LEARNER GUIDE 1

APPLY THE PRINCIPLES OF EARTHWORKS CONSTRUCTION

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1.1 INTRODUCTION

This course is based on the unit of competency **RIIMPO402A: Apply The Principles Of Earthworks Construction.**

The materials in this course apply to a supervisor or technical specialist working in earthworks construction within the civil construction industry.

The course outlines the requirements for ensuring that the following activities are carried out in accordance with accepted industry principles:

- Planning and preparing for earthworks construction.
- Initiating tasks.
- Monitoring and adjusting the execution of tasks.
- Reporting on the execution of tasks.

1.1.1 EARTHWORKS CONSTRUCTION

Earthworks construction may include tasks such as:

Earthworks Construction tasks can include:	
Land Clearing	Must abide by environmental protection legislation, job specifications and approvals.
Bulk Earthwork	Relates to the movement and working of material on the site, e.g. Cut and fill operations.
Surface Drainage Works	Ensures water always leaves the area, normally down a slope so that it sheets away or runs off.
Water Storage Dam Construction	Ensures a secure water supply so that site operations can be completed to specifications, e.g. A 'borrow pit'.
Tailings Dam Construction	Used to manage wastewater, which may be treated prior to leaving the site or held in reserve for a set period of time.
Rehabilitation Works	Relates to activities aimed at fixing or upgrading conditions on the site or returning the site to pre-work standards.
Road Works Preparation	Including the sub-grade and placement of base layers – entails the removal of unsuitable materials ensuring a solid foundation for the road works.

1.2 APPLY COMPLIANCE DOCUMENTATION FOR EARTHWORKS

Documentation is essential to all aspects of every worksite. From safety plans and environmental protection requirements through to earthworks construction principles, documentation exists that outlines what to do, when to do it and how it is to be done.

1.2.1 TYPES OF COMPLIANCE DOCUMENTATION

Compliance documentation is the name given to the documents that require tasks to be undertaken in a particular way or to meet a given standard.

The compliance documentation for earthworks construction details every process and is based on legislation and regulations as well as the requirements of the organisation, the client and site operations.

Legislative and regulatory compliance requirements include:

- Occupational Health & Safety/Work Health & Safety (OHS/WHS) requirements.
- Equal employment opportunity.
- Disability discrimination.

These requirements are standard across every industry within all Australian states or territories.

Organisational requirements include policies and procedures covering:

- Workplace relations.
- Sick leave requirements.

An organisational policy or procedure is standard across the entire organisation regardless of where you are working.

Site-specific policies and requirements generally include:

- Emergency response and evacuation procedures – developed to meet the specific hazards, risks or environmental considerations of the site you are working on.
- Operational procedures, e.g. work instructions, safe operating procedures (SOPs) and other site and equipment safety requirements.

Client requirements involve:

- Client standards and expectations.
- Planned outcomes of the earthworks construction project.

Your organisation's quality management program should ensure that these requirements are met safely and consistently.

If you are unsure about a procedure or there seems to be a conflict between plans or processes, speak with your project manager directly.

Never approach the client representative on site unless you are authorised to speak for your organisation.

Some other examples of compliance documentation include:

- Australian Standards, e.g. AS 3798 – 2007 guidelines on earthworks for commercial and residential developments.

- Australian guidelines and specifications, e.g. codes of practice such as WorkCover document 2000 – Excavation work, or National Code of Practice – Managing the risks of plant in the workplace.

- Manufacturer's guidelines and specifications, e.g. pre-start checklists, service requirements, plant and equipment operation manuals.

- Vehicle specifications, e.g. operating limitations and capabilities, safe working limits.

- Training records, e.g. your own training record or licensing requirements.

- Work instructions, such as work plans, procedures or job specifications.

Every worksite will have specific requirements, which will be outlined during the initial induction for each worker. Staff should be notified of any changes to compliance documentation during toolbox meetings, staff newsletters or other established forms of communication used on the site.

1.2.1.1 STATUTORY COMPLIANCE

You should check your site documents for any statutory compliance procedures that may apply to current work activities.

These will often involve reporting back to the relevant government agencies or statutory authorities such as:

- WorkCover.
- EPA.
- RTA.

Any statutory requirements that cannot be met should be identified early so that alternative arrangements can be made. These actions will need to be approved by organisational and site management and the statutory regulatory body involved.

1.2.1.2 ADMINISTRATION

Each worksite will have administrative documentation that needs to be completed daily, weekly and monthly. This paperwork could relate to:

- Daily activities.
- Ordering and reordering.
- Workplace incident and accident management.
- Pay and other employee/worker entitlements.
- General administrative tasks.

