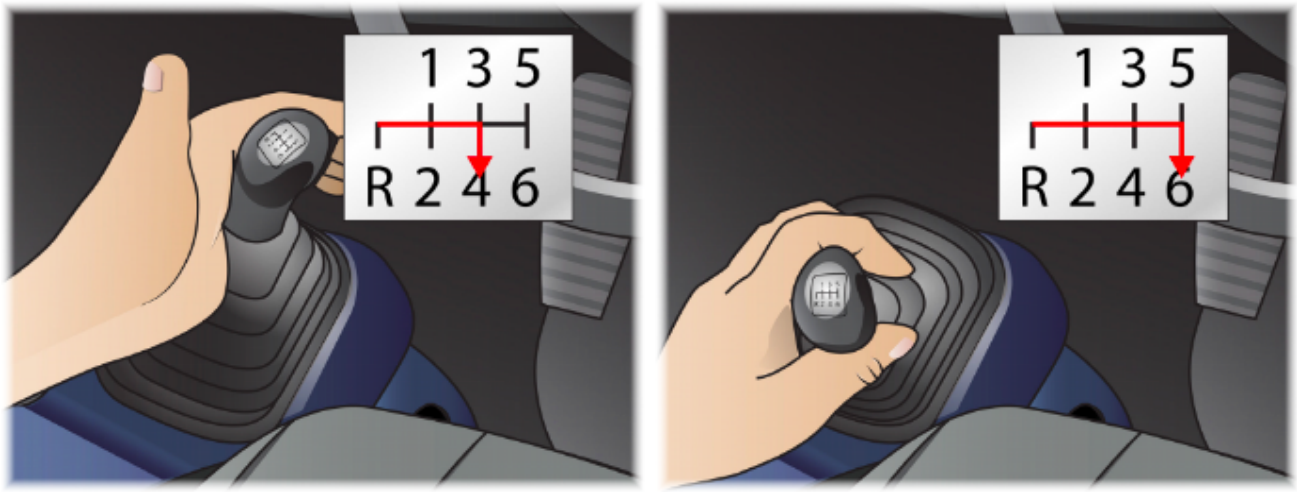
Change to a lower gear to slow down. In an emergency when you have no other choices, try to drive the truck into a ditch, soft area, gutter or up a ramp or embankment if you can.



3.1.7 Choosing the Right Gear

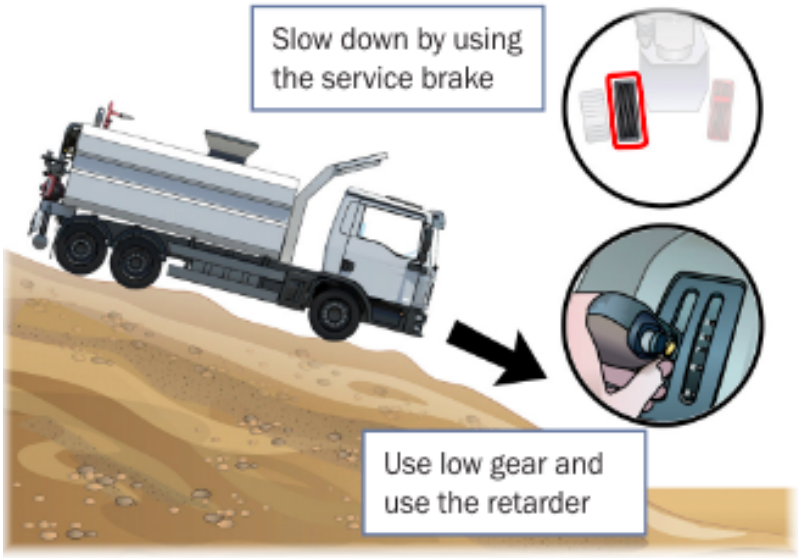
As you build up speed, the trucks engine will start to rev faster. Sometimes you need to change up to a higher gear because the engine is revving too fast. When you change gears while going up a slope the truck will slow down and the revs will drop very quickly. You can't use the sound of the engine as a way of knowing when to change gears.

Many newer vehicles have high torque engines. In these vehicles the engine noise is softened. Getting lots of practice with the vehicle you are using is the only way to get used to the revs of the engine and the gears. Use the tachometer to know when to change gears.



You are driving towards a steep slope (grade). What do you do before going down the slope?

Slow down by using the service brake, then choose a low gear and use the retarder.



Can you use the sound of the engine to decide when to change gears?

No. You must use the tachometer to know when to change gears.

When you drive on to a worksite, how fast do you drive?

You always follow site speed limits when you are driving through a worksite.

Which way do you travel down a slope, across or straight down?

Travel straight down the slope. You might use the manual retarder and gears to help control the speed of the water truck.

Which gear do you use on a steep slope?

