RII Earthmoving Machinery Course Resource

CONDUCT CIVIL CONSTRUCTION MACHINE OPERATIONS

LR	**Conduct roller operations**	**RIIMPO317F**
LS	**Conduct civil construction skid steer loader operations**	**RIIMPO318F**
LB	**Conduct backhoe/loader operations**	**RIIMPO319E**
LE	**Conduct civil construction excavator operations**	**RIIMPO320F**
LL	**Conduct civil construction wheeled front end loader operations**	**RIIMPO321F**

If you are viewing these notes on line you can click on the competency code and it will open in training.gov.au so you can see what content is included within the units.

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TRAINING AND CERTIFICATE OF COMPETENCY

A Machine operator must be trained and hold the relevant Certificate of Competency to operate a particular piece of plant in the workplace. These units are taken from RII Resources and Infrastructure Industry Training Package.

Competence in any of these standards requires evidence of the ability to utilise the components and controls of a Machine to carry out operations without damage to the machine itself, other vehicles, loads, property or injury to people. It requires the ability to read workplace documents, calculate the weight of loads, conduct pre-start and shut-down procedures to ensure mechanical reliability, communicate and cooperate with other personnel such as co-workers, general public, prevent spillage of load, demonstrate emergency operating procedures and maintain operating records.

The assessment must determine that there is sufficient underpinning knowledge and practical skill with a machine for the operator to take the knowledge and skills (competency) and operate in a new workplace. The assessment must be adjustable but prescriptive to ensure transferability.

It is not about doing it once to pass an exam.

REMEMBER: You are being assessed from the moment that you walk through our front gate and throughout your training. Your record of training records should be maintained when undergoing training at this facility.

Independent authorised assessors such as ourselves evaluate operators' skills against a national unit of competency through the use of an instrument of assessment, which is subject to continuous rigorous audit by Government Departments.

A Certificate of Competency indicates the holder has achieved basic standards of competency in the safe operation of a machine.

Site-specific and refresher training should be provided by the employer to maintain and enhance the operator's skill level as should additional training for specific attachments.

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COMPETENCY BASED TRAINING EXPLAINED

No two students will arrive at The Operator School with the same workplace and operational experience. Competency based training allows for this. As you progress through your training course you will be given credits for the skills (called competencies) which you perform well and you will repeat tasks only in areas where you have problems.

In simple terms, competency based training is almost the opposite of a “driving test” i.e. doing it once to pass an exam.

Under competency based assessment you are assessed under a wider range of operating conditions but the assessment is far more flexible than a “driving test” which is a simple pass or fail situation. For any competency to be signed off you must demonstrate it without any errors.

When all the competencies/tasks have been successfully completed in your workbook / logbook you are ready to undertake your final practical competency based assessment. Therefore, it is obvious that students will progress at a different learning pace; good operators may struggle to grasp the theory, whereas a workplace manager may fly through the theory but lack confidence when operating the machine. Your workbook / logbook will be retained by The Operator School as a record of your training and assessment in line with the current data retention requirements.

The Assessor will evaluate you against this Occupational Health and Safety assessment instrument for a final determination of competency.

There is no way around these exams; everyone has to do them, regardless of which training organisation a student chooses to use.

For the machinery classes, students are issued with a Statement of Attainment and a “competency card” upon the successful completion of the unit/s of competency of the course. The qualification displays the logo of Nationally Recognised Training, a credential which is recognised throughout Australia. The student can use this paperwork as evidence to demonstrate competency on a specific machine to an employer (person conducting a business or undertaking [PCBU]).

COMPETENT FRAMEWORK

The main difference with the introduction of the new legislation that came in with the de-regulation of earthmoving licencing is that the duty of care for the Person Conducting Business of Undertaking (PCBU or employer) is greatly increased and the responsibility of the regulator has decreased.

It is easier to look at this from a different angle, if there had been a machinery accident. WHS Inspectors and legal professionals are going to ask:-

- Operators recruited properly
- Competency checked
- Employees trained properly with new machines and new attachments
- Were clear instructions provided about the work to be done
- Do you have proof of all of this – verbal agreements are not enough, hence the use of inductions, SWMS etc.
- All this in place …… an employer gone a long way in meeting their duty of care

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In way of explanation, even when a person holds an existing OHS Machinery Licence or one of the new style RTO issued “competency cards” and are legally permitted to operate that particular piece of earthmoving equipment on a job site, an employer must not allow them operate if they do not think that they are competent. They may look at refresher or additional training, or stop them using the machines.

Training and instruction must be given for new machines, new attachments, new work methods, etc. See excerpt below from 2011 Work Health and Safety Regulations.

39 Provision of information, training and instruction

(1) This section applies for section 19 of the Act to a person conducting a business or undertaking.

(2) The person must ensure that information, training and instruction provided to a worker is suitable and adequate having regard to –
  (a) the nature of the work carried out by the worker; and
  (b) the nature of the risks associated with the work at the time the information, training or instruction is provided; and
  (c) the control measures implemented.

(3) The person must ensure, so far as is reasonably practicable, that the information, training and instruction provided under this section is provided in a way that is readily understandable by any person to whom it is provided.

Maximum penalty—60 penalty units

The licence / competency card holder himself/herself must cease to do the work if they feel they are no longer competent. This situation may arise if they have changed their job description and no longer operate a machine – they lose the skills and knowledge to do it.

There should be a constant “checking” process taking place, no one can afford complacency or stagnation under these new laws, every worker has responsibility to keep themselves and fellow workers safe.

ENTRY REQUIREMENTS

- Must be 18 years of age to hold a machinery competency card.
- Must be able to provide proof of identity (100 points required)
- Must be able to speak, read and understand English

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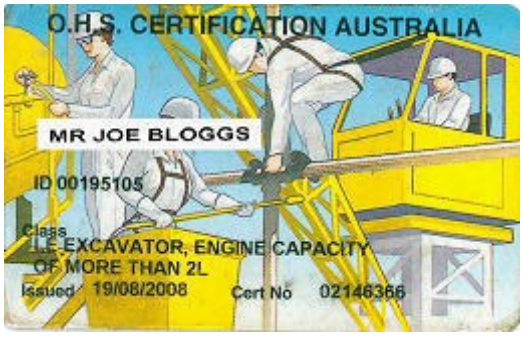
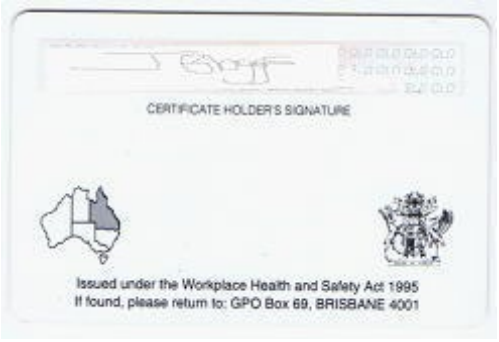
EVOLUTION OF THE “LICENCE”

Old Paper Licence

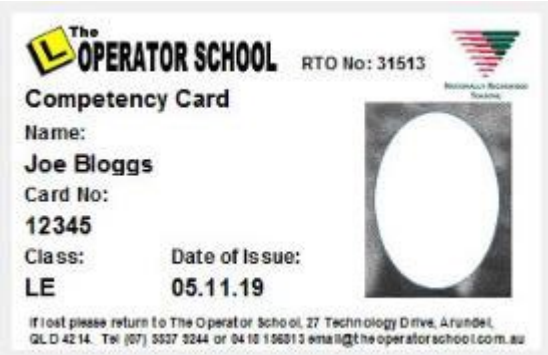
An Early Plastic Licence

Plastic Licence mostly commonly seen





New Style RTO Issued “Competency Cards”



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LEARNERS AND LOGBOOKS

Employers and operators must realise that the only people who can operate a machine: are:-

- A licence / competency card holder who is competent i.e. been trained and has relevant recent experience.

- A trainee. A trainee is a person enrolled in a course of training for a particular piece of earthmoving equipment and who is completing a logbook in the workplace. This must be done under the supervision of a person who also holds competency for that type of plant and has the suitable current experience to develop a student's skills whilst ensuring everyone remains safe.

When you are operating the piece of plant in the workplace, you must be directly supervised by someone who holds a licence / competency card for the relevant piece of plant being used during training, is competent and has the necessary relevant experience, to allow for the completion of your practical work based training, which is recorded in your machinery logbook.

This covers those of you who are with us on a "in house" course, where your training record / logbook will be completed internally here at The Operator School.

This also covers those students enrolled on a 2 stage course (practical training recorded in the workplace, done in conjunction with your employer).

The gap between sitting the theory, completing the logbook and taking the practical exam should not exceed 2 months.

The workbook you complete here is a record of your formal training.

No learner should be on a machine if unauthorised or unsupervised.

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THE CIVIL CONSTRUCTION INDUSTRY

Civil construction is one segment of the broader construction industry focused on building core infrastructure like roads, highways, pipelines, sewers, water treatment systems, bridges, subway tunnels and light rail transit lines.

However, application of these machines is also present in house and swimming pool construction, plumbing, landscaping yards, recycling facilities etc.

Whatever industry sector you may end up working in, it is important that you learn how to operate a piece of plant in a safe manner preventing injury to yourself and others and damage to the machine itself

COMPLIANCE DOCUMENTATION

Compliance documents contain information, processes and procedures that must be complied with, and also 'best practice' information to be used as a guide for workplace tasks.

Compliance documents and requirements fit into a number of categories:

Acts

These are Laws laid down by Government to protect the health, safety and welfare of people at work. The current legislative instrument is the Work Health and Safety Act 2011.

For More information on Qld Legislation click here

Regulations

Give more details or information on particular parts of the Act, such a reporting notifiable incidents, licencing (high risk work), permits and registrations, handling substances i.e. asbestos, provision for worker consultation, participation and representation. Provision for the resolution of issues and protection against discrimination. The current document is the Work Health and Safety Regulations 2011

For More information on Qld Legislation click here

Australian Standards

Usually encompass the regulations. Australian Standards go into even greater detail on the minimum levels of performance or quality for a hazard, work process or product. They can also include a work-based best practice component. There are literally thousands of Australian Standards and you will often see them displayed like this AS 2294.1 - 1997 Earthmoving Protective Structures General.

For more information on Australian Standards click here.

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Codes of Practice

Provide practical instructions on how to meet the terms of the Law. Codes of practice are admissible in court proceedings under the WHS Act and Regulations. There are approximately 40 codes of practice currently adopted by Queensland. New codes of Practice will continue to be rolled out under the current OHS framework of Legislation. Therefore it is important that you are aware of the Codes of Practice that are relative to your workplace. These would include but are certainly not limited to Code of Practice for excavation work, for construction work, demolition work and for traffic management

For more information of Codes of Practice in Qld click here

Site Requirements

Each site will have specific limitations, safety issues, access requirements and daily task steps to be followed.

These could include:-

- Site Safety Plan (Traffic Management, PPE, SWMS etc.)
- the Quality requirements (the materials to be used and the standards of finish you are expected reach)

Operator's Manuals

Will provide specific technical information on the machinery you are using in order that the machine can be operated within its specified limits to prevent damage to the machine and possible injury to the operator or nearby co-workers.

Other examples of compliance documentation and related information may include, but is certainly not limited to:

- Manufacturer's guidelines and specifications
- Permits & Licencing
- Safe Work Method Statements (SWMS, operator signs onto this)
- Job Safety Analysis (JSA, operator signs onto to a JSA)
- Employment and Workplace Relations legislation
- Equal Employment Opportunity and Disability Discrimination legislation
- Environmental requirements
- Emergency and First Aid Requirements

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INTERPRETING REQUIREMENTS

Apart from understanding the requirements in documents applicable to the Machines being used, it is important to understand the terminology used to rank the compliance levels.

Should – this is a preferred course of action. It may arise from Standards or Codes of Practice and you may need to justify not doing things this way should something go wrong (in a Court of Law if there is an incident).

Consider – this means the choice of action is yours. It implies this is usually the best choice but circumstances may require a different choice.

Must – (also **Require** or **Mandatory**) means the action is legally required and is enforceable.

OBTAIN AND APPLY WORK INSTRUCTIONS AND REQUIREMENTS

For each job there will be work instructions to outline the structure of the tasks to be completed. These may be available as part of the overall job plan or you may have to speak to appropriate people such as the site supervisor, the project supervisor, OHS representative or other qualified people to find out what is involved. Instructions would include:

- Plans, blueprints and/or drawings.
- Specifications and project documents.
- Operational details.
- Quality requirements, which may include:
  Dimensions.
  Tolerances.
  Standards of work.
  Material standards as detailed in the project drawings, specifications and project documentation

As these compliance requirements can vary from state to state, company to company, and job to job, you are required to familiarise yourself with the documentation applicable to your work location and situation. You will need to develop an understanding of how construction work is done including the sequences followed to complete specific tasks. Developing an understanding of the work being done on the site can also help you get your own work done more efficiently

Working safely and effectively is your responsibility and ensuring those around you are aware of the requirements is another way of increasing your own safety level.

The procedures for your work should be applied from the planning level all the way through to the completion of the work and beyond, to maintenance and storage of all materials, tools and equipment.

To apply any of the requirements from any level (Acts, Regulations etc.) you must understand them. You need to be able to apply what is written relevantly to your work. If you have any problems, difficulty or issues doing this, make sure you ask for assistance from appropriate personnel. You should always be sure you confirm them by asking questions and even repeating back your understanding of what is being conveyed.

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PLANS, DRAWINGS AND SKETCHES

When looking for information from documentation, pictures may give a better and more explicit view of information needed to perform work. A sketch showing the relationship of the dump site to the main gate may be more easily recalled than a lengthy written explanation.

You need to be familiar with the terminology used in the plans and drawings so you can understand what the information is. If needed, ask a supervisor, site personnel or project staff for assistance.

You should be able to understand any graphical information so as to interpret any conditions or restrictions on your work, and to get an overview of the site and possible influences on how you complete your tasks.

SAFETY REQUIREMENTS

Safety requirements that you will find in the project safety plan include:

- Protective clothing and equipment.
- Use of tools and equipment.
- Workplace environment and safety.
- Handling of materials.
- Emergency procedures.
- Hazard control.
- Dealing with hazardous materials and substances.

DUTY OF CARE – IF YOU SEE IT, YOU OWN IT!

On a large project it is the Principal Contractor that has overall responsibility for the job's safety requirements and satisfactory completion.

All personnel, this includes **you**, have a legal responsibility under duty of care to do everything reasonably practicable to protect others from harm by complying with safe work practices, including activities that require licences, tickets or certificates of competency or any other relevant state and territory OHS requirements.

This includes:

- Employers.
- Self-employed persons.
- Persons in control of the workplace.
- Supervisors.
- Designers.
- Manufacturers.
- Suppliers.
- Workers.
- Inspectors.

In OHS Legislation duty of care is also expressed as "exercising proper diligence".

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RESPONSIBILITIES

Employers must ensure: -

- Worker has completed general construction induction training (white card)
- Inductions are done for new workers / worksite
- Operators avoid stress and fatigue
- A safe work environment, systems and equipment is provided
- Safe supervision and work instructions
- Consult with employees on the safety of the workplace
- Personal Protective Equipment provided and used include instruction and training on the correct use and storage of the PPE
- Provide training for any new machines or new attachments
- Provide site specific and refresher training to maintain and enhance employee's skill levels
- Inductions for changes to traffic management plans and work place policies or procedures
- Maintain a register of current competent operators and ensure visiting contractors are competent before operating a machine

Employees must ensure: -

- That they are in a fit state to work – not too tired etc.
- They co-operate with their employers, performing work in a safe manner
- Be alert in identifying and reporting hazards
- Use and look after the Personal Protective Equipment that has been provided
- Know the safety plan and work methods.
- The responsibility is on the worker to operate safely
- Be honest in their competencies / experience.

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SITE INDUCTION

In large worksites the principal contractor has responsibility to ensure that a site induction is carried out before the person undertakes any activities in the work place, as per example below.

No.	Items covered	Yes	No	N/A
1	Have you established the competencies and qualifications (including trade qualifications) of the person?	☐	☐	☐
2	Have you established proof of the person's construction induction training (white card?	☐	☐	☐
3	Have you ensured the person has been taken through relevant safe work method statements for the tasks to be performed?	☐	☐	☐
4	Does the person have the correct PPE available? Hard hat — Safety footwear High visibility vest — Long sleeved shirt Safety glasses — Other …….……..	☐	☐	☐
5	Have you shown the person what to do in an emergency and identified the location of the: • Assembly point and evacuation route? • Closest medical facility? • Contact details of emergency services? • Provisions for emergency communications?	☐	☐	☐
6	Have you shown the person: • The location of the first aid facilities/kits? • Who the first aiders are and how to obtain treatment?	☐	☐	☐
7	Have you shown the person where all relevant firefighting equipment is located? For example: Fire extinguishers, hose reels, etc	☐	☐	☐
8	Have you introduced the person to the Health and Safety Representative(s)?	☐	☐	☐
9	Have you shown the person where the amenities (including toilets & drinking water) are located?	☐	☐	☐
10	Have you explained the procedures for reporting incidents, injuries and hazards?	☐	☐	☐
11	Has the person been trained to set up and use any specialised equipment required?	☐	☐	☐
12	Have you explained the site security procedures?	☐	☐	☐
13	Have you explained the site health and safety rules?	☐	☐	☐
14	Have you given the person an opportunity to ask questions about their responsibilities and to have any issues clarified?	☐	☐	☐

I have participated in the site induction during which I had the site specific health and safety rules explained to me. I understand the standards expected of me and I agree to work safely and comply with these standards and procedures at all time.