Try to stay on top of your administrative duties at all times. It is easier to complete one-day's worth of paperwork than to allow the tasks to pile up and try to complete them once a week.

Speak with the administrative officers for the site to determine how the paperwork should be completed and submitted in line with your organisation's requirements.

1.2.2 OCCUPATIONAL HEALTH & SAFETY/WORK HEALTH & SAFETY (OHS/WHS) LEGISLATION

State or territory legislation and regulations include Occupational Health & Safety/Work Health & Safety (OHS/WHS) requirements that will affect the way all operations are conducted on a worksite.

All requirements for site and equipment safety, including excavation/trench work, confined space entry, materials handling and all other work activities, are based on OHS/WHS legislation.

The aim of the legislation is to ensure the safety of everyone working on or visiting the site.

Harmonisation of Work Health & Safety Legislation

In response to industry calls for greater national consistency, the Commonwealth, states and territories have agreed to implement nationally harmonised Work Health & Safety (WHS) legislation to commence on 1 January 2012.

While not all states and territories have actually implemented the model WHS legislation as of the start of 2012, it is important to be aware of these changes, as all states and territories will eventually implement them.

Harmonisation aims to develop consistent, reasonable and effective safety standards and protections for all Australian workers through uniform WHS laws, regulations and codes of practice.

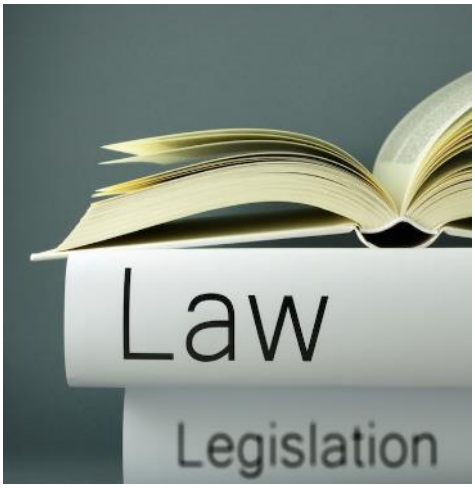
Key Elements Of The Work Health & Safety Legislation

The following key elements of the WHS legislation will impact the way you do your job, and the responsibilities of your workplace:

1. There is a primary duty of care requiring ***persons conducting a business or undertaking (PCBU)*** to ensure, so far as is ***reasonably practicable***, the health and safety of ***workers*** and others who may be affected by the carrying out of work.
2. A requirement that ***officers*** of corporations and unincorporated bodies exercise ***due diligence*** to ensure compliance.
3. ***Workers*** must exercise reasonable care that their acts or omissions do not adversely affect the health and safety of persons at a workplace.

The legislation also outlines requirements for:

- The reporting requirements for notifiable incidents.
- Licences, permits and registrations (e.g. for persons engaged in high risk work or users of certain plant or substances).
- Provision for worker consultation, participation and representation at the workplace.
- Provision for the resolution of health and safety issues.
- Protection against discrimination.



Many specific details relating to WHS will be negotiated within the workplace in accordance with the legislation.

It is important that you speak with your Health and Safety Representative or supervisor for more information on how these elements will effect your day-to-day operations, or if you have any concerns relating to health and safety.

A list of common WHS terms and their definitions can be found in Appendix 1A.

Duty of Care

Everyone on a worksite has a legal responsibility under Duty of Care to do everything reasonably practicable to protect others from harm.

This is done by complying with safe work practices, including activities that require licences, tickets or certificates of competency or any other relevant state and territory OHS/WHS requirements.

1.2.2.1 SITE AND EQUIPMENT SAFETY REQUIREMENTS

All workers and visitors on a construction site must observe site and equipment safety requirements and procedures. These are outlined in the site safety plan and generally follow OHS/WHS guidelines.

Site and equipment safety requirements and procedures cover such things as:

- Selecting and using Personal Protective Equipment (PPE) and clothing required for various tasks or the entire site.
- Management of hazards and risks.

- Selecting and using tools, plant and equipment.
- Safety documentation including Safe Work Method Statements (SWMS), Material Safety Data Sheets (MSDS).
- Safe Operating Procedures (SOPs).
- Emergency procedures.

Anything that is faulty or looks like it could create a hazard must be reported at once to your supervisor, team leader or OHS/WHS officer.

1.2.3 PROJECT QUALITY MANAGEMENT

Quality management is an ongoing aspect of site operations.

If tasks are not completed in line with the stated objectives, they may not be acceptable to the client. Unsatisfactory work will need to be redone, costing significantly more time and money.

Quality management plans, requirements and procedures will detail exactly what you are expected to achieve and the standards you and your team are expected to reach.