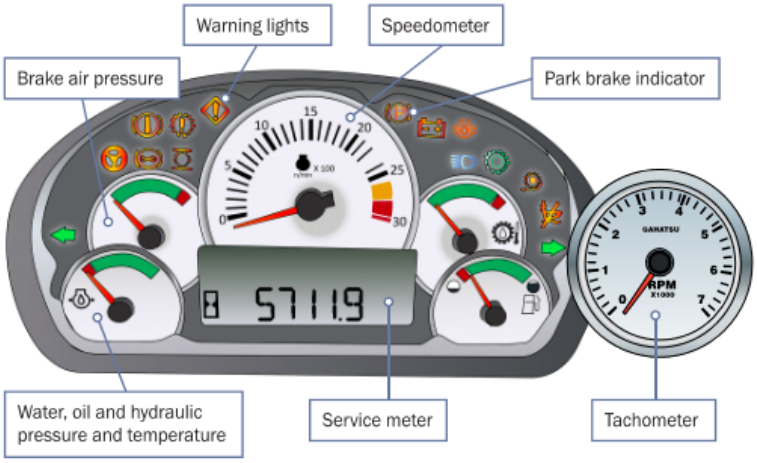
Use a low gear

What are some work conditions that affect how you operate (drive) the water vehicle?

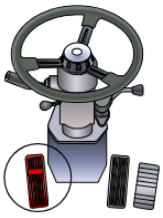
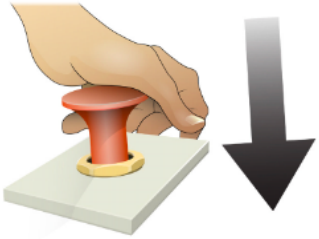
Weather. For example, you should stop working in a thunderstorm. 	If you are working when it is dark, or in dark areas it is difficult to: • See hazards • Judge distances. 

Your water vehicle will have monitoring systems such as gauges and alarms. What are some examples of monitoring systems you would pay attention to?

Some monitoring systems include:



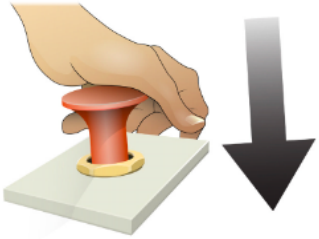
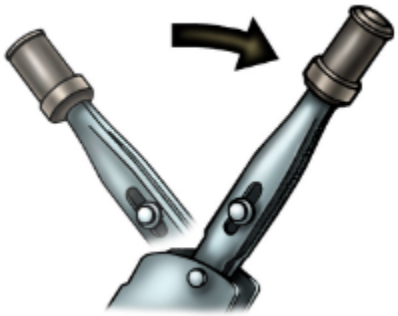
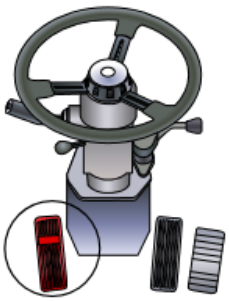
What should you do if you hear the low brake pressure warning alarm?

1. Apply the emergency brake until the machine stops. 	2. Apply the parking brake. 

3. Shut down the machine and tag out. 	4. Remove the key. 	5. Report to the supervisor. 

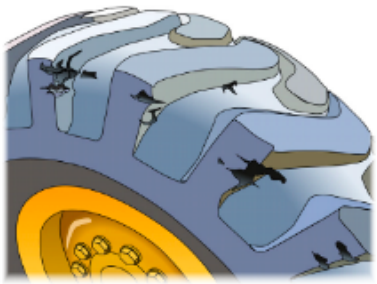
How do you shut down the water cart?

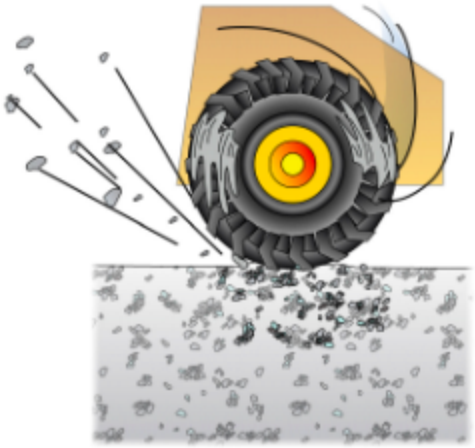
These are general steps. The steps may be different on your machine. You should check the operator's manual for your machine if you aren't sure.

1. With the truck stopped, put the transmission into neutral. 	2. Put the park brake on. 
3. Turn on the emergency brake by using the lever or pedal.  	

What is the risk if you brake hard on rock or shale?

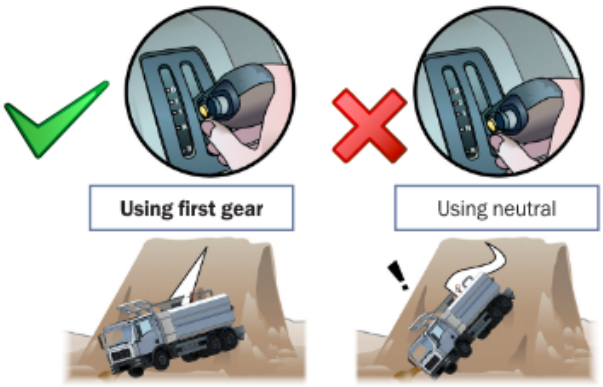
- The tyres could slip on the surface.
- The tyres could be damaged and leak air, also the tyre tread can wear faster.





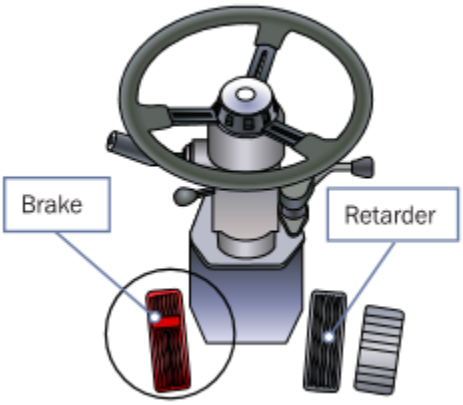
Can you coast the water vehicle down a hill?