Inductee Name: …… Signature: …… Date: ……

Inducted By: …… Signature: …… Date: ……..

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PERSONAL PROTECTIVE EQUIPMENT (PPE)

Machinery operators have to wear PPE. It is the responsibility of the employer to provide the necessary protective equipment (this maybe a labour hire company if you are working for them). The PPE must be in good working order and training and instruction on the PPE must be provided, (60 penalty points apply for non-compliance.

It is the responsibility of workers to inspect the equipment prior to use and report faults. It is also the responsibility of the worker to wear and use the equipment properly, where and when necessary, following the training and instruction that was provided.

46 Duties of worker (in relation to PPE)

(1) This section applies if a person conducting a business or undertaking provides a worker with personal protective equipment.

(2) The worker must, so far as the worker is reasonably able, use or wear the equipment in accordance with any information, training or reasonable instruction by the person conducting the business or undertaking.

Maximum penalty - 36 penalty units

(3) The worker must not intentionally misuse or damage the equipment.

Maximum penalty - 36 penalty units

(4) The worker must inform the person conducting the business or undertaking of any damage to, defect in or need to clean or decontaminate any of the equipment of which the worker becomes aware.

Maximum penalty - 36 penalty units

Clothing should not be too loose, loose clothing can catch on controls. Long hair should be tied back. Also be aware of Jewellery that can also catch on controls.

Safety Helmets

Safety helmets must be worn wherever there is a risk of objects falling from above and on any work site where the hard hat sign is displayed. Make sure that you wear a helmet marked as complying with AS 1801 *Industrial Safety Helmets*.

High Visibility Shirts / Jackets

High visibility clothing is mandatory on a construction site – it makes it easier for people to see you.

Safety Boots

Choose boots that are comfortable, give maximum grip and give protection from pinching, jamming and crushing. A range of lightweight flexible boots with steel or plastic caps is available that comply with AS2210 *Safety footwear* – usually require ankle stability.

Do not wear thongs or sandals, they can get caught in the pedals and are not acceptable in the construction industry.

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Gloves

Gloves protect your hands from:

- Heat and abrasion
- Molten metal
- Sharp edges
- Chemicals (acids, alkalis, solvents, fats and oils)
- LPG freeze burn

Eye Protection & Face Shields

You must wear eye protection that conforms to AS 1337 Eye protectors for industrial applications i.e. goggles, face shields etc, if you are likely to be exposed to: -

- Physical damage caused by flying particles, dust, molten metal.
- Chemical damage caused by toxic liquids, gases, vapours, dusts.
- Radiation damage caused by sunlight, visible light, infra red, laser and welding flashes.
- Acids from batteries.

Respiratory Protection

Wear a face mask or respirator that conforms to AS1716 *Respiratory protective devices* if you are likely to be exposed to:

- Toxic gases and vapours
- Toxic or disease causing dusts, such as silica and asbestos.

Inhalation of some chemical vapours and gases can cause a wide range of unpleasant symptoms including narcosis, headaches and in some cases death.

Hearing Protection

Hearing damage is likely if you are exposed to long periods of industrial noise above 85 decibels. 8 hours at 85 decibels is the recommended daily limit. This is the noise level of a large truck or Machine. A chainsaw for example has a noise level of about 110 decibels.

If you think it is likely that you are being exposed to dangerous noise levels ask your employer to provide you with hearing protectors complying with AS 1270 *Acoustics – Hearing protectors*.

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NIGHT AND DAY WORKING PROCEDURES

When you work in the civil construction industry, there might be different rules for the day shifts and night shifts.

Day Shifts

Some of the dangers of working a day shift are heat stroke / exhaustion, sunburn and skin cancer

- Slip, Slop, Slap. Many employers have a long sleeved shirt and long pants policy for this reason
- Wear protective sunglasses, polarised if possible to protect eyes from glare.
- When possible, try to work in the shade.
- Drink lots of water.
- Use air conditioning to reduce sweating. If you sweat too much you can become dehydrated.
- If your worksite is running 24/7, do the more difficult work in the day time if you can.

Night shift working Procedures

The main dangers of working a night shift are fatigue and visibility, however heat can still be a factor during the summer months. Tired and dehydrated operators could easily cause an accident.

- Make sure you have enough light to see what you are doing, including fuel for the generators and spare globes (if lights go out quickly could cause an accident).
- Use additional portable lights, vehicle headlights
- Make sure key areas (entrances and exits) and information signs are well lit
- Use personal light such as helmet lights and emergency blinking lights
- Make sure you can communicate, radios, whistles etc.
- If you have to go somewhere by yourself make sure to notify your fellow workers
- Be extra aware of dips, trenches and other hazards around the worksite.
- Be careful with fatigue, drink some water, stretch your legs and have a break. Don't drink too much coffee. Your body will get used to caffeine, and then you'll need more to stay awake.

Change of shift Procedures

- You may have to attend a pre-work safety briefing / de-briefing (toolbox) before you start / finish work and complete some paperwork.
- It is important to tell the next shift any safety issues that might have been raised during your shift.
- You must let them know how the work went and what they need to do to progress with the current job
- It may also stop you being blamed for something you did not do..

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FATIGUE MANAGEMENT

Humans are diurnal animals – that means we are awake during the day and sleep at night. To manage fatigue your mind and body needs to rest in the form of sleep. If you are working in shifts, getting the right amount of sleep is important. As an adult you should get approximately 7.5 hours sleep. This is even more important if you are working night shift.

Short naps of about 15-20 minutes can make up for lost sleep. Napping for more than an hour can cause sleep loss during your designated rest time. To avoid this, set an alarm to wake you from your nap.

Whilst earthmoving machinery is not classed as “fatigue-regulated” (like the heavy vehicles), operator fatigue is still a major cause of accidents. At heart of the OHS Legislation is a primary duty – an operator driver must not operate a piece of plant on a worksite while impaired by fatigue. If there were an incident and after investigation it was found that the operator had worked a double shift, or 3 x 14 hours shifts etc. it is highly likely the employer would be fined.

Fatigue Warning Signs

There are many warning signs of fatigue. Some of the more basic ones that should not be ignored include:

- yawning
- heavy eyes
- blurred vision
- reduced concentration.

The most important ways to stay healthy and avoid fatigue are:

- Get enough sleep.
- Eat a well-balanced diet.
- Exercise regularly.
- Try to relieve stress.

QUALITY REQUIREMENTS

When building roads, tasks are organised by working backwards from the finish level of the job. The specifications required and materials to be used are often referred to as the ‘Quality Requirements’ for the job. The materials used and the finish required would depend on the job being done i.e. a major highway would need to be finished to a much higher standard than a pavement in a side street due to the sheer volume of traffic it that would be using it.

Therefore, it is important that everyone works to plan as the potential for over-ordered or wasted materials (work that has to be re-done because it is sub-standard), wear and tear on machines and double handling of work will significantly affect the budget allocated to the project. In major projects there is often a separate default crew fixing up these issues, i.e. the light rail project.

As a machinery operator you may often need to deal with contingency issues such as:-

- Unavailability of materials
- Unavailability of work instructions if staff off on RDO’s or sick
- Equipment downtime
- Weather
- Utility issues i.e burst pipes, cables dug up etc)
- Public complaints about noise or dust

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UNDERSTANDING SOIL TECHNOLOGY

The characteristics, weights and density of the materials being moved or loaded will affect your work. You need to understand the basics of soils, clays and other materials so as to:

- Know how to best respond to them and handle them
- Understand conditions for moving the materials.
- Achieve the best outcomes in your work.
- Help when you need to calculate load amounts.

If the plant is not appropriate to the materials being used, outputs will be low and damage may occur to the machinery itself. The weight and consistency of the material will affect the way the chosen machinery works. Ground collapse is one of the primary risks to be controlled in excavation work. There is grave danger in assuming that the ground (density of material) you are working on is stable, ground collapse can occur quickly and without warning, giving a worker very little time to escape. Suffocation can often occur before help arrives, or workers can be crushed.

The stability of any excavated face depends on the strength of the soil in the face being greater at all times than the stresses it is subjected to.

Topsoil	Generally topsoil dumps easily and cleanly. Topsoils are normally removed and stored on site for later re-use during re-vegetation processes. There are stringent processes around the avoidance of contamination of topsoil. Topsoil should be stored away from other materials. Machines may need to be washed down if swapping between topsoil and other materials.	
Clay and Mud (Hard, compact soils)	Clay and mud can tend to be dense and sticky and may not discharge cleanly from the bucket if the material is wet or damp. Mud can purge from the excavator, rather than discharge smoothly. As a material to work with, clay is more cohesive and harder to excavate and push than a lot of other materials.	
Stones, rock and gravel	The operating techniques needed will depend on the type of type of rock and the size (gauge) of gravel and stones. For example: Metamorphic rocks are heavy and hard. Igneous rock is volcanic. It can be very hard but may also be very light. Igneous rock can be very abrasive and may cause damage to the excavator or wear down ripping points quickly. Sedimentary rocks and shales could peel out when cut and removed.	

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Sand and Silt (Loose or running material)	Depending on the amount of moisture in them, silts and sands can often be moved cleanly and easily. Equally they can also be difficult to work with because of their fine nature. Loose or running material is often the safest, because the need for safety precautions is obvious from the start.
Construction site materials	The handling of construction site materials such as concrete, cement, CTB (concrete treated base), bituminous mixes, blended or waste materials will depend on the actual properties of the materials and the environmental conditions such as the moisture levels.

You must always be aware that all sorts of things can affect ground conditions, rain, seepage (saturation changes texture and weight), evaporation, previously excavated materials, shock or vibration etc.)

Moisture content (viscosity) of material is also very important in civil construction work, as it affects how well materials compact and therefore, the finished outcomes. Water is often added to dry materials to 'activate' it i.e. bring it to its Optimum Moisture Content (OMC) before it is laid in earthworks or in pavement.

As you work in the civil construction industry you will learn many of the properties of these materials and also the extensive terminology that surrounds them for example, with concrete you will learn about slump. With gravels you will learn about gauge and application, you will learn about dewatering, to make the ground suitable for actually working with.

UNDERSTANDING BASIC EARTHWORKS CALCULATIONS

As a machine operator, the two main calculations you will need to be able to apply are for Area and Volume.

As long as you do not exceed the weight and volume capacities for the machinery you are using, you will obtain satisfactory performance.

There are simple formulas to remember

Area	
Length x Width = Area	Using this formula Length of 4 m x width of 20 m = area of 80 m
Area ÷ Width = Length Area ÷ Length = Width	Use this formula where you only know 1 of the dimensions (e.g. width or length), you can work out other factor. Area of 50 m^2 ÷ width of 5 m = 10 metres in length
Volume	
Length x Width x Depth	Length of 20 m x width of 4 metres x Depth of 0.5 metres = 40m^3

You may also need to convert volume of materials needed into weights of material needed as most civil construction supplies are ordered in metric tonnes not m^3. The formula for doing this is the length x width x depth = x the weight of the material being used (see weight table page 52)

Ordering materials is an important part of the job. It is important to make sure you have enough material to complete the job, especially when pouring concrete, which goes off (hard) quickly. Order too much and the waste could be the difference between a profit and a loss on the job!

When loading material into a tipper, you also need to allow for expansion of that material.

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CIVIL CONSTRUCTION WORK SEQUENCES

Examples of civil construction work sequences that you may need to be familiar with include:

Earthworks:

- Moving earth around to change the purpose of the landscape
- Mark out work area with pegs according to plans or survey
- Install sediment control i.e. fence and ponds
- Clear the surface (e.g. remove vegetation) often called “grubbing”.
- Remove (strip) topsoil (make a stockpile for later use)
- Cut and fill to shape contours, batters, benches or drains

Drainage:

- As for Earthworks and followed by:
- Mark out and cordon off area of work (another operator maybe doing a different task next to you)
- Box out (excavate) drainage line
- Layer the floor of excavation with 5 mm to 20 mm gravel as specified in work plan (this process is often referring to as “sanding up”)
- Lay pipes to specification
- Backfill with gravel to haunch pipe (stop from rolling)
- Place down layers of material previously excavated from trench (or other material if specified in plan) and compact as per specifications to finish level
- Compaction will be a mix of non- vibe (static) and vibe runs
- Landscaping.

Roadworks:

- **As for Earthworks above followed by:**
- Box out (excavate) the area to be worked on i.e. pavement (road), kerb, footpath
- Place materials specified, down in the layers specified back up to the finish level
- Compacting layers as required to specifications supplied i.e. static or vibe compaction
- Final trim is done to finish level
- Static roll to seal

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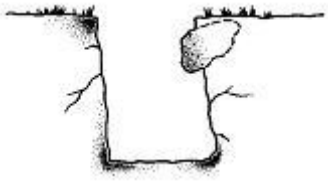
OTHER USEFUL TERMINOLOGY

Over Burden

Also known as ‘waste’ or ‘spoil’, it is the material that is left over after operation. If digging a trench this might be used to backfill the trench after the work is done.

Floaters

If you are excavating and you come across large exposed rocks in the side of a trench, known as “floaters”, these must be removed. The rocks could fall and injure someone



Water Scouring

This is where water has run a path that has changed the face of the terrain in some way leaving, channels, small ravines etc. Often ground is left uneven after water scouring has occurred.

Sediment Ponds

Huge part of today’s environmental controls. Run off water from the site is collected in sediment ponds and needs to be treated before being pumped off site.

Windrow

When a grader is trimming and collects to the side of the road. A civil construction worker will often be asked to clear a pile of windrow.

Bunding

Bunding is the process of building up a small pile of dirt or mulch to hold back run off of water or in emergency situations to contain a spill (whilst the spill kit is located).

De-watering

Dewatering is the common term used to describe the removal or the draining (pumping out) of groundwater or surface water from an excavation on a construction site.. On larger civil construction projects the water is pumped into and out of the sediment pond (treated in the process). On smaller jobs for instance if excavating around underground services it is removed on the spot with a vacuum truck (often referred to a “sucker” trucks).

Culvert

A culvert is a structure that allows water to flow under a road, railroad, trail, or similar obstruction. Typically embedded so as to be surrounded by soil, a culvert may be made from a pipe, reinforced concrete or other material. A structure that carries water above land is known as an channel.

Spoon Drains and V Drains

Spoon and V Drains are drains built in concrete designed to collect and channel water. Spoon drains are curved and V drains are shaped in a “v”.

Gabions

Gabions are rectangular woven wire mesh baskets filled with rock to create flexible, permeable structures such as retaining walls for industrial, road and mining construction.

Conduits

Tubes that protect electric wiring or cables, often laid in the ground.

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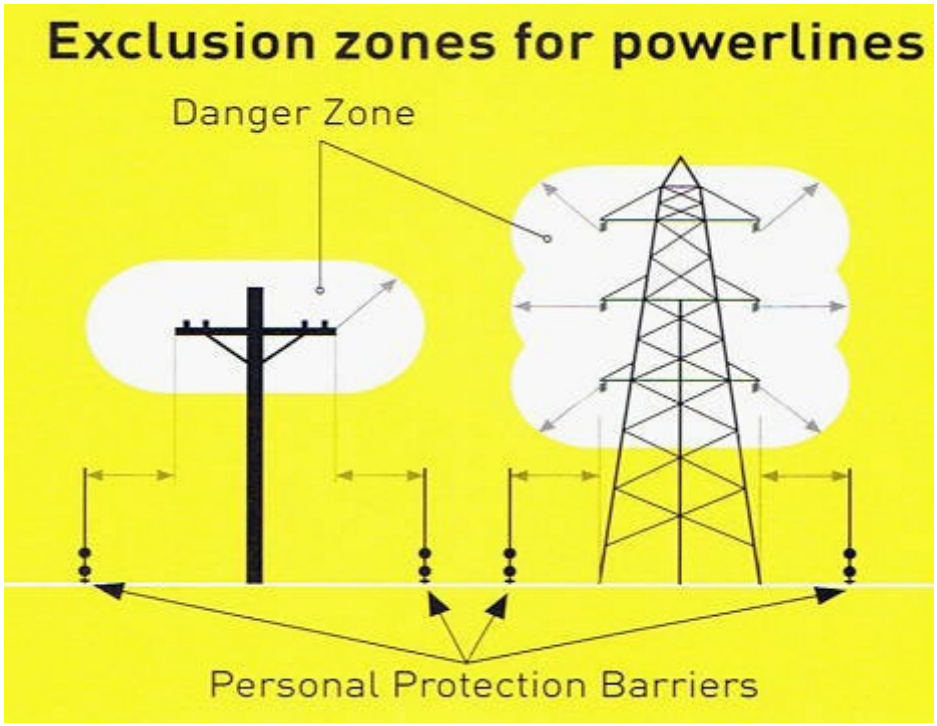
For information on electricity refer to Relevant Code of Practice or the supply authority.

Keep a safe distance from electric power lines. Find out where all power lines are located in your workplace. Do not operate a machine under power lines. (To avoid the boom making contact with the lines when the boom is raised, operators must be aware of the droop or sag in the middle of a power line). Constant vigilance and an observer are required whilst working or travelling in the vicinity of live electrical apparatus.



Workers and their equipment should not approach overhead powerlines any closer than the following: -

Voltage	Examples	Exclusion Zone
Powerlines with voltages up to 132kV	e.g. low voltage and high voltage distribution and sub transmission lines, usually on poles	3m
Between 132kV and 330 kV	e.g. sub transmission and transmission lines on either poles or towers	6m
More than 330 kV	e.g. transmission lines usually on towers	8m

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‘Tiger Tails’ (also known as Torapoli Pipes) are plastic covers used to warn people they are in the presence of overhead power lines. They are not insulators.