They may include factors such as:

- Dimensions and tolerances of tasks.
- Material standards.
- Work standards.
- Documentation requirements.
- Project specifications and drawings.
- Client standards and expectations.

As a supervisor you should always determine the quality management plans and procedures before any tasks are started.

It is also essential that your work team knows, understands and adheres to these quality requirements and each member follows instructions and procedures exactly.

This will make it easier for the team to incorporate the quality requirements into their activities instead of making them an additional step to be completed at the end of the task.

1.2.4 ENVIRONMENTAL MANAGEMENT

All organisations play an important role in environmental management, however the legislation that affects them directly differs depending on the activities they undertake.

Federal, state and local governments jointly administer the environmental protection legislation in Australia through bilateral agreements.

At the federal level, the *Environment Protection and Biodiversity Conservation Act 1999* covers the assessment and approval processes of national environmental and cultural concerns.

The Act is administered by the Department of Sustainability, Environment, Water, Population and Communities.

The Department also administers other Acts relating to the sea, importing, heritage issues, hazardous wastes and fuels.

Environmental protection requirements are part of every worksite. You must be able to identify the environmental management plans, requirements and constraints, confirm any aspect of the environmental management plan you are unsure of, and apply the project environmental protection requirements to all the tasks you do on the site.

Environmental protection plans can include requirements for:

- An organisational or project environmental management plan.
- Noise and vibration management.
- Dust management.
- Waste/clean-up management.
- Water quality protection.

1.2.4.1 ENVIRONMENTAL MANAGEMENT PLAN

This is the overarching plan that outlines the main environmental achievement goals of the organisation and how these goals will be achieved. It may detail items such as:

Some common aspects within the overall plan may include:

- Dust monitoring and dust suppression measures to be put in place, i.e. water carts.
- Stability or structural reports on buildings in the area to monitor vibration results.
- Noise management requiring hearing protection, or strict work times, e.g. no work before 7am or after 6pm.

The site requirements and constraints will be clearly and completely outlined in this plan and must be followed exactly.

Requirements are the things that must be done. Constraints are the things that either must not be done or must be done is a particular way.

1.2.4.2 WASTE/CLEAN-UP MANAGEMENT PLAN

The waste/clean-up management plan outlines how the waste materials and rubbish from the site will be disposed of.

It also provides guidelines for recycling from the site and the re-use of waste materials.

This plan may have sub-plans for hazardous wastes, chemical wastes and other classes of waste as appropriate for the worksite you are working on.

1.2.4.3 WATER QUALITY PROTECTION PLAN

This plan provides the steps that will be used to protect the water in adjacent areas.

It will detail items like silt fences, diversion drains and sediment ponds.

This plan can have a sub-plan for any wetlands or low-lying areas if these will impact on the work zone.

1.2.5 WORK ZONE TRAFFIC MANAGEMENT

It is often necessary to control the movement of traffic and people around and through the work zone and the entire site. Requirements and procedures for controlling traffic, vehicles and pedestrians on your worksite will be outlined in the 3 different types of traffic plans:

Types Of Traffic Plans:	Description:
Traffic Management Plan	Deals with traffic moving through the site, including traffic on public roads and members of the public.
Vehicle Management Plan	Deals with on-site vehicle movements, haul circuits and dump runs, and material routes. Under this plan, larger vehicles will have right of way unless site plans say otherwise. Road rules still apply and directional signs need to be obeyed.
Site Isolation Plan	Outlines are how the site will be isolated from the general public. It could detail barricades and fences but also how specific areas of the site will be isolated to keep the construction crews safe from traffic such as moving machinery (generally through the use of concrete barriers) and other hazards, e.g. excavations and trenches.

1.2.5.1 TRAFFIC CONTROL DEVICES

Traffic control devices are used in a variety of traffic conditions such as:

- Congested urban environments.
- Pedestrian areas.
- Parking sites.
- Buildings.
- Low traffic rural areas.
- Off-road un-trafficked areas.

To ensure the safety of personnel/workers and the general public, traffic management signs and devices may be used. These can include:

- Traffic signs, for example:
  - Workmen ahead.
  - Reduce speed.
  - Speed limits, e.g. 60km, 40km.
  - Speed zones are enforceable.
  - Changed traffic conditions ahead.

- Traffic and regulatory cones.
- Escort vehicle or other vehicle-mounted signs, signals and directions.
- Highway traffic signs.
- Guide and warning signs.
- Hazard markers, flashing lights.
- Portable traffic lights and signals.

- Arrow boards, message boards.
- Barricades, bollards and barrier boards.
- Site safety signage.