No. You must always keep the water truck in gear so you keep control of the machine.



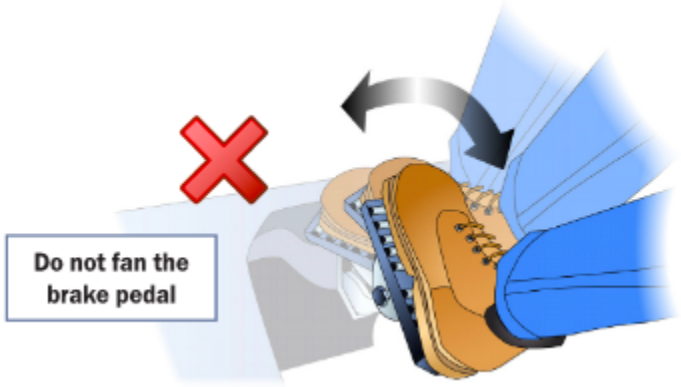
What does the retarder do?

The retarder helps you control the speed of the water vehicle on slopes. You can use the retarder with the service brakes on slopes. This helps you bring the truck to a smooth stop, and minimises wear on brakes and gears.



Why should you firmly press the brake pedal instead of fanning the pedal?

Fanning the brake pedal might use up the brake booster pressure too quickly. Avoid fanning the brake pedal.



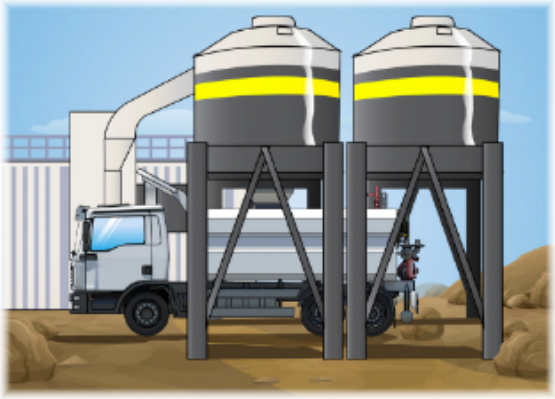
3.2 Load, Transport and Distribute Water

What is a water vehicle loading point?

A water loading point can be a reservoir, river or water station where water is stored and trucks can be loaded. Water can be loaded into a vehicle using pressure or pumps.

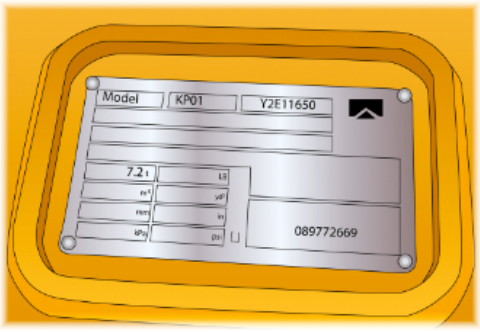
How do you make sure the water vehicle is lined up directly under the standpipe? Why is it important?

Some water loading points have a monitor which the driver can see as he lines up. Other points have marks on the ground to help the driver line up. It is important to make sure the water is loaded properly, without spilling. If water is spilt at the load point it can make the ground boggy.

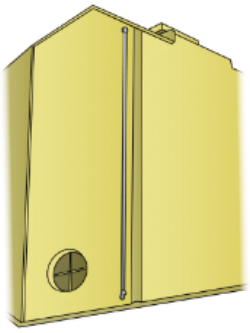


How do you find out the limits and capacity of the water vehicle?

Ask your employer, check the operator's manual and check the data or load plates inside the cabin.



Why do water vehicle have water level monitors?



- To make sure you don't put in too much water. If the water tank is overloaded, it can cause back flow which might break hoses or fittings.
- To indicate when the tank is becoming empty.

How do you stay safe while filling the vehicle with water?

Make sure the water point attachment is securely coupled to the water truck.

Always keep three (3) points of contact when climbing the ladder. For example, have one foot and both hands in contact with the ladder.

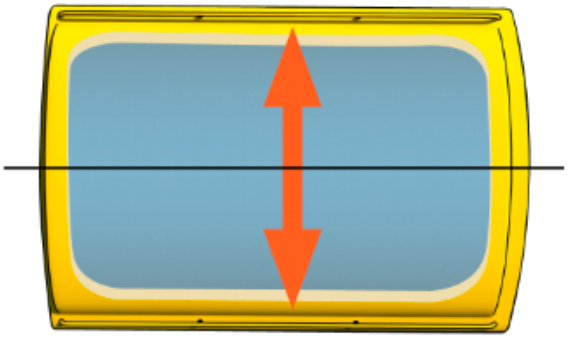
Do not climb the ladder with muddy boots