Distances may vary with experienced / authorised people (these people have usually done an Electrical Awareness Course). You need to check your state for regulations/codes of practice and training courses.

If you are required to work close to power lines you should:-

- apply for an exemption from the relevant authority
- If possible the power lines should be isolated i.e. turned off
- If not possible to turn the power line off, the power line must be insulated by a competent and authorised person
- The use of a spotter may also be permitted depending upon the legislation within that State or territory

If you do not know the voltage stay at least 8m clear of power lines.

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If you do make contact with power lines:

If possible, attempt to break the Machine's contact with power lines by moving the machine. Be aware that the controls maybe electrified so you should not attempt to do this if there is any possibility that you are endangering yourself.

Alternatively:-

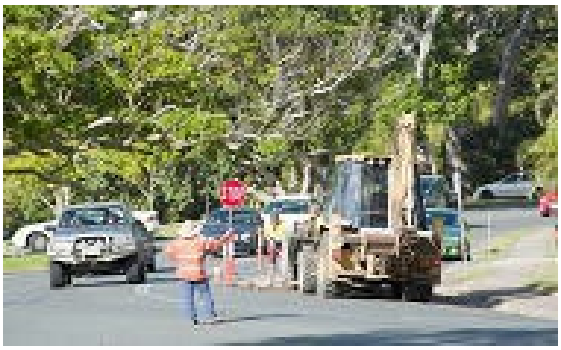
1. Stay on the machine – do not touch controls, they may be electrified
2. Stay Calm
3. Call for assistance
4. Do not leave the machine until the electricity has been turned off
5. Warn others to stay away until the power has been switched off
6. If help fails to arrive – don't panic, secure machine
7. Take seatbelt off
8. Then jump well clear with your feet together so you do not earth yourself from potentially different voltages on different parts of the ground (make sure you understand this rule)
9. Do not make contact with the ground and the machine at the same time
10. Avoid any water and obstacles
11. Jump with both feet as close together as possible (or shuffle) to a distance of at least 8 metres away, do not walk or run as ground maybe electrified
12. Stand this safe distance away until help arrives
13. Fill in incident report form
14. Make sure machine is checked over for damage before being put back into service.

TRAFFIC MANAGEMENT PLAN

A traffic management plan must be in place for any construction or maintenance work undertaken on or adjacent to any sort of public access road, separation of plant, people and vehicles to control the risk of an accident and keep traffic moving with the minimum of disruption.

This could be the construction of a new 4 lane highway, a footpath around the local library or maintenance on some underground services. The Principal Contractor (or PCBU if a smaller job) has the responsibility for this. Traffic management plans are organised by the Contractor through The Department of Transport and Main Roads (TMR) and occasionally require involvement of the Qld Police. Further information can be found in:-

- The Traffic Management Construction Work Code of Practice (who has responsibility what needs to considered)
- Manual of Uniform Traffic Devices Part 3 (MUTCD Part 3) provides technical detail and also details on the Traffic Controller Accreditation Scheme.



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A Traffic Management Plan needs to include the following:-

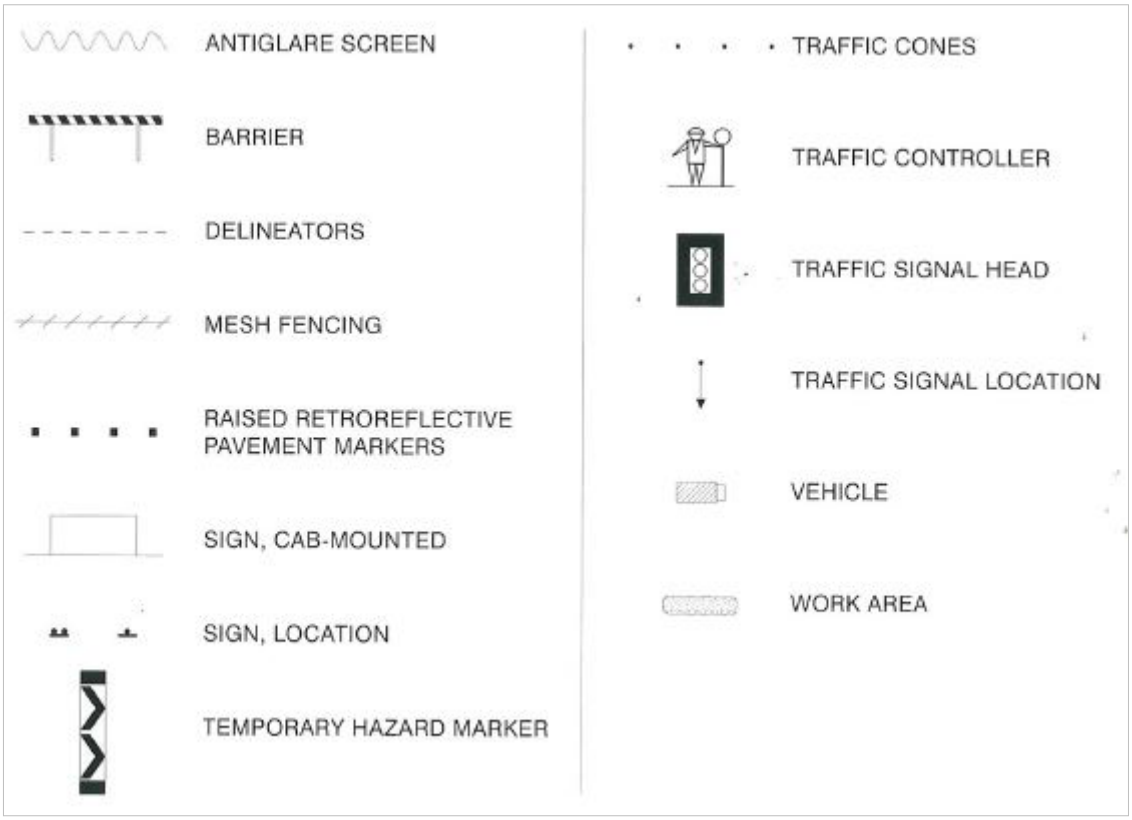
- Description of the proposed works and lane/road closures.
- Identification and assessment of traffic impacts of proposed works.
- Detail traffic management measures to ameliorate the impacts of proposed works.
- Assessment of public transport services affected.
- Details of provisions made for emergency vehicles, heavy vehicles, cyclists and pedestrians.
- Assessment of effect of proposed traffic management measures on traffic movements in adjoining streets.
- Proposed public/ tenant notification process if required.
- Dates and times of operation

Some of the traffic control measures that may be considered include:

- road closures
- footpath closures
- detours
- right of way conditions
- fences
- signing
- traffic controllers.

As a machinery operator, it is extremely important that you have access to the TMP and that you understand and implement the requirements. If anything is unclear, ask questions. The time to sort things out is before operations begin.

Common Symbols you will observe on a TMP include:-



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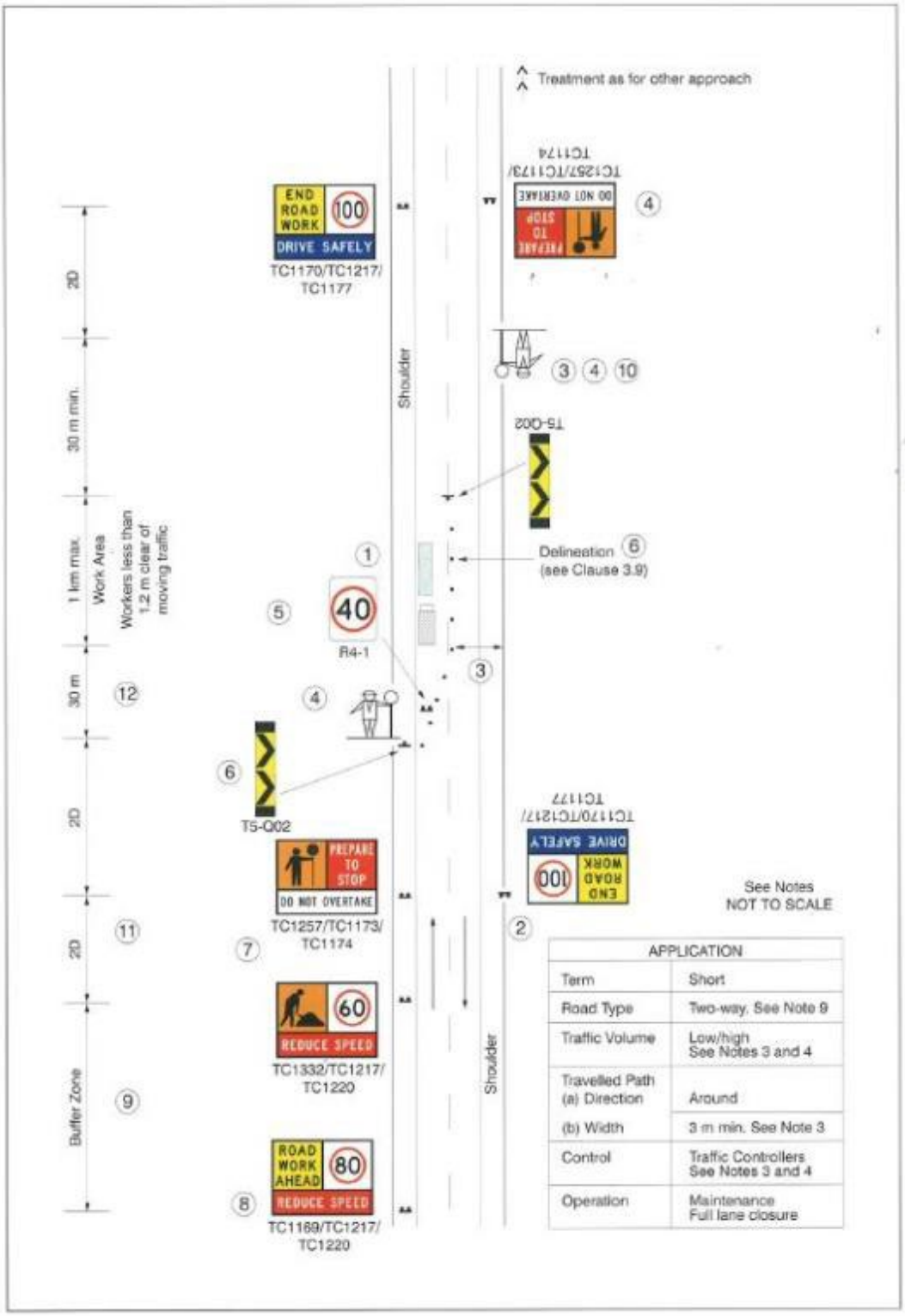
Example of a Traffic Management Plan for a short term, full lane closure on a 2 way road.



TRAFFIC MANAGEMENT ON SITE

Normally traffic management on site is organised by PCBU, speed is normally limited to walking pace and communication between labourers, machinery operators and truck drivers is done by two-way radios or “Pos Coms”. If the worksite is adjacent to any busy road, the “gate supervisors” will normally be accredited traffic controllers due to the high risk involved of getting site traffic in and out of the main stream of traffic. General awareness of the ‘rules of the road’ on site will help ensure a safe working environment for everyone.

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ENVIRONMENTAL PROTECTION REQUIREMENTS

Environmental protection requirements are used on site to ensure the minimum possible effects on the immediate work environment such as plants, animals and resources. Environmental protection requirements also cover more immediate physical issues such as noise, dust and vibration.

All the above should be taken into consideration when an Employer is designing and implementing an Environmental Management Plan.

NOISE

Noise issues may be alleviated by work being performed during restricted hours. In urban areas it is common for construction work to be limited to the hours of 7am to 7pm, with tighter restrictions for weekends.

DUST

Dust can be controlled with covers or more commonly with water. Water is usually sprayed onto surfaces using water tankers but in some cases may be applied with a fog machine to capture and settle the dust.

VIBRATION

Vibration can be a costly side-effect of construction. For major projects there will often be a survey of the local area to establish current conditions so any damage caused by the work can be properly assessed after work is complete.

Vibration is a difficult effect to alleviate as mostly it is a part of the work practices. Work practices may be able to be modified to reduce some components.

Some ways to control vibration effects include:

- Using cuts (e.g. in concrete) at the sides of work to minimise transmitted vibration.
- Using cutters instead of impactors to break down pavement or solid surfaces.
- Scheduling work to specific times to minimise impact on locals.

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RESOURCE POLLUTION

It is very important that water, air and land be protected from pollution sources. In cases where the work involves the use of noxious chemicals or other sources of pollution, steps must be taken to either protect the environment or restore it after work is done.

Water resources are particularly vulnerable due to how fast the pollutant can be washed downstream and out of control lines.

The use of sediment fences and sediment ponds (to treat the water before it is removed from site) are a feature of all major civil construction works.

WASTE MANAGEMENT

In construction projects there is often a high risk of pollution from waste. Controlling the risk can include procedures for dealing with all expected types of waste. This must include hazard controls, such as covered areas for waste that might blow away, to reduce the risk associated with each type of waste.

At the end of the work, or even at regular intervals while the project is running, there should be disposal of waste in acceptable manner. This may include removal or neutralisation of wastes.

Typical construction site materials OR waste, which may be observed:

- Pegs.
- Plastic wrapping
- Wire.
- Cordage.
- Safety equipment.
- Other support equipment.

CLEAN-UP

At the end of the work, the site must be cleaned up. Apart from ensuring all tools and equipment are returned to base, this should also include disposal of wastes, removal of excess or damaged material and restoration of the site as far as possible.

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ENVIRONMENTAL MANAGEMENT PLAN

An environmental management plan (EMP), is designed to help you remove or lessen the impact on the environment where you are working.

An Environmental Management Plan should be available to detail:

- The environmental protection steps agreed to in the initial project set up.
- Site specific needs.
- Hazards to the environment.
- Risk Control measures to mitigate or remove the risk from work activities.
- Procedures to follow at the end of work to ensure the site minimally affected.

The plan may be organisation-wide; it may be for the project, or even for the specific site.

Ideally the work should be completed and the site should be returned to as pristine a condition as possible, given the purpose of the work.

The EMP identifies environmental concerns, their level of risk, and environmental protection measures that will be used to reduce the risk. You need to decide (a) how serious and (b) how likely the risk is to the environment when making your EMP.

Firstly you need to decide how serious the impact on the environment could be. The following table will provide you with a guide:

How serious is the risk?		
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 ground water**
2	**Major**	**Release leading to measureable change to stormwater quality** **Soil contamination over a wide area** **Damage to a heritage site**
3	**Moderate**	**Short term minor change to ecosystems** **Onsite release that is contained with little contamination** **Localised, short-term change in stormwater quality**
4	**Minor**	**On-site release immediately contained** **Isolated complaints from the community**
5	**Insignificant**	**Impact on environment can't be measured**

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Secondly, you need to decide how likely it is the risk will happen. The following table will provide you with a guide:

How likely is the risk?		
Level	**Likely to happen**	**Examples of impact on the environment**
A	**Almost certain**	**Environmental concern 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 issue that is very unlikely to happen**

Finally, you need to decide *how serious* and *how likely* a risk is to the environment. Even a moderate risk that might possibly happen needs to be planned for.

Examples of environmental impacts and controls that could be used:

Example 1
Environment impact: Dust leading to loss of topsoil
Cause: Stripping soil in dry, windy conditions
Control: Do not strip soil if very dry or windy.
Use a water cart to stop dust from stripped areas

Example 2
Environment impact: Soil and clay going on residential streets
Cause: Not cleaning wheels of vehicles leaving worksite
Control: Wash wheels or use rumble grids or put gravel at exit points

Example 3
Environment impact: Noise
Cause: Engine noise from heavy machinery
Control: Work on site to be carried out between 7:00am and 6:00pm

Example 4
Environment impact: Loss of topsoil
Cause: Stockpiles stored down-slope of vegetation stockpiles
Control: Store stockpiles up-slope of vegetation stockpiles

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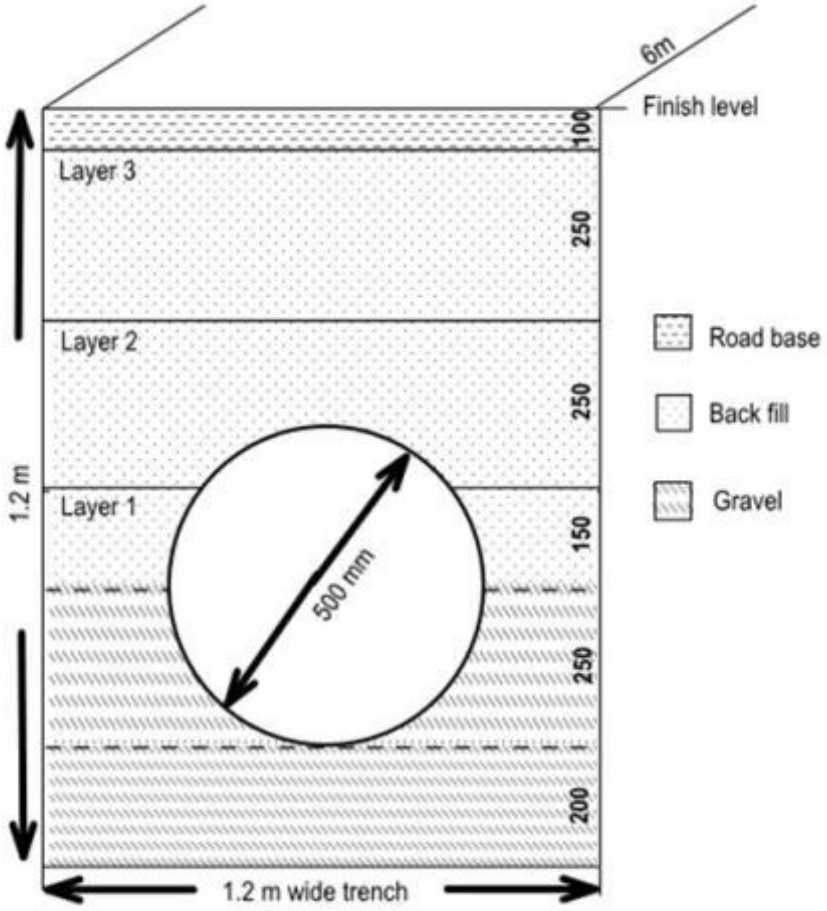
JOB PLAN

The job plans below explains the quality requirements for the job and gives examples of the kinds of things you would read in a job plan. The job plan outlines the materials to be used and the finish that is required.