In the traffic or vehicle management plan, the type of signs and the distances between them will be listed. These distances must be maintained unless you receive approval to vary the traffic management plan.

1.2.5.2 TRAFFIC CONTROL LICENSING AND ACCREDITATIONS

In most states of Australia, traffic management is covered under specialised traffic control training.

The 4 different levels of traffic control training are:

- Using stop slow bat.
- Applying or implementing traffic control plan.
- Selecting and modifying traffic management plans.
- Designing and inspecting traffic management plans.

To comply with the regulations, anyone who is required to work with traffic control must have the specific traffic control training that is appropriate for the task being undertaken.

This can be obtained through a Roads and Traffic Authority (RTA) approved training organisation. Your WorkCover or RTA office will be able to advise if specialised training is needed and who provides it.

1.2.5.3 APPROVAL OF TRAFFIC MANAGEMENT PLANS

Traffic management plans may need to be approved by the road management authority (e.g. RTA) or local council in your state or district.

Most large worksites will have a traffic management engineer who you should speak with if you believe the traffic signage or placements don't suit the work or environmental conditions. The engineer will then be able to assess the requirements in the field and determine a course of action.

If the site is too small for a dedicated traffic engineer, you should consult with your manager, the project manager/engineer or another authorised person about any issues or concerns with the traffic management plans.

1.2.6 RISK MANAGEMENT

Risk management is the process of reducing or managing the risks when working with a hazard or in a hazardous situation and should take into consideration the context of the organisation and worksite.

Risk management must be conducted in accordance with:

- Legislative, organisation and site requirements/procedures.
- Australian Standards (AS/NZS ISO 31000:2009).
- Codes of Practice.
- Employment and workplace relations legislation.
- Equal employment opportunity and disability legislation.

Risk management is made up of the following stages:

Consultation and communicating with others and monitoring and review should be planned for and carried out at every stage of the risk management process.

See Appendix 1B for an example of a Hazard Report Form which can be used to document the risk management process.

1.2.6.1 CONSULTATION AND COMMUNICATING WITH OTHERS

Consultation and communicating with others is an important part of the risk management process and should take place at all stages.

Identifying risks and hazards and coming up with ways of controlling them includes talking to the people with knowledge of the situation, or who are directly affected by any action you may take.

You should always talk to any workers involved in the hazard control measures as well as the OHS/WHS officer or supervisor.

This will help ensure that risks and hazards are not only effectively identified but that those involved with controlling and treating them are clear of their role and responsibilities in the risk management process.

It also allows different skills, expertise and views to be brought together to enhance and support the risk management process. It is important that different views and concerns are identified and recorded as part of the consultation and then taken into account during the decision-making process.

Controlling a hazard can be a team effort and it's important that everybody knows what they need to do and how/if they need to change their work process to suit.

1.2.6.2 RISK/HAZARD IDENTIFICATION

A **RISK** is the chance of a hazard hurting you or somebody else or causing some damage.

A **HAZARD** is the thing or situation that causes injury, harm or damage.

If you can remove or at least control a **HAZARD** you can reduce the **RISK** involved.

Checking for hazards is the first step in risk management.

Before commencing work on a site you should consult with safety officers, supervisors, site engineers, managers responsible for the site or other relevant workplace personnel/workers.

They can inform you of any site-specific hazards and ground conditions and ensure that you adhere to any workplace policies and site-specific procedures.

A site induction needs to inform you of any hazards which exist on site.

Some of these hazards can be removed through staff training, better equipment and safe work methods. Talk to the OHS/WHS officer for more information.

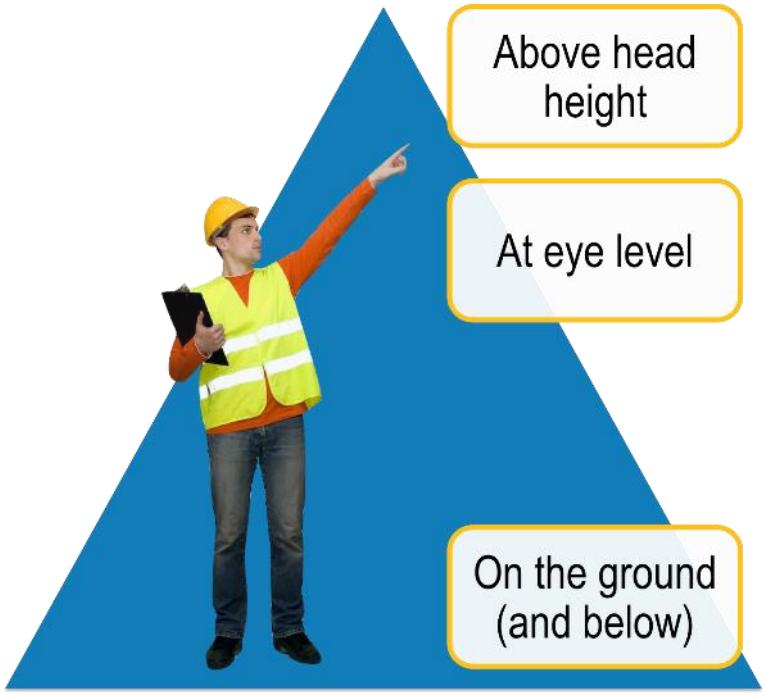
Each worksite will have specific risk management procedures, safety systems and information, and procedures for communication, reporting and record keeping.