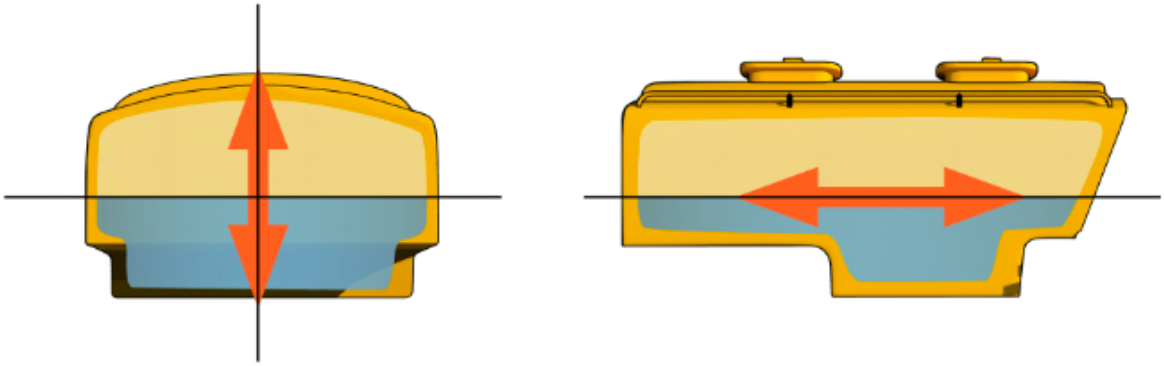
When loading with water, why do you open and close the gate valve slowly?

The water pressure can have a hammer effect if the valve is opened or closed too quickly which can cause damage to hoses and pipes.

3.2.1 Safety around Surge (Forward) and Sway (Sideways)

When you drive a water vehicle that is full, the load stays fairly stable because there is no space in the water tank so the water can't move around very much. As the tank starts to empty there is an air space in the top of the tank. This means water can move around as you drive. This causes the water to sway or surge.





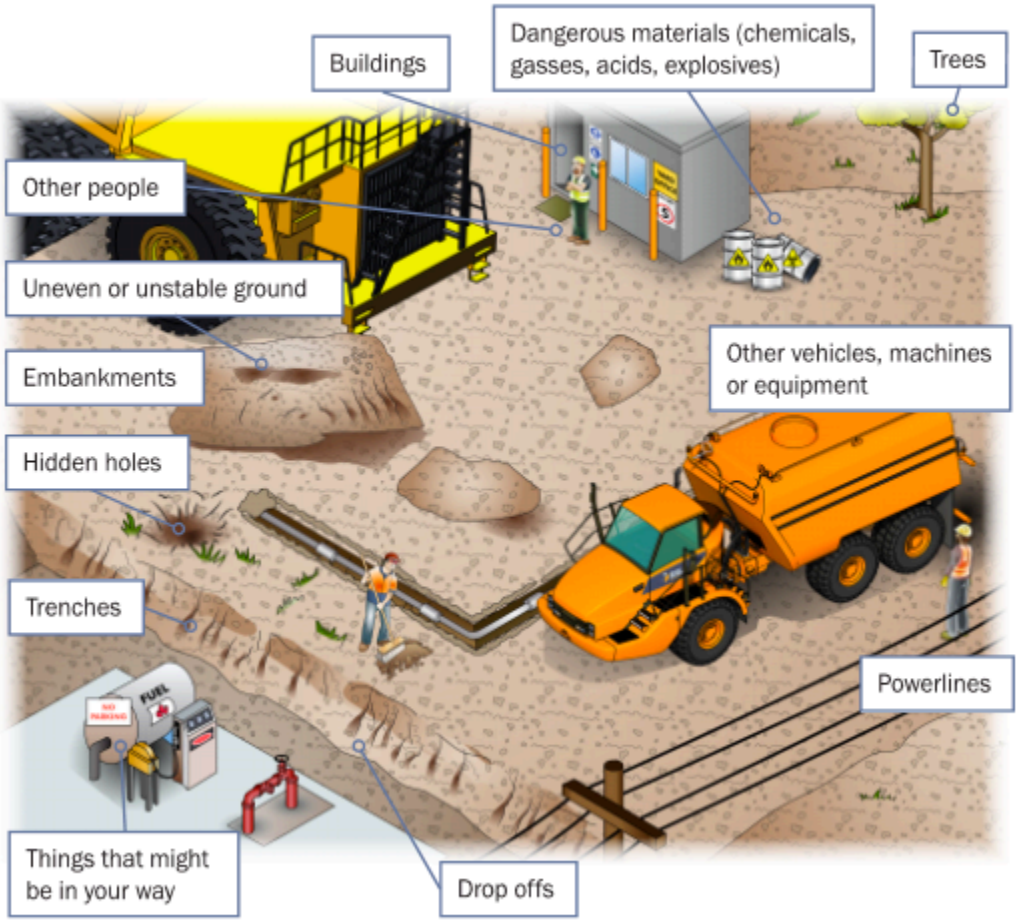
3.2.1.1 Sway

Sway is where the water in the tank moves from side to side. This can happen if you change direction suddenly. For example, going around a roundabout one way and then turning the other. This can cause the water to sway to the outside of the tank. The weight of the water moving suddenly to one side of the vehicle can make the truck unstable. It can tip the truck over.

3.2.1.2 Surge

Surge is where the water rushes forwards or backwards in the tank. One example of when surge might occur is when you brake hard. The water in the tank rushes forward and puts forward force on the vehicle. This makes it harder to stop. This may affect your braking distance. If you're not careful you could cause an accident.

What are some hazards you must look out for as you do your work?



Why do you need to be careful using an articulated water vehicle on a slope?

The vehicle might tip over. Articulated trucks are not as evenly balanced as rigid trucks when turning.

You're using an articulated water vehicle on a slope. Why should you avoid braking hard on the slope?