Install Drainage line of 500 mm pipe at the entrance to a driveway



Before work starts

- Tell customer the starting date for the work and how long the job will take
- Mark out the work area with survey pegs
- Organise signage and traffic control for the work area if needed (provide enough space for area to work)
- Find out where underground services are such as water, gas and electricity
- Organise the equipment for removing the excess backfill, boxing out etc. – an excavator
- Organise the equipment for compacting the surface – trench roller / compaction wheel
- Contact the quarry to organise the necessary materials
- Organise the 500 mm od stormwater pipe and fittings

How to do the job

- Set up the work area with flagging or temporary fence
- Excavate the trench to 1.2 m deep (using batter bucket 1.2 m)
- Stockpile the spoil 1.2 metres away from trench (used later to backfill)
- “Sand up” the floor with 7 mm gravel to a depth of 200 mm
- Install pipe
- Haunch pipe with more gravel up to a level of 250 mm
- Place 1st layer of backfill material to 150 mm deep on either side of pipe (still see top of pipe)

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- Compact using trench roller or compacting wheel
- Place 2nd layer of backfill material to 250 mm deep
- Compact using a mix of a vibe run on the sides and a static (non-vibe run) over the top of the pipe (to avoid potential damage to pipe from squashing it to a rock piercing it)
- Place 3rd layer of backfill material to 250 mm deep
- Compact material using a full vibe run
- Test the compaction meets state standards and requirements
- Place final layer of road base to 150 mm and compact
- Final trim to finish level of 100 mm
- Remove excess backfill and excess material from worksite
- Clean up

Quality requirements.

- The excavation must be 1.2 m deep, 1.2 m wide and 6 metres long
- Materials must be made up in layers outlined in the plan
- Compaction requirements required for each level
- You need 2 lengths of 500 mm by 3 metres long storm water pipe & fittings
- You need 5 tonne 7 mm aggregate,
- You need 2.5 tonne of road base

Things to remember

- Be careful of underground services & overheads
- Work safely and be careful of hazards
- Think about the type of machine you are using - avoid wheel-spin (or machine slippage) by not making deep cuts.
- Apply safety requirements

IDENTIFY SITE HAZARDS

Hazards need to be identified so that you can decide on hazard control measures.

Risk Management involves:

- Identifying a hazard.
- Assessing the risk level.
- Identifying controls to remove or reduce the risk.
- Implementing the controls.
- Monitoring the hazard to ensure the controls are working.

Job Safety Analysis (JSA) Job Hazard Analysis (JHA)

Some workers argue that Job Safety Analysis (JSA) and Job Hazard Analysis (JHA) are the same thing, some say they are not. However, they are both concerned with hazards, the JHA is used to identify hazards the JSA is used to control those hazards. In the civil construction industry these are commonly referred to as ‘start cards’ or ‘take 5’s’. They are normally handed out during toolbox talks (signed on to) and kept by each individual worker (handed in at the end of the shift) to record hazards as they are encountered during that working day.

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TYPES OF HAZARD

Remember to check:

Up High

- Overhead hazards (e.g. power lines, service pipes, trees, buildings, etc.).
- Weather (e.g. wind, lightning, storms).

Eye Level

- Sufficient lighting.
- Traffic (e.g. pedestrians, other vehicles and plant, site traffic).
- Shape, size or type of load to be worked.

Ground Level

- Terrain / surfaces and edge solidity, recently filled trenches and slopes.
- Load bearing ability (e.g. temporary formwork)
- Trip and fall hazards

Other types of hazard include

- Noise
- Ventilation
- The environment in general
- Poorly maintained or faulty equipment
- Warning signals (lights or audible)
- Restricted access areas
- Structures and other construction hazards such as scaffolds.
- Handling characteristics of the Machine and the load
- Using different techniques for different terrain or materials.
- Hazards from components of the Machine (e.g. hoses under pressure, hydraulic tanks, cooling systems or braking systems).
- Working at heights.
- Hazardous materials.
- Radio interference
- Knowing and following site plans and procedures, including communications and traffic movement
- Underground services

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UNDERGROUND HAZARDS

Before commencing any type of excavation work:-

- Look for underground hazards.
- Dial-before-you-dig (a free National service on the Web to get reports of all underground services in your area – go to http://1100.com.au and register)
- Cable locators
- Maps and Plans
- Call your supervisor
- Call the supply authority

Underground services colour coding that you may see in the day to day operation of your machine are listed on the table below:-

Colour	Underground Assets
Orange	Electricity
Yellow	Gas
Green	Water
White	Communications
Red	Fire Services
Cream	Sewerage
Purple	Reclaimed Water
Silver/Grey	Steam
Brown	Oils, Flammable Liquids
Light Blue	Air
Black	Other Liquids

Always follow the four P's

- Plan
- Pothole
- Protect
- Proceed

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Indications that you may be operating close to underground services would include:-

- Warning tape
- Sand gravel
- Change in fill
- Change in compaction

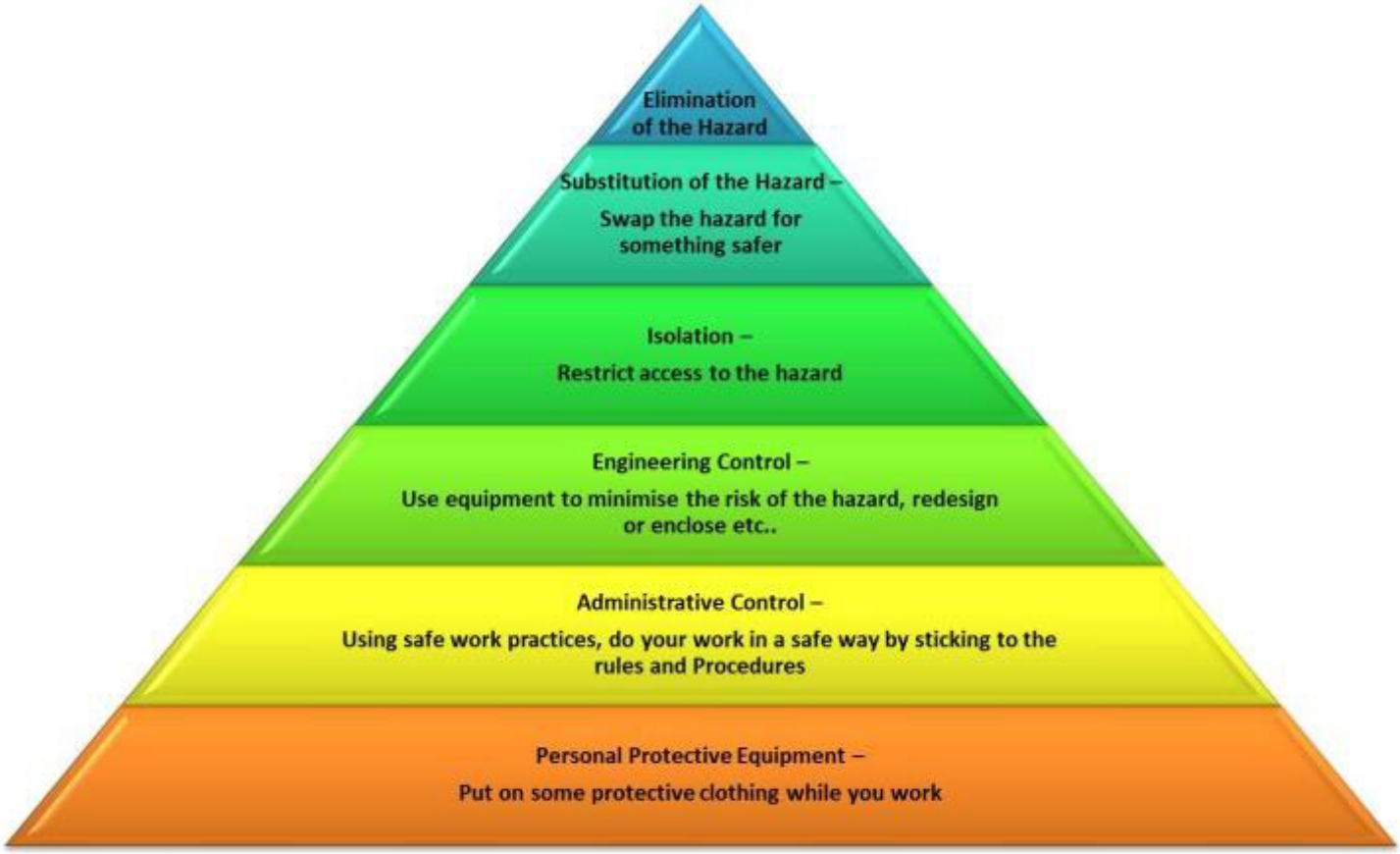
If you come across any of these indications, stop excavating and start digging by hand carefully (seek advice before undertaking).

Always excavate with services in mind, just because you have been told that there aren't any services in that area, does not mean it is true. Stay aware.

If an underground service is damaged, report to the supervisor and the supply authority.

HIERARCHY OF CONTROL

When planning short or long-term strategies the law requires that risks are eliminated otherwise the Hierarchy of Control must be considered when dealing with all hazards.



You might need to use a combination of control measures to lower the effect of the hazard. Whatever the control measure make sure it complies with the appropriate standards (rules and regulations i.e. Acts, Regulations, Australian Standards and Codes of Practice.
Admin control measures and PPE do not control the hazard at the source. They rely on human behaviour and supervision and used on their own tend to be the least effective control measures to minimise risks.

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Safe Work Method Statements (SWMS)

Safe Work Method Statements or SWMS as they are commonly known provide workers with a procedure to follow when undertaking a specific task. These documents can often consist of between 4-30 pages, depending on the task being undertaken and always have underpinning legislative requirements built in to them. There are SWMS for everything, concreting, manual handling, changing attachments on machines, digging trenches, working at height, re-fuelling machines etc.

The task should be performed according to the SWMS unless there is an over-riding reason to change it. Consult with project or supervisory personnel before doing so.

You may have a SWMS of 30 pages for conducting general excavations that has everything in it that you need to consider during a risk assessment such as traffic management, underground services, overheads etc. but if you are in the middle of a field cutting a shed pad for a customer, not all of the SWMS would be relevant.
Workers will come into contact with many similar documents, the terminology of which will change from worksite to worksite, for example Safe Work Procedures (SWP) or Job Safety Environment Analysis (JSEA).

A worker will be required to read and understand a SWMS plus “sign on” to many of these documents before starting the job, i.e. take personal responsibility for assessing the risk and implementing the control measure.

The completion of all these documents will help a PCBU to meet their legal responsibilities in relation to the risk management and chain of responsibility process.

“A SWMS must be prepared in consultation with those people who will be doing the job.”

The Safe Work Method Statement must be available for inspection at any given time. It must also be reviewed each year and amended if necessary.

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Safe work method statement

This SWMS is a site-specific statement that must be prepared before any high-risk construction work is commenced.

Company	Holeshot Earthworks	**Date:**	15.2.15
Person responsible for ensuring compliance with this SWMS:	Chris Slade	**Permit Required YES / NO**	
High-risk job:	Re-fuelling of Machinery	**Location:**	27 Technology Drive Arundel

What are the tasks involved?	**What are the hazards and risks?**	**How will hazards and risks be controlled? (describe the control measures and how they will be used)**	
		List Hierarchy of Control Method 1 - 5	
Moving the machinery out of the designated traffic management flow at irregular times	Unfamiliar traffic flow, possible collisions or confusion	3.	Isolate the machine, barricades & signage
		5.	Re-fuelling done outside of normal working times
Filling the Fuel tank	Spillage	4.	Erect bunding, readily accessible fuel spill kits
		5	Training
Operating the fuel nozzle	Fumes, splashes, contact with skin and clothing,	6.	PPE – Goggles, fuel resistant gloves, overalls or aprons, face masks
Re-fuelling of various pieces of plant	Unfamiliarity with machines	5.	Training
	Isolated area, used infrequently	6	Ensure area is regularly maintained.

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Safety data sheets

You will find further information that may be relevant to the work at hand by checking Materials Safety Data Sheets (SDS) and Materials Handling methods.

These will detail:

- Any special handling required.
- Any specific procedures to follow.
- Risk controls.
- Emergency procedures.

For hazardous material containers there is usually a placard or label attached giving category of material, and codes for handling issues and a contact number for expert advice. Work plans and site-specific documentation may include all or some of the above information, but normally you will find this in the project and work instructions.

SELECT EQUIPMENT AND TOOLS

The requirements for the work will decide the correct plant, equipment and tools for the job. Make sure you know the capabilities of the plant and equipment available so you can choose the correct equipment. The manufacturer's manuals can be of assistance and organisational documents can contain information about what equipment is available for use.

Equipment may include:

- The right type and size of earthmoving machine for completing the task
- The correct rate attachment
- Other large pieces of equipment such as jackhammers, air compressors, electric generators, hydraulic jacks
- Hand tools – these may be normal tools such as screwdrivers and hammers or may be specific to the job such as shovels, picks, hammers, hydraulic jacks and pinch/lever bars.
- Hazard identification tools – this may include equipment for testing ground compaction to ensure your Machine will not collapse the surface.
- Maintenance tools and equipment for the Machine.
- Shovels or other implements for clearing material from the bucket, arms or wheels.
- Personal Protective Equipment (PPE) for hazardous sites and work.

Ensure you check and test (where applicable) all equipment to ensure it is functional and safe to use.

Record and report any equipment which is defective or fails to meet standards.

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DIESEL ENGINES

Most diesel engines must warm up before they can start. When the ignition key is turned on, the glow plug is activated. This warms up the motor so that it will fire. There is a delay of several seconds from ignition until the engine is turned on by the starter motor. A light on the dashboard indicates that the engine is warming. It goes out when the motor is ready to fire.

Try to avoid allowing a diesel engine to run out of fuel. Diesel engines fire on compressed vaporised fuel and will not fire if there is air in fuel lines. If a diesel engine runs out of fuel, a competent person must bleed the system of air before it can be restarted.

Diesel engines also emit carbon monoxide gas. A badly tuned diesel engine can emit more carbon monoxide than a petrol motor. Remember that carbon monoxide is odourless, will build up and can kill. If working in an enclosed space this can be a quick as 20 minutes.

When working with a machine in an enclosed space, steps must be taken to ensure there is adequate ventilation. In some situations exhaust control units must be fitted and maintained. For example, a catalytic convertor / spark arrest or scrubber unit.

If you are checking your engine oil and you observe bubbles or milky oil, this could indicate water ingress into the oil system. Various causes could include blown head gasket, cracked in coolant water jacket and oil cooler problem. The machine would need to be tagged out of service and repairs organized.

PRE-CHECKS

Pre-checks should be done daily and records kept. Electrical versions (phone apps) are becoming popular to fulfil these requirements. Many companies are not aware that regular documented inspections must be made of their earthmoving machines and they are fined for it.

A checklist should be kept either on the machine itself or in a designated area. In large companies with lots of machines, operators should perform the checks before starting a shift. It should be made clear within the company who is responsible for conducting the checks and what is involved. Report any defects to the supervisor / employer.

Some of the benefits of having regular checks performed on each machine include:

- Protects your own safety
- Easy to find faults and repair them whilst still minor
- More reliable machines and less chance of down time due to breaking down
- Easier to identify bad operators and staff causing damage
- Protection against insurance problems, WHSQ fines and accidents

List of Checks include:-

- **Pre-start check**
  Fluids, oils, re-fuel, tracks (or tyres), overall machine, horn mirrors, attachments
- **Post start check**
  Checks done after the machine has been started, controls, functions and warning devices, lubricate the rams
- **Post checks**
  Checks done after using the machine, fluids, re-fuelling, general condition etc.

Machinery checks will be covered off in detail when dealing with specifics of each machine.

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RECORD AND REPORT FAULTS

Any faults found on the machine should be identified.

The machine isolated – key taken out
Danger Tag or out of service tag placed on machine (in accordance with site procedures)
Report to supervisor

In industry this is often referred to as KTR - Key, Tag, Report.

Danger Tags

Tags must be kept on machine or in close proximity i.e. lock out stations (not in employer's car!).

Whoever fits the danger tag is supposed to remove it (this might mean the swapping of tags at the end of shift).

Any faults or damage, divergence from optimum performance, or failure of systems or items must be recorded and reported to the appropriate personnel.

This may be a maintenance section, a site supervisor or a project leader. It is a requirement that anything short of optimum must be reported to ensure the maximum safety for all work site personnel.

Make sure you know the recording and reporting procedures that apply in your organisation or work site – the life you save may be yours.

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ROPS AND FOPS

Roll Over Protective Structure (ROPS)

The protective structure designed to protect the operator if the Machine rolls over.