Before conducting a risk assessment at a worksite, check to see what systems and procedures are in place as they may affect the outcomes of the risk assessment.

It is important that suitably knowledgeable personnel/workers are involved in the risk identification process.

Identify Hazards

Part of your job is to look around to see if you can find any hazards before operations begin. A good tip is to check:



Potential Hazards And Risks

Potential hazards and risks that may be identified during the inspection of the work area may include:

- Weather conditions, e.g. storms, heat, humidity.
- Structural hazards, e g. fences, bridges, facilities, buildings, poles, work zones.
- Working at heights or in confined spaces.
- Hazardous materials and substances, e.g. fuel, chemicals, contaminants, gases.
- Manual handling or lifting issues.

- Environmental hazards – unstable or uneven terrain, holes, excavations, trenches, cuttings, embankments, over-hanging rocks, trees, dust and noise, unstable faces or areas.
- Damage to finished work areas.
- Water damage due to insufficient or in adequate drainage.
- Height of fill areas and embankment slopes.
- Plant rollover.
- Rotating plant (e.g. mixers) and revolving plant (excavator swing zones).

- Overhead and underground services.
- Worksite traffic, plant, machinery and vehicle interaction and people.
- Refuelling (in case of environmental damage).
- Equipment in use or unattended.
- Damaged or defective equipment.
- Other aspects that may be specific to a task or location.

1.2.6.3 RISK/HAZARD ASSESSMENT

A risk assessment involves completing a risk analysis and a risk evaluation.

By assessing the likelihood and consequence of the risk, you are able to understand the situation better and respond in an appropriate way.

Risk/Hazard Analysis

Risk analysis involves considering what the causes and sources of risks are and comprises of 3 factors:

Consequence	What would be the outcome of the event occurring? How severe would the outcome be?
Likelihood	What is the chance of the event/consequence occurring? Has the event happened before? Is it likely to happen again?
Risk Level	The combined result of likelihood and consequence.

Using a table similar to the one shown here you can assess how high the risk level is.

LIKELIHOOD	**CONSEQUENCE**				
	Insignificant	**Minor** First Aid Required	**Moderate** Medical Attention and Time Off Work	**Major** Long Term Illness or Serious Injury	**Severe** Kill or Cause Permanent Disability or Illness
Almost Certain	**M**	**H**	**H**	**VH**	**VH**
Likely	**M**	**M**	**H**	**H**	**VH**
Possible	**L**	**M**	**H**	**H**	**VH**
Unlikely	**L**	**L**	**M**	**M**	**H**
Rare	**L**	**L**	**M**	**M**	**M**

Risk/Hazard Evaluation

Risk evaluation is based upon the outcomes and results of the risk analysis.

Risk evaluation involves making decisions about which risks need to be treated and the order in which they should be treated. It should take into consideration the context of the risks in relation to:

- The organisation.
- The worksite.
- The relevant laws.
- Regulations.
- Other policies, procedures and requirements.

Using a table similar to the one shown you can evaluate how soon you should act to remove or control the hazard to achieve an acceptable level of risk.

RISK LEVEL	ACTION
VERY HIGH	Act immediately: The proposed task or process activity must not proceed. Steps must be taken to lower the risk level to as low as reasonably practicable using the hierarchy of risk controls.
HIGH	Act today: The proposed activity can only proceed, provided that: 1. The risk level has been reduced to as low as reasonably practicable using the hierarchy of risk controls. 2. The risk controls must include those identified in legislation, Australian Standards, Codes of Practice etc. 3. The risk assessment has been reviewed and approved by the Supervisor. 4. A Safe Working Procedure or Safe Work Method has been prepared. 5. The supervisor must review and document the effectiveness of the implemented risk controls.
MEDIUM	Act this week: The proposed task or process can proceed, provided that: 1. The risk level has been reduced to as low as reasonably practicable using the hierarchy of risk controls. 2. The risk assessment has been reviewed and approved by the Supervisor. 3. A Safe Working Procedure or Safe Work Method has been prepared.
LOW	Act this month: Managed by local documented routine procedures, which must include application of the hierarchy of controls.