You could tip over or roll the vehicle. Sudden movement of water in the tank, even with baffles, can make the vehicle unstable, especially when turning.

How do you stay safe when working near live stockpiles?

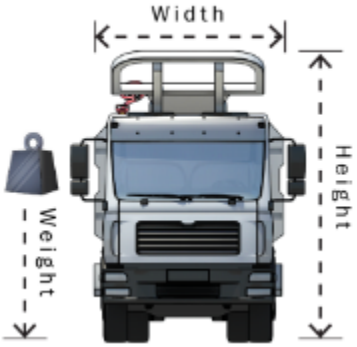
- Look for barriers around stockpiles and stay outside the barriers
- Look for signs warning you that feeders or reclaim valves are drawing material from the stockpile. If you see warning signs, keep well away from the stockpile.

What is the danger of driving next to a trench or the edge of a fill?

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

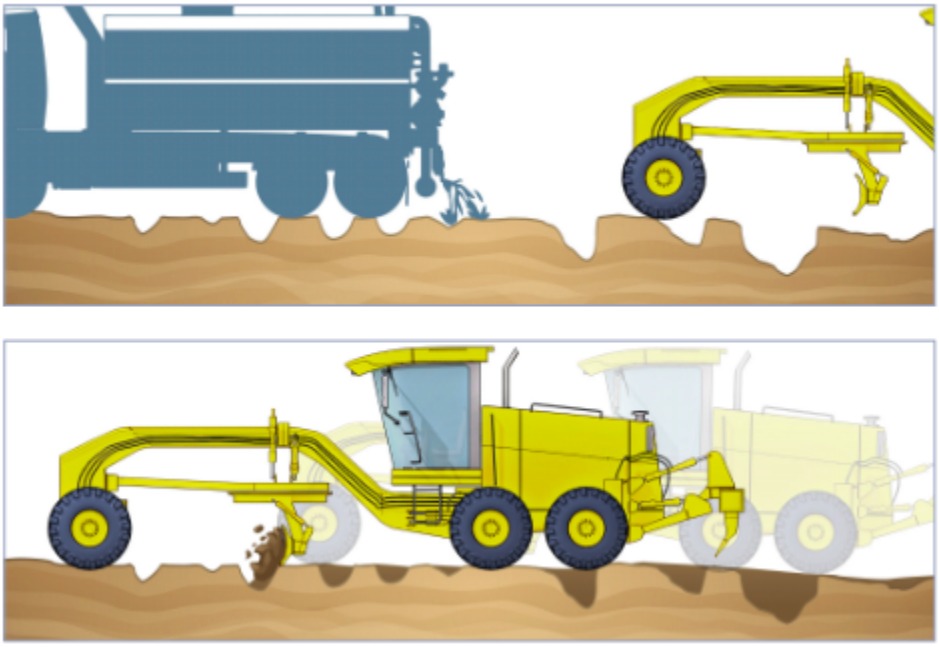
What are some safety things to remember when operating a water vehicle?

You need to know:

Don't work too close to live stockpiles. 	Know the height, weight and width of the truck 
Keep the truck away from areas where it could tip over. For example, soft and sloping edges. 	Keep away from working conveyors. 

3.2.2 About Levelling

To level a road, you work the road material across the surface. This is usually done with a grader. As the road material is moved it fills up any holes or divets. This creates a smoother surface. If the material is too dry the material is harder to work with. It creates lots of dust. The material does not stick or bind together as well. A water vehicle is an important part of this process in dry weather. Wetting down the road base makes it easier for the grader to work with, reduces dust, and makes the road base interlock better. This makes the job easier and gives you a better result.

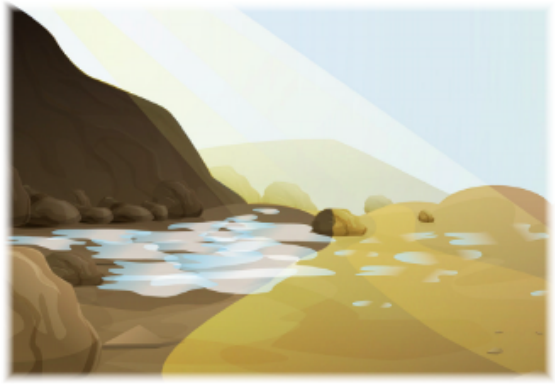


Why is it dangerous to over-water (spray too much water) the road or surface?

If a water vehicle is spraying water to compact the soil, it is important not to over-water. If it is too wet, other heavy machines cannot do their work. Over-watering can damage the surface. It can also cause accidents because heavy vehicles might slip and lose control. It is best if you can water roads that are steep or have rough clay a few hours before trucks use them.

Why should you spray less water on shady ground than on sunny areas?

You want the water to be spread evenly on the surface, so spray less water in the shade because there is more evaporation in sunny areas.

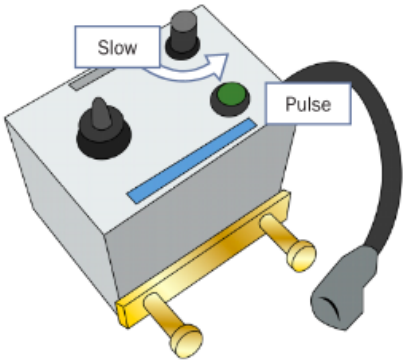


How do you distribute (spray) water on a steep slope?

Always drive down the slope. If you drive up the slope the water vehicle will slow and excess water will form puddles.