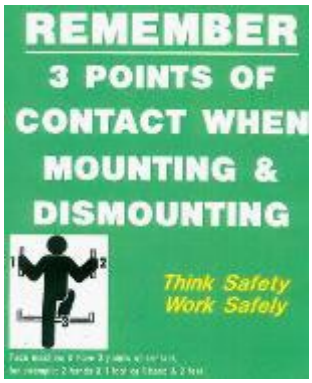
Falling Object Protective Structure (FOPS)

The Falling Object Protective Structure is designed to protect the operator from material falling from overhead. A FOPS system must be fitted in the machine is to be used in a demolition or land clearance

ROLLOVER EMERGENCY EXIT

In the event of a rollover kick out or break any available window.

GETTING ON AND OFF THE MACHINERY



SEATBELTS

All seatbelts must be worn if fitted.

If you are required to carry a passenger on your machine, the level of protection needs to be equal to that of the operator i.e. an approved seat and an approved seatbelt, plus ROPS / FOPS.

SQUASHING AND CRUSHING INJURIES

Operators should keep all body parts within the confines of the machine whilst operating to prevent crushing injuries.

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SAFE OPERATING PROCEDURES (SOP)

Once risks have been assessed the control measures need to be implemented. Some of these will require the organisation or site supervisor to implement, e.g. traffic signs or fencing of critical areas, but others will involve you knowing how to operate the Machine in a manner to counter or reduce the risk.

As the operator, it is your responsibility to ensure the work is carried out according to work procedures and following work instructions. You must balance this with the safety requirements and the limitations of the Machine you are using.

You should check your progress regularly to ensure you are meeting work requirements and keeping to the required schedule. If anything is preventing this, you should communicate the issues to the site supervisor or other appropriate personnel (e.g. OHS representative).

ZONE OF INFLUENCE

It is important that materials are not placed or stacked near the edge of any excavation as any material will add a load to the area where it is placed and this would put persons working in the excavation at risk. For example, the placement of material near the edge of an excavation, together with the weight of the machine may cause a collapse of the side of the excavation.

Machinery, vehicles and storage of materials (including excavated material) or any other heavy loads should not be located in the ‘zone of influence’ of an excavation. Excavated or loose material should be stored away from the excavation.

Alternatively, a geotechnical engineer may design and install a ground support system to carry the additional loads including any ground water pressures, saturated soil conditions and saturated materials.

Excavation failures are particularly dangerous because they may occur quickly, limiting the ability of workers (and in some cases others in the vicinity) to escape especially if the collapse is extensive

The zone of influence will depend on the ground conditions. It is the zone in which there may be an influence on the excavation including possible ground collapse.

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EXCLUSION ZONES AND BLIND SPOTS

Exclusion Zones

Whenever you are operating machinery, other workers should be outside of the swept area of the machine, unless they are suitably trained and authorised to be there. List of such workers could include:-

- Spotter
- Dogger
- Traffic controller
- Other work crew associated with the activity
- Grade checker/surveyor
- Site supervisor/manager

Controls for entering and exiting exclusion zones could include:

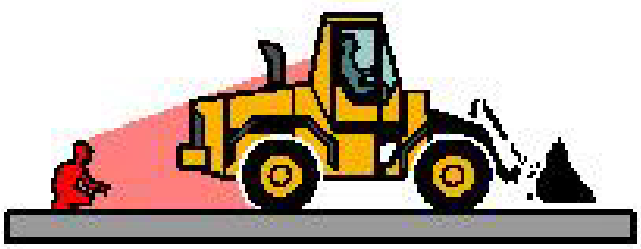
- Positive communication
- the use of spotters,
- pedestrian workers gaining the attention of the plant operator before entering the exclusion zone
- 2 way radio communication
- Proximity sensors
- information delivered as part of prestart tool box meeting
- Operator should be able to display knowledge of other work activities in the immediate area.
- listed procedure in the Site Safety Plan

For workers that are required to work inside the exclusion zone, could they perform their work in another way that would eliminate the risk? Any workers that are not required to be in the exclusion zone should be directed to leave the area.

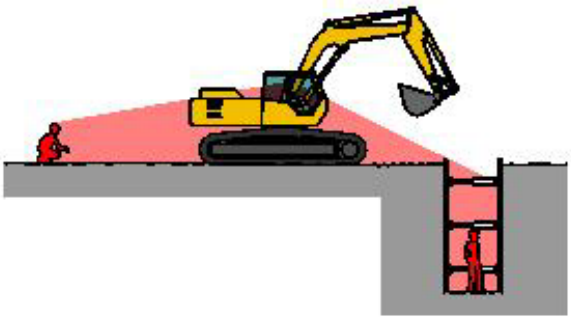
Exclusion zones are often site specific and can be different for different tasks i.e. separate set of rules for electrical work.

Blind Spots

Be aware of blind spots – use warning devices.



Blind Spot for a Front End Loader



Blind Spot for an Excavator

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GENERAL OPERATING TECHNIQUES

(Whilst photos featured in this section are for a skid steer loader, principles are the same for other earthmoving machinery).

- Earthmoving Machinery is relatively easy to tip over due conditions they are operated in and the terrain. This is common with skid steers due to their short wheel base.
- Ensure that the machine you are using is suitable for the ground conditions and that the bucket / attachment is suitable to the task.
- Always use the correct method of loading for the type of bucket.
- Don't overload the bucket – ensure you calculate the capacity of the bucket and assess the material to be loaded.
- Always travel with the bucket as low as possible and tilted back for greater stability and vision and less spillage.
- Position the bucket at the correct level and angle for excavating, loading, transporting and dumping.
- Maintain safe driving speeds for the conditions and terrain.
- Ensure constant monitoring of the load.
- Keep clear of holes or soft ground areas.

- Be careful when driving along the high side of a trench, as it could cave in.
- Never allow people to travel or be raised in the bucket of the machine.
- Ground workers should be trained not to approach machine until the operator has agreed to their request to approach and vice versa.
- You must continually monitor for emerging hazards and risks, to keep yourself and everyone around you safe.
- Always travel with the bucket as low as possible.
- Follow all road rules and vehicle movement plans at all times.
- Plant should not be left running unattended (no-one in the seat) for any reason, hydraulics are not fail safe and should not be trusted. If you need to get off to move a rock, move a barricade etc, investigate for underground services, turn the key off. In the event of an incident WHS Inspectors would prosecute for an unsafe practice.
- Turbo timers are to protect the turbo, not so you can leave early.

Travelling on sloping surfaces

- Always travel directly up or down a slope.
- Never attempt to go across the slope, because the machine may overturn.
- If you have to travel up or down a steep slope, select the lowest gear possible before you move to maintain optimum control and stability.

Reversing / Travelling

Always look in the direction of travel, don't rely on rear view mirrors. A reverse beeper or travel alarm must sound before any movement. If beeper not fitted sound the horn. In some situations spotters may be required.

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CIVIL CONSTRUCTION TECHNIQUES

(Whilst photos featured in this section are for a skid steer, principles are the same for other earthmoving machinery).

STRIPPING MATERIALS

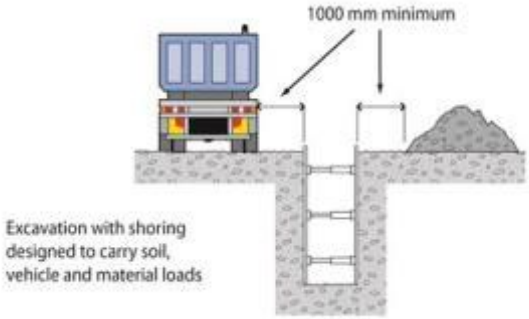
Clearing trees and scrub (often called “grubbing), stripping grass and removing topsoil. This is often done with a dozer.

CUT AND FILL

“Cut and fill” is the process of cutting excess amounts of material from ground that is “too high” and using it to fill ground that is “too low”, to get to a level where the job can be taken to the next stage, thereby minimizing the amount of labour, as material does not need to be taken off site. This is known as earthworks.

STOCKPILING

Stockpiling is the process of working with “cut and fill”, the material is stockpiled whilst pipes, drains etc. are installed, this stockpile disappears as the earth is replaced around the work and the ground is re-contoured.



A stockpile should be a minimum of 1 m from an excavation. Add on a metre of width for every metre of depth. The stockpile should be maintained and a level working surface should be kept in the immediate vicinity of the stockpile.

TRENCHING

Trenching is an important skill to have as a machinery operator. Trenches are dug to install infrastructure such as water pipes, drains, utilities etc. Trenches are also dug to locate previously installed infrastructure in the general area, but whose exact location has been lost as proper plans or drawings may not be available. Trenches over 1.5 metres must be benched, battered or shored to be made safe for entry for the worker in case of collapse or cave in. Trenches over 2 m deep, must be fenced to prevent unauthorised access (a person falling in).

BOXING OUT

Boxing out is the term given to an excavation between two given points to a specified width and depth. It is used to prepare footpaths, kerbs, roads and drainage channels.

The ground is excavated down to the **fill** level (normally 500 - 600 mm however this could be a lot deeper if that fill level is not stable enough to be constructed upon). From here the fill level is built back up to the **finish** level with layers of fill, gravel, sealing products, asphalt or concrete.

BULK EXCAVATION

Done with bigger machines, often need to organise tip trucks to remove the material from site. Can involve the use of spotters, two way radios, traffic control.

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DISCHARGING

After materials are excavated and transported to the designated location, the material is needs to be discharged (dumped). When discharging a load:

- Dump materials at least 1 metre from excavations to prevent accidental cave in etc.
- Rule of thumb is allow 1 metre from excavation for every metre deep
- Follow site procedures for load placements.
- Place loads to ensure stability and avoid causing hazards.
- Constantly keep sight of the load that you are discharging.
- Keep a safe operating grade when placing a load.
-

DUMPING LOW (less dust)

When transferring material for re-use dump low to the ground for stability and accuracy and less dust

DUMPING HIGH (more dust)

Used for maintaining stock piles, loading trucks and blending of materials. Caution should be taken as the stability of the machine can be affected. Also creates more dust, unless conditioning material with water.

BACKFILING

Refilling an excavated hole or trench with the material dug out from it. The volume that comes out will always be higher than the volume that is placed back in the excavation as the material becomes “looser”.

TRACK ROLLING

Backfilling is often followed by track-rolling to compact the material. Industry standard is generally 3 passes x half a track width apart.

MIXING MATERIALS

Excavators often used to do this as they have a large bucket and are able to move large amounts of materials quickly. Water is the main material added during any mixing, this is known in the industry as “conditioning” - getting the material ready to work with.

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SPREADING

Spreading is often done with a skid steer. Common materials include gravel, mulch and top soil.

Materials are dumped in small piles (normally the width of the blade wide) 1-2 metres apart in lines. The skid steer then runs through the material going forwards it making it one of the most efficient way to spread materials. Alternatively, a spreader bar can also be used

When bucket is flat and the machine is operating in reverse, this is known as “putting a shine on it”

“Back blading” this is the process of using the edge of the cutting blade for smoothing over an area. Skid steer operates in reverse, operator lifts bucket up before driving forward and lowers again when reversing. This process is known as “back blading”.

LEVELLING

As it sounds, the levelling out or stabilising of uneven ground. Often happens after spreading material. Levelling is part of the final trim process (usually done with a grader).

When levelling, work to the designated grades in the required manner. This will include the type of levelling, the grade and slope, and the fall (for water to shed off).

When levelling, the work must be checked against site reference points such as pegs, benchmark points or other defined levels. After levelling often comes compaction with a vibrating roller (non-vibrating also known as a static roll for final trim).

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GPS Systems

In many cases GPS and laser control systems are now used to improve efficiency, minimise emissions and provide a more accurate and better finish to the work. This eliminates the need to have a person standing close by ready to take levels (although this may still need to occur with some works).

LOADING VEHICLES

- Stop operating
- “Spot” approaching truck via contact on the 2 way or hand signals with the driver and stop them at a safe distance from the machine. You need to control the situation.
- Approach an awaiting truck slowly and in the correct manner.
- If possible always place the tipper on the cabin side of the excavator
- If driver has not remained in the cab of truck, don’t proceed with loading unless he is in clear view of you at a safe distance away.
- Always load on firm level ground to stop the chance of a rollover or collision with other plant
- Never slew a load over the cabin of the truck as the bucket could hit the cabin or load could drop onto the cabin
- Avoid contact with the haulage vehicle by leaving enough room to raise the bucket.
- Make sure anyone in the area is at a safe distance from loading operations and that they remain within your view
- Place a layer of soil in the truck to take the impact of large rocks.

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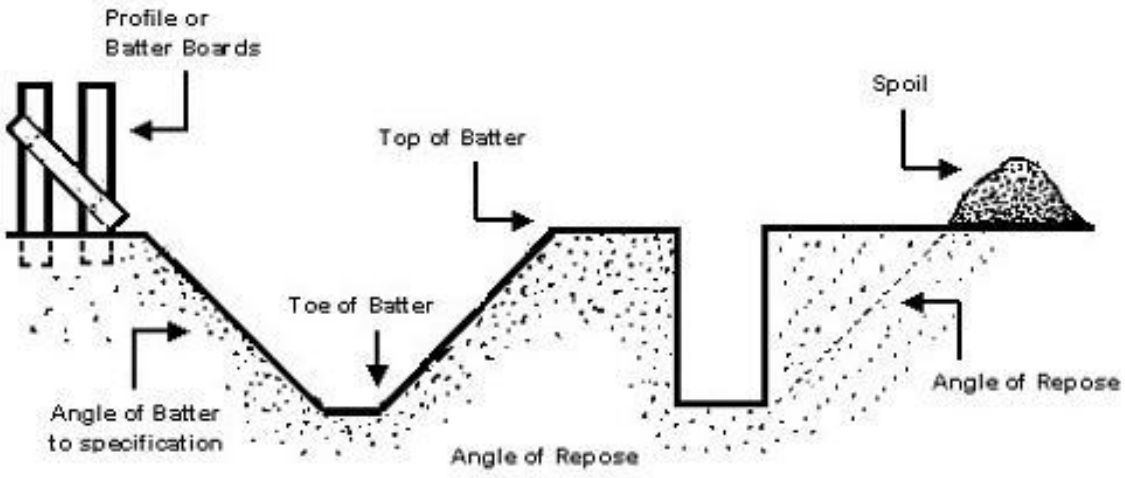
BENCHING, SHORING AND BATTERING

Benching, shoring and battering are methods used to stop the caving of excavations / trenches. Trenches over 1.5 metres deep or excavated in unstable or uncompacted ground, must be made safe by the use of benching, shoring or battering where personnel would need to enter the trench. Any trench over 2 metres needs to be fenced off to prevent unauthorised access (people falling in).

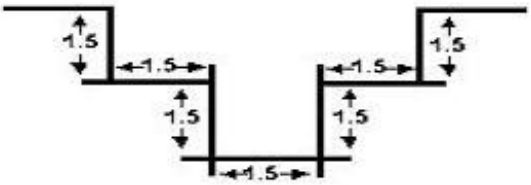
BATTER

Batter angles should not exceed 45 degrees unless otherwise engineered.



BENCHING

Benches are steps that are dug into the materials to allow safe working on slopes. Benching cannot exceed increments of 1.5 metres. Be aware some industries will use smaller dimensions.



SHORING BOX

Shoring is a positive ground support system that can be used when the location or depth of an excavation makes battering and/or benching impracticable When shoring boxes are installed, workers must work within the confines of the box and must exit before boxes are moved. Shoring boxes must be used whenever someone is entering a trench more than 1.5m deep. A ladder must be provided for entry / exit but they cannot be used to work from.

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SURVEY PEGS

On nearly all civil construction sites, the work to be done is marked out with survey pegs.

Design engineers layout the details of their plans onto the pegs and operators have to be able to understand these and follow the instructions on the pegs in order to deliver a task to the specification required.

Underground services, or new services to be installed would also be marked out on pegs.

Pegs are still very common as they are very cheap compared to the expensive pogo sticks or rover GPS units. The downside of using pegs is that they often go missing, or they get bumped.

If a peg is missing a design engineer will need to replace it.

The finish level will always be marked on a peg. The O/S marks the offset from the peg that you must commence your excavation. Other things you might read on a peg include, TOK (top of kerb) or TBM (temporary benchmark). The tolerances an operator has to work to will be specified in the job plan.

Before commencing operation, an operator will take a measure off the survey peg with his bucket to get a feel for the levels he is working to. From time to time, he will slew back around to check the levels are still correct.

At some point during the job, the engineers will check and take proper measurements with calibrated instruments to ensure the operator is working within the required tolerance.

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ESTABLISH THE WEIGHT OF THE LOAD

You need to be able to calculate the weight of any load before you try to lift it.

This may be done with some loads by checking:

- Weight markings on the load.
- Delivery dockets or information documents.
- Any weighbridge documents available.
- Calculating the weight of the material.

If you are unsure of the weight, do not attempt to lift it. Ask a supervisor, check with colleagues or, if possible, use smaller loads that you are sure the Machine will lift within its safe load limits.

Some materials may have a weight-per-volume measurement, or you may find it by looking it up. You can apply this to your Machine by calculating the volume of the bucket in use.

BUCKET VOLUMES

Read the operator's manual or the data plates to find out the capacity of the bucket or use the following as a rough guide to calculate.

Length x Height x Width ÷ 2. With this volume you can estimate the amount of material that will stay within the safe working load limits for your Machine.