Any task with a Very High risk level is absolutely unacceptable to carry out. Steps must be taken to reduce the risk level.

1.2.6.4 RISK/HAZARD TREATMENT

Once risks have been identified, analysed and evaluated, risk treatment options need to be considered and applied.

Risk treatment involves selecting one or more options to modify a risk and then implementing the selected option/s. These should be recorded in a risk treatment plan.

Once an option has been implemented it may be referred to as a risk control.

Consider Hazard/Risk Control Strategy Options

The Hierarchy of Hazard Control is the name given to a range of control methods used to eliminate or control hazards in the workplace. The Hierarchy has 6 levels:

It is important that you understand what each level in the hierarchy stands for and how they can be implemented. Hazards should be re-assessed after the implementation of control measures to review whether the risk has been reduced enough.

1. Elimination	This is the best kind of hazard control. Eliminating or removing the hazard completely reduces any risk connected to it. An example of eliminating a hazard would be removing dangerous materials from the site, or repairing defective equipment.
2. Substitution	This is where you swap a dangerous work method or situation for one that is less dangerous. An example of this would be to use a group of people to move an item instead of trying to move it on your own (where the item cannot be broken down into smaller loads).
3. Isolation	This is where you isolate the hazard. This might mean fencing off an area or restricting access to the hazard in some other way.
4. Engineering Controls	This is where you use an engineering or mechanical method of doing the job. An example would be installing ventilation, or using a piece of equipment to move a load instead of moving it by hand.
5. Administrative Controls	This is where site rules and policies attempt to control a hazard. It can include working in teams, setting specific break times and frequent rotations for repetitive work or using signage to warn of hazards.
6. Personal Protective Equipment	This is your last line of defence and the least effective control – it should be used in conjunction with other hazard control methods. PPE includes any safety equipment worn on your body. Workplaces often have mandatory PPE requirements to go on site.

Follow all appropriate standards when deciding hazard control strategies including:

- Codes of practice.
- Legislation.
- Australian Standards.
- Manufacturer's specifications.
- Industry standards (where applicable).

1.2.6.5 MONITORING AND REVIEW OF THE RISK MANAGEMENT PROCESS

Monitoring and review is an important part of the risk management process and should be planned for at every stage.

This involves regular surveillance and checking and responsibilities concerning it should be clearly defined.

Monitoring and review should:

- Ensure that treatments and controls are effective and efficient.
- Aim to improve risk assessment through obtaining further information.

- Be used to analyse events and changes that have occurred through the implementation of the process and any lessons that may be learned from this.
- Be used to detect any changes, including changes to risks, which may require revision of treatments, or the emergence of new risks.

It is important that monitoring and review results are recorded and reported according to organisational policies and procedures.

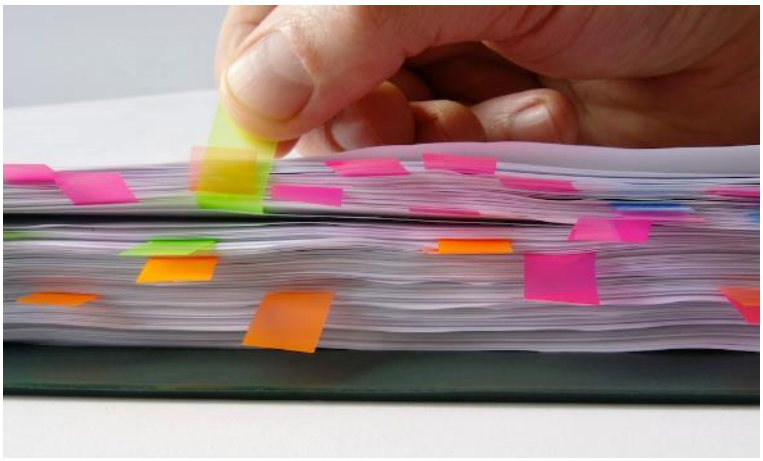
1.2.6.6 REPORTING AND RECORD KEEPING

Make sure you record any action you've taken and talk to your supervisor and OHS/WHS officer about the control strategies in place.

Reports and records could include:

- Safe Work Method Statements (SWMS).
- Risk Assessment Reports.
- Incident Reports.
- Job Safety Analysis (JSAs).

Keeping records is important as they can help ensure that any risk management activities are traceable. Records also provide a basis for improving methods and tools in the risk management process, as well as improving the overall process.