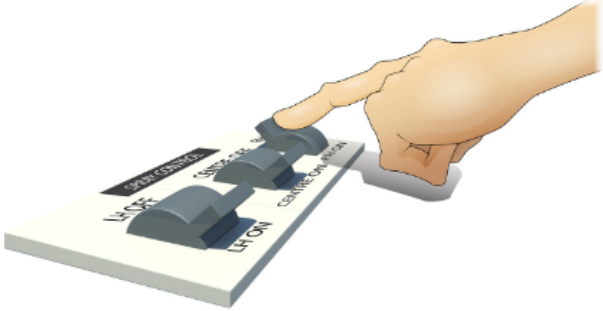
What equipment can help you spread (distribute) water evenly?

Water vehicles can be fitted with pulsed water spray systems which help you (the driver) control the water flow. Some vehicles also have speed controls to control how fast (and hard) the water pump supplies water to the sprays.



How do you spray only half of a road?

Set the controls to spray on the area to be watered.

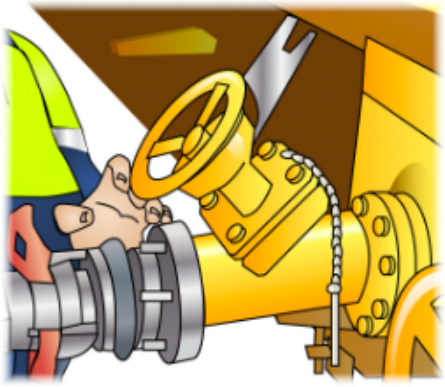


How do you spray on corners or bends?

Water the full length and width of the road in one go. Do not stop half way through the corner as this can cause flooding. If a truck slips on a wet surface and then hits a dry patch, it can tip over.

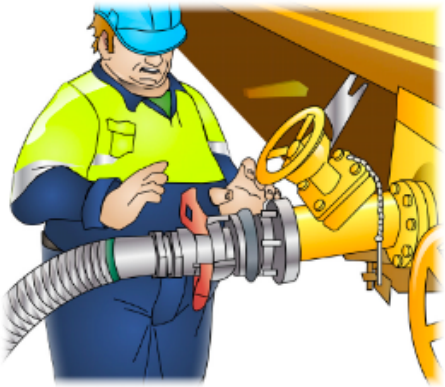
What is the flow diverter?

The flow diverter is a tap located at the side or back of the water truck. It is used to change the water flow from spraying to bulk discharge. You use it when you want to fill a water tank or other storage facility with water from your vehicle.



You want to fill an underground storage tank with water. Must you use the vehicles's pump?

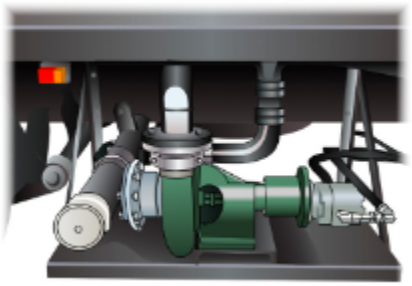
No. You could use gravity feed to discharge from the truck to the underground tank. If you use the pump, the pressure may dislodge sediment in the tank.



Why must you keep checking pumps, lines and nozzles while you are working?

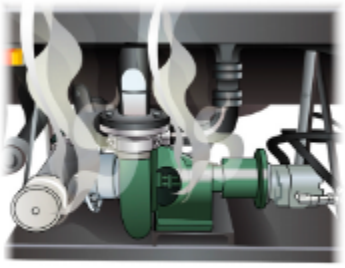
There might be a problem such as:

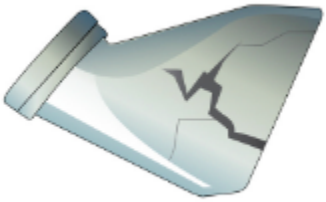
- a burst line, so you lose water and possibly cause a hazard for other vehicles
- a nozzle blocked with dust and no longer working.



You notice a problem with a pump, line or nozzle, which cannot be fixed. What should you do?

Put the unit out of service. Report to the supervisor to arrange for the fault to be repaired.





How do you know when and where to spread water at the worksite?

Your supervisor will tell you. There may also be a written work plan that you can follow when dust needs controlling.

What can a work plan tell you about the quality requirements of the job?

The work plan may tell you:

- dimensions (the size of the work area)
- type of water cart to use
- drawings to help explain the job
- the sequence (order) the job needs to follow
- standards of work expected.

4.1 Carry Out Machine Operator Maintenance

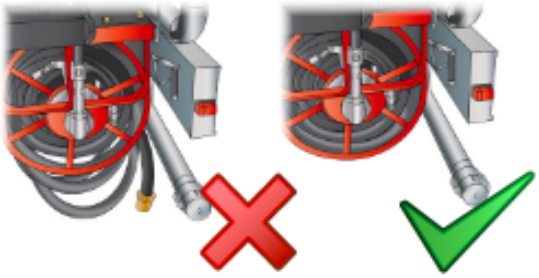
How do you prepare the water vehicle for maintenance?

- Drive the machine to the maintenance area and park it safely
- Always allow the engine and tyres to cool before starting any maintenance
- Check the logbook to see if a regular service is due or if any faults have been recorded. Use the logbook to record maintencance work done on the vehicle.
- Clean the water cart
- Be ready to help the authorised mechanic if necessary.

What do you have to clean on the water vehicle?