Material	Weight in Kilograms (kg) per cubic metre
Blue metal	2,000
Clay	1,900
Concrete	2,400
Copper	10,000
Earth	1,900
Gravels	2,400
Shale	2,600
Steel	7,300
Water	1,000
Lead	12,000
Sands:	
Dry beach sand	2,000
Wet beach sand	2,300
Dry river sand	1,300
Wet river sand	1,500
Shale	2,600
Steel	7,300
Water	1,000

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SAFE WORKING LOADS

All Machines will have a rating that specifies the safe working load limit (SWL) for the machine. This is found on a plate on the Machine called the Load Plate Specification. You could also refer to the Operator's Manual. You need to know and understand the operational limits of the equipment you are using to ensure you do not damage equipment or create unnecessary hazards by incorrectly using the machine or attachments.

Failure to operate within that limit can cause damage to the machine, severely affect stability and could potentially cause and accident or injury. You may also be liable under law for any damage or injury caused by exceeding the load limits.

Note that the terrain and slope, along with the type of load, may affect the load limits. Therefore an operator should also make sure that he / she is aware of site requirements. Refer to relevant codes of practice

USING ATTACHMENTS ON THE MACHINE

Machines can be very versatile. There are a wide variety of attachments that can extend their use across a wide variety of tasks. Attachments should be used for the purpose they have been designed for. Each item will have procedures for use, including cleaning and storage requirements. All these requirements can be found in the Operator's Manual or attachment instructions documentation before commencing work. Employers should provide training and equipment familiarisation.

If such procedures are not discussed, ask questions, find out by chasing down manuals or talking to more expert operators to ensure you have a full understanding of the uses and limits of your equipment.

Ensure also that you know and apply any required risk controls to ensure you remain safe with the tasks being performed and that you do not create extra risk through your actions.

Attachments may include:

- General purpose bucket
- 4:1 bucket – can be used to scoop, doze, scrape and pick up.

1. Scooping

2. Dozing

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3. Scraping

4. Picking up

- Auger – for hole drilling
- Hammer
- Ripper
- Grab
- Clam shell
- Fork tynes
- Dozer blade – can be used for leveling surfaces as well as cleaning rubble/waste.
- Chain digger – used for trenches.
- Power broom.
- Profiler – to ensure surfaces match specific profiles.
- Rotary hoe – for tilling ground.
- Pavement milling devices – for removal of concrete or other surfaces in preparation for resurfacing.
- The list goes on …

Attachments are designed for specific uses so be sure to use the correct attachment for the job. Make sure you treat them as any other equipment, with inspection for faults, recording and reporting of issues with them, proper maintenance and correct storage accord to manufacturer's instruction.

If you are using an attachment for the first time, you should read the Operator's Manual to familiarise yourself with the technical information and you should be given training by your employer.

FITTING AND REMOVING ATTACHMENTS

Each attachment will have its own requirements as to its limits, how it is fitted and on the Machine. For each attachment you need to read and understand the operator's manual or manufacturer's equipment guides. You also need to consider what the site requirements are.

Make sure you use all appropriate safety precautions (such as releasing hydraulic pressures where needed) before detaching or attaching equipment to the Machine.

Generally, to fit an attachment:

- Collect any required tools or equipment.
- Make sure the Machine is safely parked and located correctly for attaching the equipment.
- Ensure manual handling procedures are correctly followed – attachments can be heavy and/or awkward to manipulate.
- Connect the attachment using the manufacturer's guides and ensuring all connectors are correctly connected.

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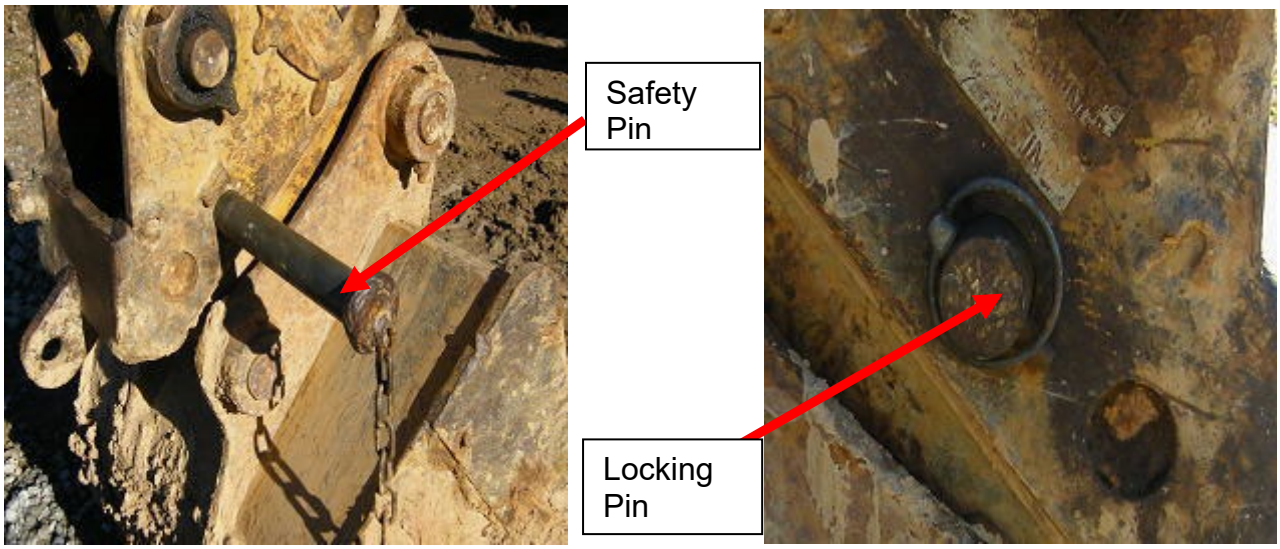
ATTACHMENT SECURITY

Always ensure all locking pins, keepers etc. are fully engaged and secure.
Just because the handles are down, don't assume the attachment is secure, always check the pins.
If the lock pins (keepers) are not in place there is a good chance the attachment will fall off.



2 and 3 way tilt hitches are more common, safer and easier for the operator.

Generally, to remove an attachment:

- Refer to manual
- Collect any required tools or equipment.
- Ensure Machine is safely parked and removal of attachment will not cause a hazard.
- Ensure manual handling procedures are correctly followed – attachments can be heavy and/or awkward to manipulate.
- Ensure any pressure couplings have the pressure released before detaching.
- Disconnect connectors in correct order and using recommended safety procedures.

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TESTING ATTACHMENTS

Before attempting to use the Machine with an attachment, ensure it:

- Is correctly fitted.
- Is securely connected.
- Functions correctly.
- Follows site procedures.
- Is safe to use.

Once you are sure of these things, test the use of the attachment in a safe area. Make sure you are not in the middle of other activities and that your area is clear of hazards, including other machinery and people.

CLEANING AND STORING ATTACHMENTS

Once the attachment has been removed it should be cleaned, inspected for wear or damage and maintained according to manufacturers or organisational requirements. It should be stored in a safe and designated storage area or placed back on the truck.

Most items will have specified storage areas and requirements so ensure you know where and what these are before you detach heavy attachments. This will allow you to offload the attachment where it is meant to be and minimise heavy lifting or handling.

Be aware of and allow for hazards with attachments. Some parts may be hot or have corrosive coatings – be sure you use appropriate risk control measures such as correct PPE. Some parts may also be sharp or heavy – make sure you know and apply correct handling of them.

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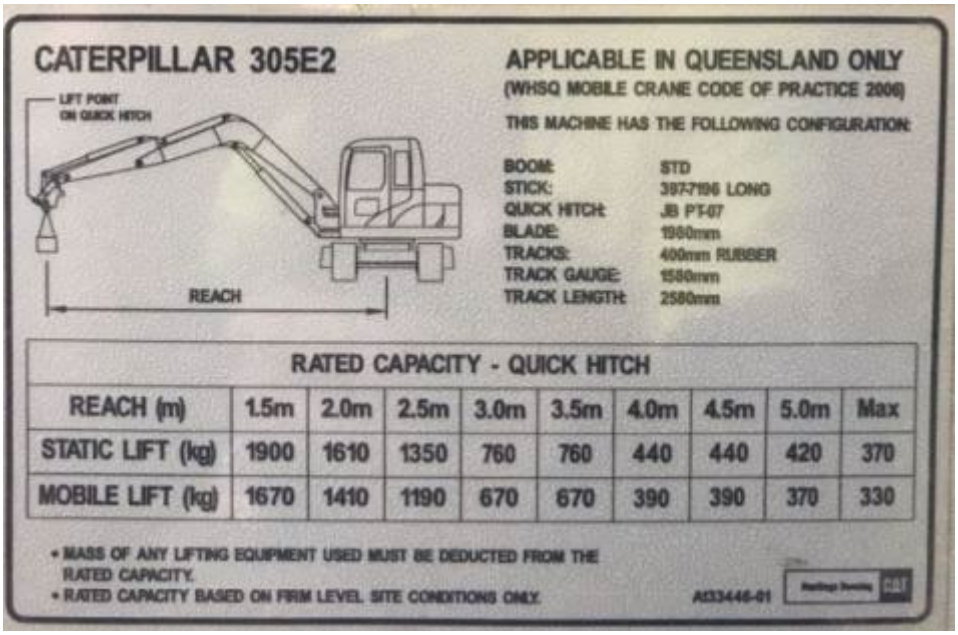
USING A MACHINE IN CRANE MODE

A person can operate a piece of earthmoving machinery in crane mode if they are deemed competent by the PCBU (employer) and the Manufacturer (s) permit this in their technical specifications for the machine.

LOAD CHART



CATERPILLAR 305E2

APPLICABLE IN QUEENSLAND ONLY
(WHSQ MOBILE CRANE CODE OF PRACTICE 2006)

THIS MACHINE HAS THE FOLLOWING CONFIGURATION:

LIFT POINT ON QUICK HITCH

REACH

BOOM:	STD
STICK:	3977196 LONG
QUICK HITCH:	JB PT-07
BLADE:	1980mm
TRACKS:	400mm RUBBER
TRACK GAUGE:	1580mm
TRACK LENGTH:	2580mm

RATED CAPACITY - QUICK HITCH

REACH (m)	1.5m	2.0m	2.5m	3.0m	3.5m	4.0m	4.5m	5.0m	Max
STATIC LIFT (kg)	1900	1610	1350	760	760	440	440	420	370
MOBILE LIFT (kg)	1670	1410	1190	670	670	390	390	370	330

- MASS OF ANY LIFTING EQUIPMENT USED MUST BE DEDUCTED FROM THE RATED CAPACITY.
- RATED CAPACITY BASED ON FIRM LEVEL SITE CONDITIONS ONLY.

A53446-01

The operator of the earthmoving machinery can lift a load under the limited circumstances listed below:

- The load to be lifted must be within the safe working load limit (SWL) of the machine (see load chart above)
- the weight of the load to be lifted is predetermined by a competent person (for example, may be marked on the load)
- selection of the sling and slinging techniques for the load is predetermined by a competent person
- condition of lifting gear is predetermined by a competent person
- lifting points are predetermined by a competent person and marked on the load
- load is lifted within the view of the operator at all times; and
- standard lifting procedures have been documented and signed-off by a competent person.

In all other circumstances, i.e. when a second person is needed to attach the load to a machine,and calculations and angle factors etc come into play, a holder of a high risk work dogging (DG) licence must be used to sling all loads.

Burst Protection (crane valves) must be fitted to a machine for lifting any load over 1 tonne.

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SLINGS, WIRES, CHAINS AND SHACKLES

Slings, wires, chains and shackles are used when using jibs and other Machine attachments. There are generally three types of slings:

- synthetic;
- steel core rope
- chain

Synthetic Slings

If a synthetic sling is frayed, worn or split it must be discarded, because the sling could fail during a lifting operation.

ROUND & FLAT WEBBING SLINGS

The table gives a clear answer. Remember the maximum W.L.L. depends on the angle

Round & Flat Slings						
LOADING FACTOR	L = 1.0	L = 0.8	L = 2.0	L = 1.73	L = 1.41	L = 1.0
LIFTING MODE	VERTICAL	CHOKE	BASKET	60°	90°	120°
SLING COLOUR	W.L.L.	W.L.L.	W.L.L.	W.L.L.	W.L.L.	W.L.L.
	TONNE	TONNE	TONNE	TONNE	TONNE	TONNE
VIOLET	1	0.8	2	1.7	1.4	1
GREEN	2	1.6	4	3.4	2.8	2
YELLOW	3	2.4	6	5.1	4.2	3
GREY	4	3.2	8	6.9	5.6	4
RED	5	4.0	10	8.6	7.0	5
BROWN	6	4.8	12	10.3	8.4	6
BLUE	8	6.4	16	13.8	11.2	8
ORANGE	10	8.0	20	17.3	14.1	10

- Easy to use
- Read the tags (can be for 1 lift only)
- Can be colour coded or can count the stitch pattern
- Amortisation date
- Inspect before every use (tested according to industry / manufacturers recommendations)
- Don’t take chances
- If in doubt do not use it

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Steel Core Rope (wires)

Things to look for when checking Steel Core Rope

- wire is not stretched or affected by heat, rust or acid attack;
- that the eye splicing is not damaged
- that the tags are not missing
- that the tags are legible
- whether more than 10% of the wires are broken within a length that is 8 times the diameter of
- the wire rope
- whether there is any bird caging of the wire
- Not user friendly – gloves must be worn

If you are going to use a chain sling, you need to make sure that its safe working load is appropriate. You will be able to determine this by referring to the metal tag attached to the end link of the chain.

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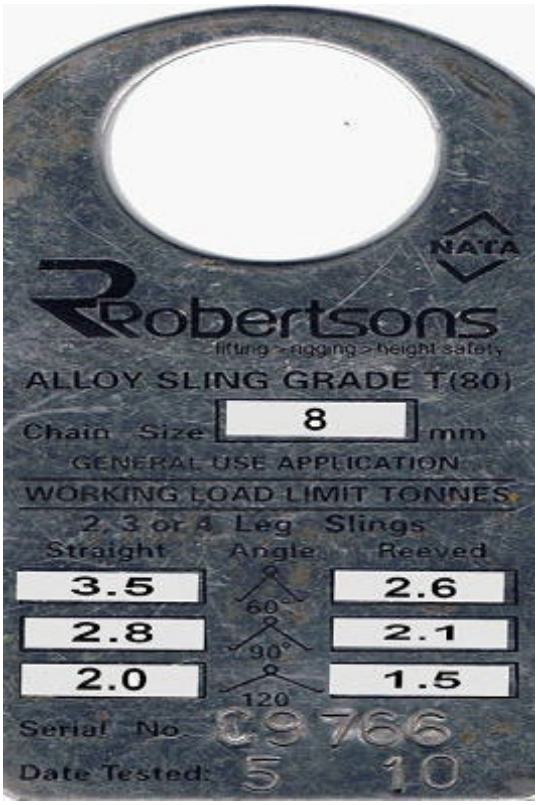
Multi Legged Chains

- Inspect for damage before every use
- Check WLL / SWL on chain
- For double or multi legged chain slings the WLL / SWL can be obtained by either the tag or by calculations using the approved formula (can vary on the angles used)
- Check test dates / certificates for compliance
- Do not use unrated / not tagged chains

SWL Chain Tag

Chains and slings must share a common SWL tag



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Shackles

Bow Shackle

Dee Shackle

- When using shackles make sure pin is secure – with lockwire or split pin
- 10% max wear is allowed, anymore and the shackle should be replaced

INSPECTION OF EQUIPMENT

As with all work equipment, any equipment being used for lifting should be inspected and any faults or damage should be recorded and reported appropriately.

When inspecting lifting equipment you should check for the following issues:

- Kinking.
- Rust.
- Stretching.
- Cuts or gouges.
- Corrosion.
- Discolouration such as heat markings.

CHANGING THE ANGLE OF SLINGS

Generally this will decrease the load limit for the particular sling – a rule of thumb is the wider the angle of the two sides of the sling, the less capacity. You should take the time to study what differences the various types of sling will have on the Safe Working Load limits.

The types of sling are:

- Single sling.
- Basket hitch.
- Endless sling or grommet sling.
- Multiple slings.

Each type has a different level of effect on the load the sling can lift.

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Single sling

Direct load

Load factor
= 1

Rectangular load

Load factor
= 0.5

Round load

Load factor
= 0.75

Basket hitch

Round load

Load factor
= 2

Rectangular load

Load factor
= 1

Round load

30°	1.93
60°	1.73
90°	1.41
120°	1.00

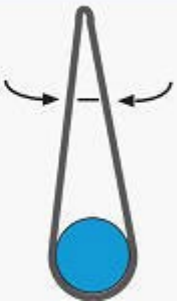
Rectangular load

30°	0.97
60°	0.87
90°	0.70
120°	0.50

Endless sling or grommet

Basket hitch round load

45°	1.38
60°	1.30
90°	1.06
120°	0.75



Multiple slings

Direct load

Load factor
= 2

Direct load

30°	1.93
60°	1.73
90°	1.41
120°	1.00

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CONNECT LIFTING EQUIPMENT

The type of lifting equipment you use will be determined by the task. There may also be limitations in what type of equipment is available.

Before you do any lifts, you need to check the SWL on the machine you are using, to ensure that the machine is actually capable of making the lift.

Make sure the chains / slings you use are suited to the task and are capable of the maximum lift.

If not, break the load into smaller lifts, or if needed, get different equipment or even a different machine capable of performing the work. Never attach slings to the bucket teeth to lift things. Bucket teeth are subject to a lot of fatigue and can easily snap off, they are not rated or approved.

POSITION THE MACHINE

Before lifting procedures take place, you must ensure you position the Machine correctly so as to ensure stability and allow for effective lifting operations.