1.2.7 INTERPRETING AND APPLYING EARTHWORKS DOCUMENTATION

Being able to access, interpret and apply the requirements of the documents is part of any job on a civil construction worksite. During your site induction you will be told how to access the documentation relevant to your site and duties.

It is essential that you are able to read and accurately interpret your workplace policies and procedures so that you can work efficiently and safely, meeting organisational and client expectations.

Take the time to read through all the relevant documentation. Make notes about any points you aren't clear about and then clarify them later.

Read or listen to all instructions and follow them carefully. Check the wording of any labels, codes or markings.

Interpretation of compliance documentation is getting the key information out of the document that allows you to make correct decisions for each situation.

When interpreting documents it is vital that you understand the difference between words such as should, consider and must.

Should	***Should*** **indicates a preferred course of action. If you take a different course of action you will need to be able to justify this in the event of an accident or incident.**
Consider	***Consider*** **means that you have a choice of actions and need to select the action that will give the best and safest result for the particular circumstances.**
Must, Requires, Mandatory	***Must***, ***Requires*** **and** ***Mandatory*** **all mean that the action is a legal requirement and MUST be complied with.**

If you have any difficulties interpreting and/or applying requirements or you don't understand something, speak to your supervisor or team leader. It is always better to ask than to go ahead and possibly disrupt operations and/or cause a safety issue.

APPENDIX 1A – WORK HEALTH & SAFETY COMMON TERMS AND DEFINITIONS

Person Conducting a Business or Undertaking (PCBU)	A 'person conducting a business or undertaking' (PCBU) replaces the term 'employer'. A PCBU includes all employers, sole traders, principal contractors, unincorporated associations, partnerships and franchisees. Volunteer organisations that also employ people will be PCBUs. A PCBU's primary duty of care is to ensure the health and safety of everyone in the workplace, so far as is reasonably practicable.
Officers	An 'Officer' is a person who makes, or participates in making, decisions that affect the whole or a substantial part of a corporation. This includes Health and Safety Representatives (HSR).
Workers	'Worker' replaces the term 'employee'. It is defined broadly to mean a person who carries out work in any capacity for a PCBU. A 'worker' covers employees, contractors, sub-contractors (and their employees), labour hire employees, outworkers, apprentices, trainees, work experience students and volunteers.
Reasonably Practicable	Reasonably Practicable is defined as action that is, or was at a particular time, reasonably able to be done to help ensure health and safety based on the following factors: a) Chances of the hazard or risk occurring (likelihood). b) The degree of harm (consequence). c) The knowledge of persons involved in the situation relating to the hazard or risk and methods of eliminating or controlling it. d) The availability and suitability of ways to eliminate or control the hazard or risk. e) The costs involved in taking action to eliminate or control the hazard or risk including consideration of whether the cost involved is inconsistent to the level of risk.
Due Diligence	The Work Health and Safety Act 2011 (the WHS Act 2011) imposes a specific duty on officers of corporations to exercise due diligence to ensure that the corporation meets its work health and safety obligations. In short, they have a responsibility to ensure that the PCBU is doing everything it should to ensure health and safety. The duty requires officers to be proactive in ensuring that the corporation complies with its duty. Due diligence may be demonstrated through the following courses of action: 1. Acquiring knowledge of health and safety issues. 2. Understanding operations and associated hazards and risks. 3. Ensuring that appropriate resources and processes are used to eliminate or minimise risks to health and safety. 4. Implementing processes for receiving and responding to information about incidents, hazards and risks. 5. Establishing and maintaining compliance processes. 6. Verifying the provision and use of the resources mentioned in 1-5.

APPENDIX 1B – HAZARD REPORT FORM

Company Name:	Form Completed By:	Date of Inspection:
Site:	Address:	Contact Phone Number:

1. Identified Hazard	Hazard Type:
2. Hazard Details	Description of Hazard:

LIKELIHOOD	CONSEQUENCE				
	Insignificant	**Minor** First Aid Required	**Moderate** Medical Attention and Time Off Work	**Major** Long Term Illness or Serious Injury	**Severe** Kill or Cause Permanent Disability or Illness
Almost Certain	**M**	**H**	**H**	**VH**	**VH**
Likely	**M**	**M**	**H**	**H**	**VH**
Possible	**L**	**M**	**H**	**H**	**VH**
Unlikely	**L**	**L**	**M**	**M**	**H**
Rare	**L**	**L**	**M**	**M**	**M**