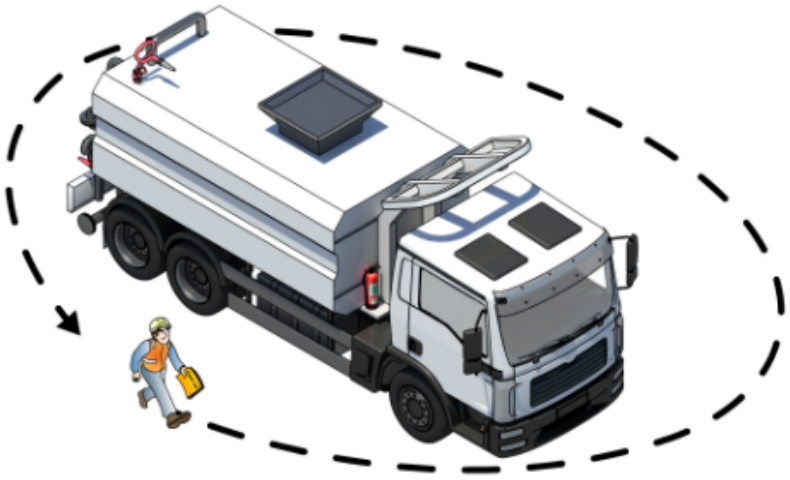
Clean the steps, windows and cabin. 	Clean the mirrors and light covers 

As part of the park up procedure, what water vehicle attachments should you check?

Make sure: • the hose reel is secured. If it is left loose and the next operator drives off, it could cause injury or damage. • spray bars and cannons are secure. 	Make sure the access/fill hatch is closed. 

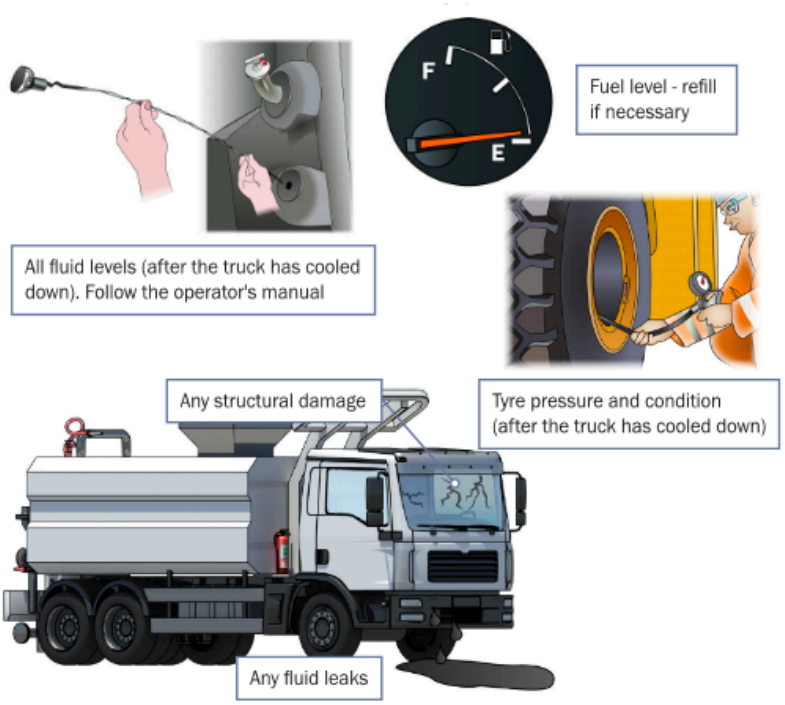
When do you test and inspect the water vehicle?

Every time before and after you use it. You do this to make sure it's safe to use or ready for handover to the next operator.



You need to make sure the machine is safe to use for the next person. What post-operational checks do you do after you've finished using the water vehicle?

Check the operator's manual. Some examples of things you should check are:



What do you do if you find a fault with the water vehicle? For example, you might see a fluid leak under the vehicle.

Follow these steps:

1. Stop working and remove the key. 	2. Tag out the machine. 
3. Record the fault in the logbook or daily inspection checklist. 	4. Tell your supervisor. Organise for an authorised maintainance worker to remove and replace the tyre. 

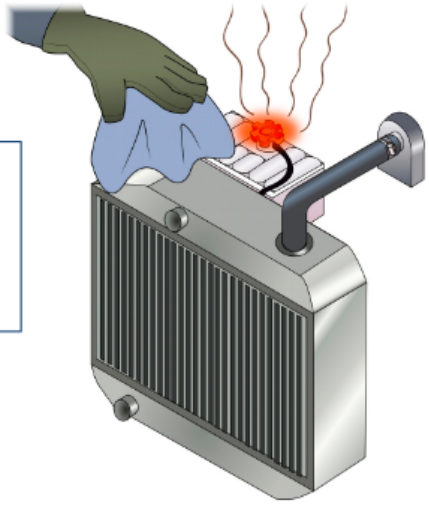
You need to take off the radiator cap to check the coolant, but the radiator is still hot. How do you take off the radiator cap safely?

It is safest to wait until the radiator has cooled down.

- Allow the radiator to cool down.
- Always use hand and face protection plus a rag. The rag will make sure that no hot coolant sprays onto you.
- Undo the radiator cap slowly to release the pressure.