Positioning the Machine appropriately means making sure:

- You are located correctly in relation to the load.
- You have accounted for the stability issues both before and after you have the load
- If the machine you are using has a blade, this should always face towards the load to be lifted for stability.
- You can see the entire work area you are working in.
- You have room to manoeuvre the Machine.
- You know the traffic plan and have clear area to work.
- All other personnel are away from the area.

Make sure the lifting equipment is:

- Connected properly.
- Rated for the maximum lift you will be doing.
- Positioned correctly for the lift.
- Conduct a post-connection check to ensure that the equipment is attached correctly
- If applicable, the slings are properly positioned to balance the load
- Supplemented with a tag line if the load is likely to swing (16 mm in diameter).
- The load is moved using appropriate communication so others know where you are and where you are going.
- The move is monitored – if necessary you may have to have a spotter to warn of the load shifting, hazards or personnel encroaching in the working space
- Ensure that if lowering objects such as pipes into trenches workers are standing well clear.
- The load is deposited safely and is stable before you remove any attachments or slings.
- The load is lifted, moved and deposited according to work instructions and safety procedures.
- Refer to relevant code of practice.

Wherever possible use a machine more suitable for the job, such as a crane and a dogman.

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COMMUNICATION

It is very important to have clear communication between you and other personnel involved when planning movements, transporting materials, and lifting and placing materials and loads.

You may need to communicate with:

- Project Managers
- Foremen
- Supervisors
- Leading Hands
- Team leaders.
- Plant operators.
- Labourers
- Contractors
- Site safety personnel.
- Management or Administration.

TYPES OF COMMUNICATION

Common operational communication practices and equipment may include:

- Two-way radio – popular because broadcasting to everyone on the UHF channel at the same time, (live comms) & cheaper than phones.
- Hand signals.
- Mobile phone.
- Voice warnings.
- Site-specific instructions.
- Written instructions.
- Instructions related to job/task

There may also be on-site meeting processes, which may include:

- Toolbox Meetings
- Safety Briefings
- Training Sessions
- Notification/scheduling (time, place, purpose).
- Task discussions.
- Local coordination of procedural and operational issues.
- Fault reporting.
- Solution finding.
- Negotiations on solutions for operational issues

“POS Coms” (positive communication) is common place on a worksite i.e. the process of telling someone what you are actually about to do and waiting for a response that the message has been understood and acknowledged, rather than assuming they know, particularly in regard to the movement of the machines around site .

The need for effective communication on a civil construction site is paramount. The ability of every worker to listen and act on instructions to keep himself and others around him safe and keep the costs of the overall job from spiraling out of control due to double handling of work or wasted materials, could be the difference between bringing a job in on budget or not.

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HAND AND AUDIBLE SIGNALS

When shifting a load you may need to make use of hand and audible signals. Some common hand signals used on construction sites in Australia include:

BOOM UP		**BOOM DOWN**	
SLEW RIGHT		**SLEW LEFT**	
DIPPER OUT		**DIPPER IN**	
TRAVEL AND TRAVERSE		**STOP**	

Whistles, bells or other devices may also be used as audible signals to assist with movement of loads. Hand and audible signals are designed to make the lifting and placement of objects safer and more effective.

Each site should have a list or chart of the hand and audible signals that are commonly used on the site. If you are unsure of the signals that are used on your site, speak with your supervisor or other team members.

The most important aspect of hand and audible signals is that both the spotter and the operator FULLY understand what is meant by each signal. There must be full understanding by each party. This is best achieved by discussions between both parties prior to the commencement of the job.

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WHISTLE, BELL OR BUZZER SIGNALS

Motion	Whistle, bell or buzzer signal	Motion	Whistle, bell or buzzer signal
BOOM UP	**3 Short** **...**	**BOOM DOWN**	**4 Short** **....**
SLEW RIGHT	**1 Long, 2 Short** **_ ..**	**SLEW LEFT**	**1 Long, 1 Short** **_ .**
DIPPER OUT	**1 Long, 3 Short** **_ ...**	**DIPPER IN**	**1 Long, 4 Short** **_ ....**
		STOP	**1 Short** **.**

DRIVING A MACHINE ON THE ROAD IN QUEENSLAND

The Department of Transport and Main Roads classify earthmoving machinery under the general heading of “specially constructed vehicles”, this includes earthmoving machinery, agricultural machines such as tractors and harvesters and loadshifting equipment.

When driving a “specially constructed vehicle” on the road in Queensland, an operator needs:-

- A Class C provisional, probationary or open licence.
- Proof of competency for the machine i.e. old OHS Licence, or new style competency card (Responsibility for what is actual proof of competency now rests with the employer, the employer needs to be satisfied that competency is met by its employees or contractors and that records have been kept)
- The machine needs to be road registered (or an exemption organised, known as Conditional Registration)
- Requirements for driving a machine in different States will vary, we advise always checking with the road regulators
- Insurance requirements should also be taken into consideration

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(From 1 January 2016 all mobile cranes over 4.5t GVM are required the operator to hold the appropriate class of heavy vehicle licence – a HR Licence).

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PARK THE MACHINE

When the work has been completed the Machine should always be parked in the designated location. Given its value and potential risk in unauthorised hands, the parking procedures should be so well known they are automatic.

Your Machine parking requirements may include:

- Where possible, park on a level surface and keep access points clear.
- Make sure the machine controls are in the neutral position.
- Apply all brakes and locks.
- Provide warning lights, signs and barricades if the Machine must be parked on a public access way.

Do not park a machine on:-

- soft ground
- tidal areas
- next to the edge of an excavation
- on a slope
- in front of emergency exits
- under an overhang

SHUT DOWN THE MACHINE

After you have followed all parking procedures you will need to shut down the Machine. Your shut-down procedures may include:

- Let the engine idle for a while to cool down. Each manufacturer will have a specified time for idle but you will damage the engine if you repeatedly stop and switch off for the night.
- Ensure any pressures are released and cool-down procedures for high temperature equipment are monitored.

You should ensure that you are well-versed in the parking and shut-down procedures for the machine you are operating. This may require the use of a checklist. It is important to make sure that after you have left a machine it is not dangerous to other people, either because of where it is left or because of the condition you left it in.

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POST OPERATIONAL CHECKS

Do a check of the machinery like you did when you started:-

- Do a walk-around inspection of the vehicle, looking for any changes during the work, or damage.
- Record any findings of the walk-around inspection.
- Make sure you have followed organisation guidelines regarding security of the vehicle.
- Record log book entries, hour/meter readings as required.

The following procedures are just as important as operating the machine. Make sure you follow each stage carefully, and make sure you know the reasons for proper shutdown procedures.

Post-operational checks need to be carried out, in order to:

- detect any structural damage that may have occurred during the operation of the machinery
- make sure all the machine's systems are shut down and the machinery will not present any hazards to others in the workplace
- detect any leaks in oil/hydraulic lines that could affect safe operation of the machine when it is next started
- make sure the Machine is ready and safe for use by the next operator
- Any faults found, take the key out, tag the machine out of service and report to your supervisor.

Note: A post check can save you getting the blame for something you did not do!

The best way to do an inspection is to use a checklist. You may need to speak to a mechanic, the maintenance people for the organisation or read the owner's manual/manufacturer's manual to set up your checklist.

You may also need to have a couple of different checklists, depending on number of hours the Machine has been operating since the last scheduled maintenance or perhaps the type of work.

The inspection done overnight while working at a site might be less detailed than that performed at the end of the job.

FAULTS AND DEFECTS

You should have a standard system in place for recording and reporting any faults found in the inspection. All defects and faults should be immediately reported and an assessment done to determine the urgency of repair or replacement.

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There may be organisational standards for this or you may have to perform a risk assessment, but no matter what, you should always check later to ensure the reports have been noted and that the repairs or replacements are either done or scheduled.

Do not use any machinery or equipment that has unresolved faults or damage.

MACHINE KEYS MUST BE REMOVED (SITE SPECIFIC)

You might not be aware but it is actually against regulations to leave the keys in an unattended Machine.

This is to prevent unauthorized use of the machine. Many Companies get fines because an unauthorized operator (casual staff, truck driver, contractor etc.) has used their Machine and had an accident. If an unauthorized person has access to your Machine, they won't be covered under your insurance and you face being fined.

Obviously, there are some practical disadvantages to removing the keys from the machine as employees will take them home, they will get lost etc. ensure you follow a safe procedure which can be site specific.

Make sure that unauthorised movement of the Machine is prevented. Make sure that the area is safe and clear at all times.

ROUTINE MAINTENANCE TASKS

To prepare the Machine for its next use, you should also carry out any minor servicing it needs. Similar to the situation with your car, basic maintenance can be done by a machine operator after every shift or after 10 hours:-

- bucket and machine should be cleaned and greased
- check buckets for wear – cutting edge, pins and teeth (worn out buckets are ineffective and can be dangerous)
- air pre-clean filters should be cleaned and air filters checked
- track tension checked
- tyre pressures. Be very careful inflating tyres, use a clip on style pressure gauge, and stand to one side (never stand in front of the tyre while you're pumping it up). Split rim wheels are potentially lethal.
- battery
- make sure the work cabin is clean and free of clutter
- windows cleaned
- reporting any faults or service requirements to your supervisor
- record faults or repairs in the maintenance log

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SCHEDULED MAINTENANCE TASKS

To ensure the continued safe and effective use of the Machine, you should make certain all scheduled maintenance is carried out. This may be done at:

- At the end of the job.
- On a regular basis (e.g. at the end of each week / month)
- During breaks in the work, such as waiting for the next delivery of material to be worked.

A scheduled maintenance program would include:

- Cleaning.
- Authorised servicing.
- Replacement of serviceable parts such as filters, fluids and accessories.
- Draining fuel and air tanks of dirt and condensation if necessary
- Monitoring previous issues.
- Recording new issues or faults

Employers are required to maintain service records for all plant and machinery and produce them if requested by a WHS Inspector or a Court of Law. It is part of their duty of care requirements in regards to their employees.

Good maintenance and record keeping can prevent downtime and help to keep costs down i.e. picking up on a defective hose before it actually bursts can save major time and damage. All equipment can and should be maintained during operations as this will prolong the life of the machine and make the work as effective as possible.

Many Companies will make their own logs for these records but there are also a range of books that can purchased to record the required information.

Most organisations will have arrangements to have regular servicing done on all equipment. Many will have a special section just for such work, and employ mechanics or engineers capable of repairing and overhauling vehicles in the workshop.

To undertake repairs

- You must be **qualified**
- You must be **authorised**
- You must **competent**
- Refer to supplier
- Check hour meters / service stickers
- Attachments also need to be maintained and serviced

Do not mess with machines

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HYDRAULIC SYSTEMS

Machines are powered by an internal combustion engine.

The motor operates a hydraulic pump. The hydraulic pump pushes oil into a control box under pressure.

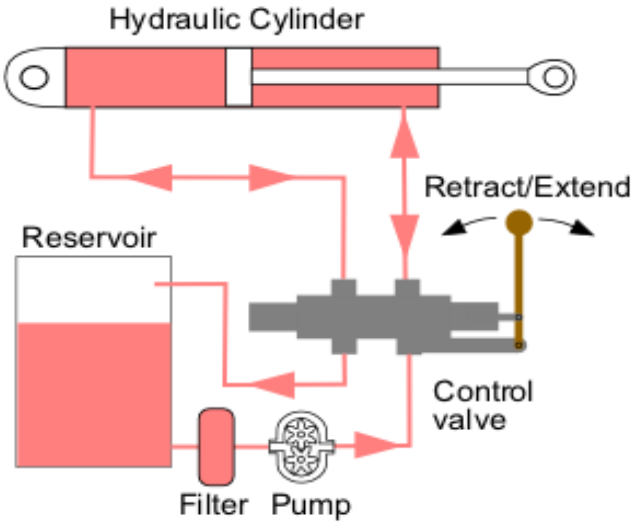
Hydraulic oil leaves the tank under low pressure. It passes through a pump, leaving the pump under high pressure. This can be as high as 3,000 psi (capable of piercing your skin, removing an eye, burning you, or injecting you with oil, which is also poisonous), it then passes through the control box (valve bank).

The driver can then direct the oil through the hydraulic lines under high pressure to the hydraulic rams and drive motors by using control levers.

There is a level marked on a sight gauge or a dipstick in the hydraulic tank. Do not fill the tank above the level marked. Make sure that the oil is kept at the correct level. Check the level before each shift. The tanks will overflow in operation if you over filled them due to heat expansion.

Check the system for oil leaks. Leaking hydraulic oil can be very dangerous as it can cause systems to fail i.e. hydraulics to drop etc. and also can cause slip hazards.

Diagram of Hydraulic System showing Double acting rams (rams that work in both directions)



Any leaks that occur in a high pressure hydraulic system, machine should be treated with extreme caution to prevent oil injection / crushing injuries and rendered safe where possible i.e. lower all attachments (de-pressurise the system) then remove keys, tag the machine out and report to supervisor (KTR).

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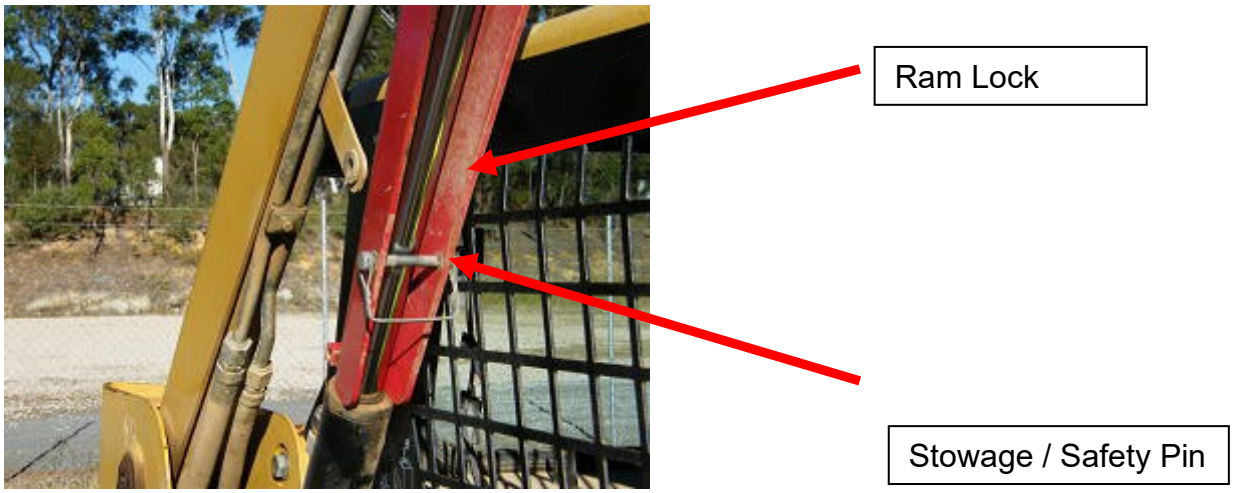
WORKING WITH RAISED HYDRAULICS

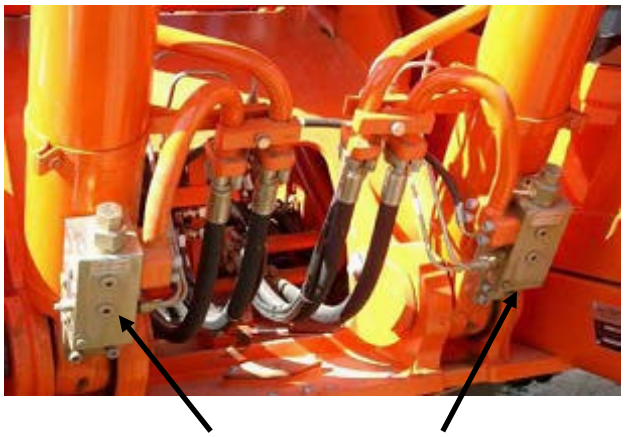
If it can't be avoided and you need to work under raised hydraulics, they must be propped according to manufacturer's guidelines. This would normally involve minimising a suspended load i.e. remove the bucket etc. Hydraulics can and will fail.



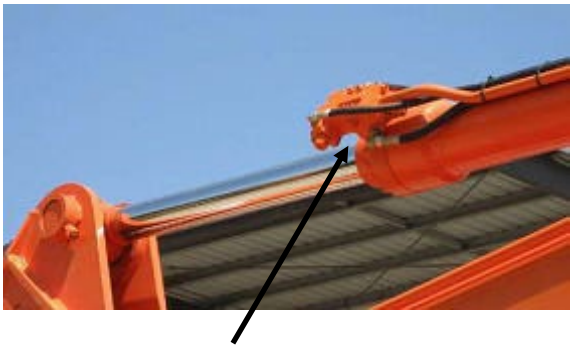
HOSE BURST PROTECTION VALVES

A catastrophic failure of a hydraulic hose supplying the oil flow to raise or maintain a lifting boom at a specific height will cause a sudden collapse of the lifting system and injury to a person if struck by a falling boom or load. The risk of hose failure increases significantly as hydraulic operating pressures increase when the mass of the load increases. To reduce the risk of a boom or dipper arm collapsing on earthmoving equipment with a rated capacity greater than one tonne, hose burst protection valves should be fitted on critical hydraulic cylinders.

These devices lock cylinders in the event of sudden loss of hydraulic fluid pressure. It is recommended that the valves meeting the requirements of rated capacity as outlined in AS 1418.8 section 5.4.3.



Burst Protection Boom Cylinders



Burst Protection Boom Dipper Arm

The following additional conditions are to be applied:

The maximum rated capacity is to be in accordance with the manufacturer's specifications for the equipment. Equipment must not be de-rated to avoid fitting burst protection.