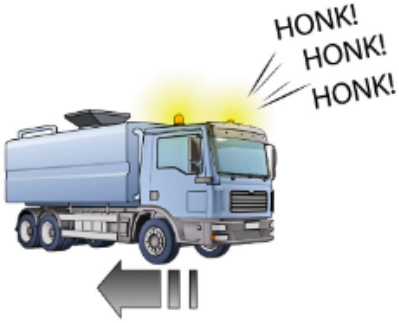
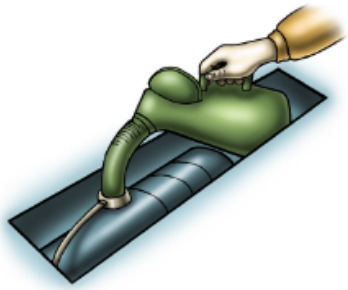
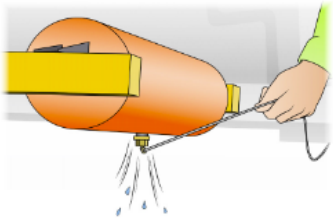
DANGER:

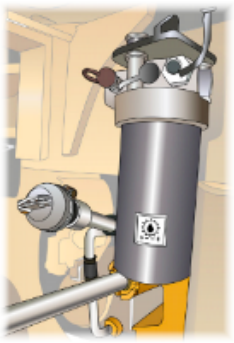
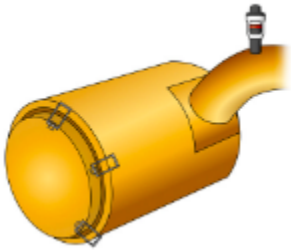
If you release the radiator cap too quickly the pressurised coolant will spray out and burn you.



What are some examples of minor maintenance you might do on a water vehicle?

Only authorised mechanics can do major maintenance. You might need to help the authorised maintenance staff. You may be allowed to do basic maintenance such as:

Test the backup alarm 	Top up coolant 
Check the seat belt condition 	Drain the air 

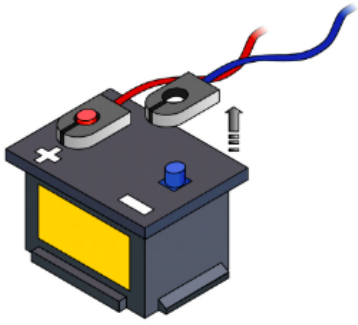
Check the transmission fluid 	Check the engine oil 	Check the air filter service indicator 

Check the tyre pressure and that the tyre is not damaged 	Clean the windows, mirrors and steps. 

You have been working in very dusty conditions. At the end of your shift, what routine maintenance would you do?

Check and clean all water nozzles and sprays on the truck. This will make sure they are not clogged for the next operator.

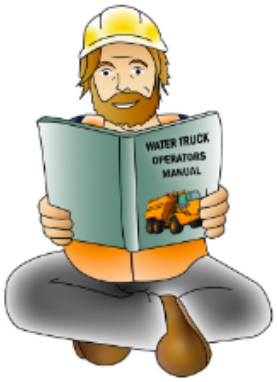
You want to change the battery. Which cable do you disconnect first, positive or negative?



Negative (earth).

Does the water tank ever need to be drained and cleaned?

Check the operator's manual for details about how often to clean out the tank. Some suppliers suggest cleaning the inside of the tank once a month.



Note:
You may need confined space training to go inside the tank

How can you find out how often the water vehicle needs maintenance?

In the operator's manual for the water truck.

You're refilling the hydraulic storage tank. Why should you leave some space in the top?

Leaving some space in the top gives the hydraulic fluid room to expand when it heats up.

Where do you record the work done when repairing equipment?

Enter all repairs and maintainance on equipment in the site specific record book or system.

5.1 Conduct Housekeeping Activities

5.1.1 Disposing of Environmentally Sensitive Fluids

When servicing and maintaining your water truck/cart you will need to dispose of environmentally sensitive fluids. Companies are available to use tanker trucks to 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. If oil ends up in landfill, it will slowly leach into surrounding land and underground water.

Stormwater and sewage polluted by oil can cause long term damage to coastal and marine habitats and ecosystems, seabirds, mammals, fisheries and people.

Disposal companies are available to remove materials from car and truck mechanical workshops, service stations, mine sites, earthmoving contractors, farms and local councils.

5.1.2 Recycling Fluids

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 recyling centre.

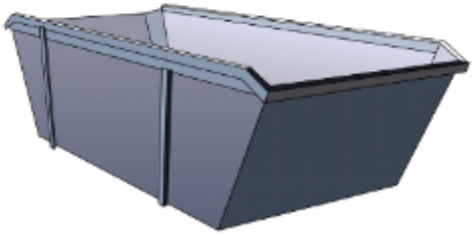
With oil, bring your materials in a clean, plastic container with a lid. The original container is a good container to return the oil in. Avoid using paint cans or other metal containers.

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

Dispose of any rubbish and recycle what you can



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.

What is the danger of not leaving the work area tidy when you have finished the job?

Tripping hazards could be caused or vehicles could be damaged.

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

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

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

After you've finished using the water vehicle, what records do you need to update?

- How much fuel the truck used
- Computer readouts, for example, the hour meter
- End of shift documents, for example, a checklist of post-operational checks
- Which supplies you used and what might need to be replaced
- Work logs – for example, record which work plan you were following
- Quality requirements, prove that you did the job properly
- Where and when you used the vehicle
- Record any faults in the logbook