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Single rated capacity − Where the decision is made to rate the lifting capacity of the equipment at its maximum lifting radius, this becomes the rated capacity1 and is to be marked on the boom or dipper arm. The rated capacity must then be strictly observed at all times, irrespective of the radius of the load. Information should be available on site to confirm that the rated capacity marked on the unit is the same as that specified by the manufacturer.

Variable rated capacities − Where the equipment has variable lifting capacities, the manufacturer's rated capacity chart (i.e. load chart) is to be fixed to the inside of the operator's cabin. For equipment with variable rated capacity, the lifting capacity at minimum radius is to be used to decide whether burst protection is required.

The burst protection device should not be provided with the ability for the operator to switch the device on and off (in case the operator forgets to switch the burst protection on when the equipment is operated as a crane).

Where the rated capacity of the equipment is 1 tonne or less, and the decision is made not to fit burst protection, the equipment must not be used to lift loads in close vicinity to workers.

Earthmoving equipment owners should seek advice on fitting of burst protection from original equipment manufacturers, to help avoid fitting faulty or unsafe systems.

Whenever suspended loads are lifted near persons, an exclusion zone should be established where possible and a SWMS should be in place.

Precision lifting and placement requires the use of plant to operate at creep speed (also called inching) Due to inherent "hydraulic drift" characteristics, whilst general lifting such as piples, bundles of steel, concrete kibbles, spoil buckets, trench shields portable toilets etc. are manageable. For precision placement a crane should be used.

RE-FUELLING

Do not refuel when the engine is running. Make sure the motor is stopped and the ignition is turned off due to risk of fire or explosion. Be aware of any environmental risks of spilling fuel. Any spillages should be dealt with according to site procedures.

BATTERIES

Batteries can explode, they contain sulphuric acid. Whilst the machine is running, the battery is charged, hydrogen is released due to the electrolysis of the water. Hydrogen is a very explosive gas. Any spark or flame around the charging battery will cause is to explode – with potentially quite harmful results.

If you need to change or disconnect a battery the negative terminal should be removed first to prevent sparks and arcing.

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DEFECTIVE PARTS OR EQUIPMENT

Depending on the site and organisation it may be up to the operator to remove and replace defective parts or equipment. Make sure you know the procedures in place at your work site.

To replace parts, make sure that:

- The Machine is securely parked and unable to move.
- You have replacements available.
- You have the knowledge and skills to perform the work.
- You have the correct tools and other equipment needed.
- You will not void warranty by working on the Machine or equipment.

If you are not sure of being able to complete the work, seek qualified assistance or report the situation to the maintenance personnel or mechanics.

CLEANING THE MACHINE

It may not be practical to clean the Machine after every use but as soon as a given task is complete, you should clean the vehicle thoroughly. Mud and other contaminants left for long periods will not only promote corrosion, they can be health hazards as well.

Cleaning is also a good way to do an even closer inspection of the Machine, and may highlight issues you didn't see during the walk-around inspections.

Make sure the Machine is kept according to organisational requirements – if there is undercover parking available, for example, use it. Ensure you keep it out of the path for other traffic and easily accessible for next use.

CLEAN UP AFTER OPERATIONS

Once the Machine is cleaned, the inspections and maintenance is complete and the vehicle is parked appropriately, you should clear the work area.

The process should be documented and may include:

- Check all tools and other equipment.
- Ensure they are clean and functional.
- Any non-working or damaged items to be recorded and reported.
- If the equipment is of critical use, isolate it to ensure it will not be inadvertently used if someone doesn't check the reports.
- Store equipment and tools in their designated locations.
- Remove any potential hazards. Duty of care towards others means not leaving a possible source of accident or danger for others.
- Clean up waste materials and dispose of properly. Your organisation should have a recycle policy, perhaps with special bins. Use them accordingly.
- Make sure you use appropriate PPE when dealing with waste or possible hazardous materials as you clean. Chemicals used for cleaning, for example are often hazardous unless used correctly.

Ensure you know and follow the procedures set out within your organisation. If in doubt, ask your supervisor or other personnel, or access your job specifications and requirements documentation.

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PREPARE THE MACHINE FOR RELOCATION

Before a machine can be moved from site to site, it must be prepared appropriately.

Some issues in moving the Machine to another site may include contamination from one site to another, safety issues on the journey, hazards from loose or detached parts and movement of the Machine.

Precautions against these may include:-

- Clean the Machine thoroughly.
- Clean any attachments going with the Machine.
- Secure all moving parts.
- Remove and store appropriately any and all attachments going to the new site.
- Ensure all connectors are secure and locked.
- If possible, lower the bucket to rest position and lock it into place.
- Remove the bucket if needed.

RELOCATION

Machines can be moved on floats / low loaders or the back of a truck. Any transport must comply with:-

- Codes of practice.
- Traffic management requirements.
- Site regulations.
- Traffic codes including lights and registration requirements if Machine is driven on public roads.

Care should be taken when loading onto the transport, including if needed, a spotter to help guide the Machine up ramps.

Normally the Machine will be reversed onto the truck and the bucket lowered to help ensure stability under moving conditions. Every machine has different loading characteristics.

Once on board the Machine must be securely locked down to prevent any movement. The transportation vehicle can then safely move the Machine to the next site.

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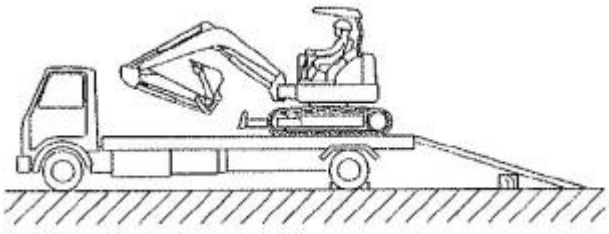
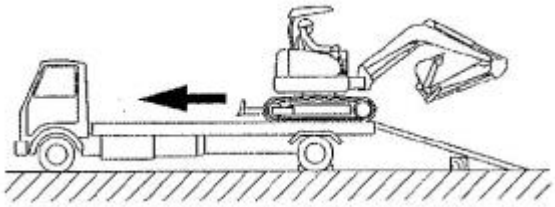
LOAD AND UNLOAD FROM FLOAT

- Choose the pickup area where the transport vehicle will park.
- Make sure it is level and on a firm surface.
- Make sure area is clear of overhead wires or potential ground hazards i.e manholes/pit covers.
- Use traffic management (witches hats, bollards, barricades, signs). Follow relevant codes of practice.
- Make sure the transport vehicle is suitable.
- Check the dimensions of the excavator (weight, width and height). This information may be stamped on the load chart on the machine or in the operator's manual.
- Communicate dimensions to the float driver.
- Confirm arrangements for the pickup.
- Float, truck or trailer driver may need your assistance to:

  a. Place & secure loading ramps at back of float (truck or trailer)
  b. Drive / Reverse excavator up loading ramp and into position

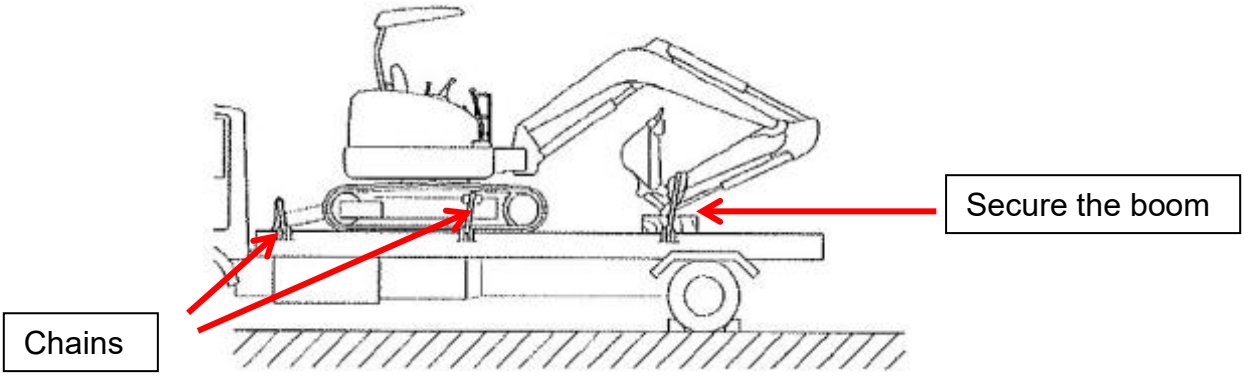


Drive onto bed of truck, boom in front for stability.



Slew boom & continue to drive up to back of cab

  c. Ensure hazard lights are on for machine and truck during the loading process
  d. Keep machine on the centreline – use a spotter
  e. Bring bucket / boom down to rest on the trailer bed
  f. Apply the brakes / hydraulic lockout
  g. Ensure doors are closed, toolbox lids are locked down
  h. Do not jump down from machine or bed of truck (float) use 3 points of contact
  i. Secure the attachment/s.
  j. Secure the excavator to the float, truck or trailer using chains and ratchet dogs (cantilever dogs are no longer legal to use)



- Use a spotter (recommended)
- Undertake the manoeuvre slowly
- Keep especially aware of machine balance points
- When loading excavators, keep the boom as low as practicable
- The truck/float operator must not move the machine if he does not hold competency for the machine.
- Must not move the float if the machine is not tied down

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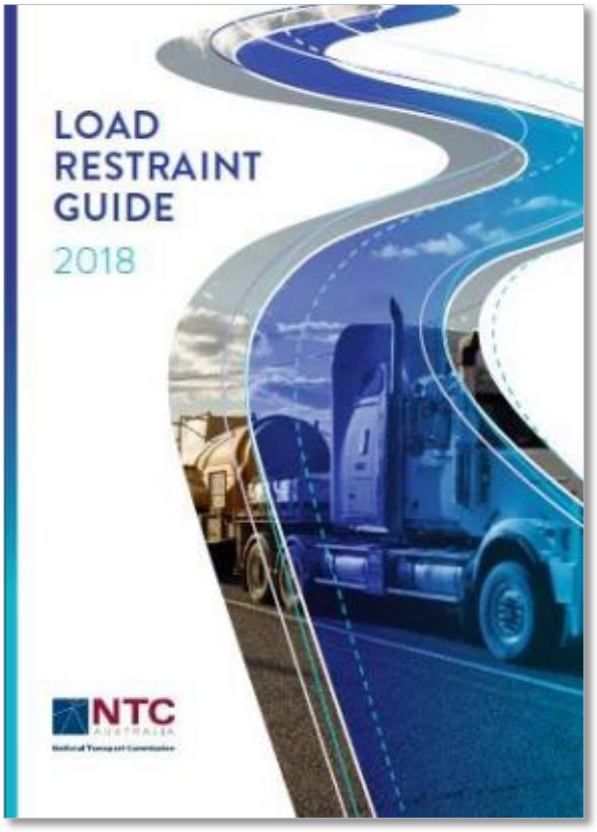
Under the Chain of Responsibility requirements Heavy Vehicle National Law (HVNL) the loader's responsibilities include ensuring a vehicle's load:

- does not exceed or cause the vehicle to exceed mass or dimension limits
- is placed in a way so it does not become unstable, move or fall off the vehicle.

As of October 2019, changes were introduced whereby a ticket for any piece of earthmoving equipment on its own, does not provide sufficient skill to independently load and unload equipment..

To perform this activity safely, an operator must complete or be assisted by someone who has completed a unit of competency for loading and unloading plant.

An operator should also refer to the National Transport Commission's (NTC) Load Restraint Guide



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SECURE SITE

When leaving a site, ensure gates are closed and locked or fences and barricades are erected to prevent unauthorised access to the site.

IN CASE OF AN EMERGENCY

In the case of a fire, accident or emergency you must make sure that you:-

- Alert personnel i.e. your immediate supervisor, colleagues in the vicinity
- Tell them the nature of the incident i.e. a spill, an accident, a near miss
- Inform all staff of the unsafe areas i.e. erect signs and barriers etc.
- Provide directions to emergency services if required
- Give way to all emergency vehicles

When the immediate situation is dealt with you would then complete the necessary paperwork for reporting the incident i.e. accident book, risk assessment, WHSQ if required within the format and timelines stated in the Legislation – see next page.

38 Duty to notify of notifiable incidents

Under current legislation a **notifiable incident** means—

- death of a person; or
- a serious injury or illness of a person; or
- a dangerous incident

(1) A person who conducts a business or undertaking must ensure that the regulator is notified immediately after becoming aware that a notifiable incident arising out of the conduct of the business or undertaking has occurred.

Maximum penalty — 100 penalty units

A person conducting a business or undertaking must keep a record of each notifiable incident for at least 5 years from the day that notice of the incident is given to the regulator under this section.

Maximum penalty—50 penalty units

The site of an accident (including those involving plant, substance, structure or thing associated with the notifiable incident) must not be interfered with unless:-

- It is necessary to save a life or relieve suffering
- To remove a deceased person
- Essential to make the site safe or to minimise the risk of further notifiable incident
- It is associated with a police investigation
- A WHSQ Inspector or the regulator has given permission for the accident site to be cleared and cleaned up.

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FIRST AID

Machinery operators work in a dangerous environment. Not only are there many minor injuries but also there are also serious injuries where the injured person will need first aid to restore breathing, heartbeat or to stem blood flow.

Know the location of the nearest first aid kit (first aid room if possible).

It is recommended that Machinery operators take the time to do an approved first aid certificate.

EXAMPLE OF HAZARD REPORT FORM

BIG HOLE EXCAVATIONS

Hazard Report Form

What are you reporting? (tick box) **Hazard** ☐ **Incident** ☐ **Accident** ☐

Details of person making this report

Name: B. MOFFET Tel: 0414 752156 Date: 6-7-2012

Position: DIRECTOR Work location: ABC ARUNDEL

Hazard report

Please explain exactly what happened. Include date and time of incident. Who was involved? If any injury was sustained and any first aid treatment performed. Include the names of any witnesses.

Incident 10.10 BUCKET FELL OFF EXCAVATOR DAMAGING ISUZU TIPPER REGO NO EGGRRK. FOUND QUICK HITCH PIN MISSING/ NOT FITTED

Risk Estimate LIKELIHOOD SEVERE
RISK LEVEL HIGH

Action Taken IMMEDIATE ACTION REQUIRED

Signature of person completing this section: B Moffet Date: 6-7-2012

Incident analysis (to be completed by supervisor)

Action initiated: ☐ First aid treatment
☑ Other ISOLATE MACHINE
OBTAIN NEW HITCH PIN

☐ Immediate danger posed by hazard has been eliminated
☑ Maintenance request submitted
☐ All appropriate managers notified
☑ Other PRE CHECK SHEETS TO BE COMPLETED

Sign– off

Name of person conducting investigation: S. HOLMES Date commenced: 6-7-2012

Signature of person conducting investigation: S Holmes

Comments: REVIEW & MONITOR DAILY CHECK SHEETS

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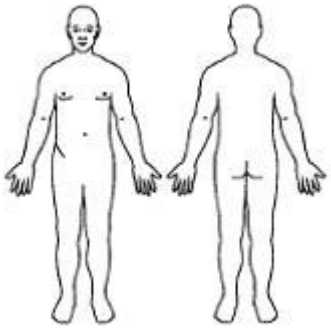
EXAMPLE OF INCIDENT REPORT FORM

Section A: Details of incident							
Name:				Sex:	M / F		
Dept/section:				ID number:			
Employment:	☐ Full time		☐ Casual		☐ Self-employed		☐ General public
	☐ Part time		☐ Volunteer		☐ Other:		
Describe the incident:							
Date:		Time:		Date reported:		Time reported:	
What happened?							
Where did it happen?							
Who was involved?							
☐ Near miss (a dangerous incident without injury to a person/damage to property). Go to section C.							
☐ Accident (incident resulting in injury to a person/damage to property). Complete section B & C.							

Section B: Accident/injury report			
	Mark the injury on the diagram. Explain the injury/accident below.		
	Medical treatment:	☐ None	☐ First aid	☐ Doctor only
		☐ Admitted to hospital:	

Section C: Investigation and preventative action taken			
Investigation – why do you think the accident happened?			
Risk control measures – how can the site's risk control measures be improved?			
Who is responsible for putting the control measures in place?			
Name:		ID number:	
Dept/section:		Completion date:	

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MANAGING THE RISKS, IF YOU ARE AN EMPLOYER

Employers have a primary duty to provide a safe workplace. Providing a safe work environment, training, well maintained machinery and effective traffic management plans all play an important part in reducing the risks posed by Machines in the workplace.

All employees, including managers and supervisors, have a duty to ensure the actions they take, or neglect to take, do not put themselves or others at risk. Everyone needs to ensure that safe Machine practices are observed. Small changes in behaviour can deliver significant safety improvements.

Simple safety practices like maintaining and obeying speed limits, observing stop signs, slowing down and sounding the warning device (horn) at intersections can all help to minimize risks.

Too often, safe Machine practices are only introduced at a workplace after a worker has been killed or injured. Action must be taken now to eliminate injuries and save lives.

Safe Machine operating procedures are often disregarded once an operator has gained a Certificate of Competency. A Certificate of Competency provides an operator with skills to operate a machine in a safe manner.

However, induction into a new workplace or changed environments, unfamiliar Machines etc. mean that additional training and safe work procedures are a must!

We trust that you have enjoyed the formal training and that you have learnt the fundamentals of what it takes to be a safe operator. Please remember to take your time, practice what you have learnt here on this course and stay safe.

Remember just because other people have been driving for a long time does not always mean they are a good operator – select an appropriate trainer / mentor. Don't be a "sheep"!

Your Assessment papers are kept for 30 years and can be used in a court of law. Think about it!

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