RISK LEVEL	ACTION
VERY HIGH	Act immediately: The proposed task or process activity must not proceed. Steps must be taken to lower the risk level to as low as reasonably practicable using the hierarchy of risk controls.
HIGH	Act today: The proposed activity can only proceed, provided that: 1. The risk level has been reduced to as low as reasonably practicable using the hierarchy of risk controls. 2. The risk controls must include those identified in legislation, Australian Standards, Codes of Practice etc. 3. The risk assessment has been reviewed and approved by the Supervisor. 4. A Safe Working Procedure or Safe Work Method has been prepared. 5. The supervisor must review and document the effectiveness of the implemented risk controls.
MEDIUM	Act this week: The proposed task or process can proceed, provided that: 1. The risk level has been reduced to as low as reasonably practicable using the hierarchy of risk controls. 2. The risk assessment has been reviewed and approved by the Supervisor. 3. A Safe Working Procedure or Safe Work Method has been prepared.
LOW	Act this month: Managed by local documented routine procedures, which must include application of the hierarchy of controls.

3. Risk Assessment	Risk Likelihood Level:	Risk Consequence Level:	Risk Level:
	Is there an existing safety system or procedure that deals with this hazard? Yes / No Details:		

4. Control Strategies	Intended Control Strategy (Details and Resources Required)	Tick Box
	Elimination	
	Substitution	
	Isolation	
	Engineering	
	Administration/Safe Work Practices	
	PPE	

Is the control strategy feasible? Yes / No

5. Action Plan	Has a plan for the implementation of the control strategy been completed?	
	Have the required resources been obtained?	
	Does the implementation meet the requirements of workplace policies and procedures?	
	What is the intended date of implementation?	_____/_____/_____
	Who is responsible for implementing the control strategy?	
	Date of review of action taken:	_____/_____/_____
6. Review	Date of Review:	_____/_____/_____
	Review completed by:	
	Has the hazard control been successfully implemented?	
	New risk level:	
	Is this risk level acceptable?	
	Further action required?	

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LEARNER GUIDE 2

APPLY THE PRINCIPLES OF EARTHWORKS CONSTRUCTION

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2.1 CONFIRM SPECIFIC TASK INFORMATION AND REQUIREMENTS

Before any earthworks construction work can begin you will need to obtain and understand the information and requirements specific to the project and to each task.

2.1.1 EARTHWORKS AND CIVIL CONSTRUCTION TERMINOLOGY

The civil construction industry has language standards or terminology that can vary between states, locations or worksites.

Individual earthworks tasks and activities on a worksite may have a set of terms or phrases with specific meanings.

Tools and equipment may be known by various names, and jargon or local slang words could also be used occasionally.

Familiarise yourself with the terminology used on your site and for specific tasks.

If you aren't sure about the meaning of a particular term, phrase or word you should seek further clarification at team meetings or speak directly with your manager.

This is important when you are interpreting specific task information and requirements, issuing work instructions to your team and carrying out your supervisory duties in general.

2.1.2 COMMON TASK SPECIFICS

You will need to read and interpret all of the specific information so that you know what needs to be done and are aware of any factors that could impact the completion of tasks.

As a supervisor it is essential to make sure you have the correct details and clearly understand all specific requirements and procedures.

Clarify any points you are not sure about by speaking with your manager, the site project officer or engineer.

Common information and requirements specific to earthworks projects and tasks that you will need to work with may include:

- Relevant Safe Work Method Statement (SWMS) or Job Safety Analysis (JSA).
- Sources of materials.
- Known and potential site hazards, constraints and conditions.

- Site cultural and heritage information.
- Organisational and/or site procedures.
- Other organisations and contractors involved in the task or related tasks.
- Coordination, timing and budgeting requirements.
- Task procedures – will normally be very specific and require minimal interpretation but always clarify anything you do not understand.

Other task specifics you might need to interpret may include:

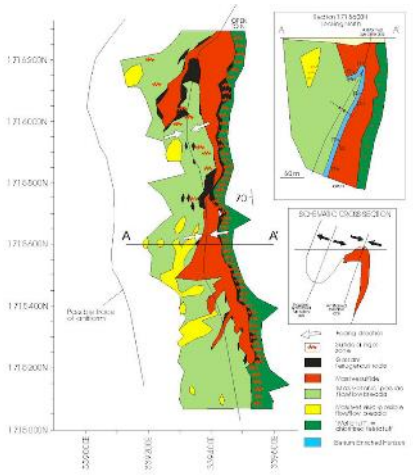
- Geotechnical, Geological And Survey Data.
- Hydrological Data.
- Meteorological Data.
- Task Drawings, Plans And Specifications.

2.1.2.1 GEOTECHNICAL, GEOLOGICAL AND SURVEY DATA

Geotechnical data for the project and site involves the principles of soil and rock mechanics.

These are used to:

- Identify soil and rock types and characteristics.
- Check conditions and materials on and under the ground surface.
- Determine their physical/mechanical and chemical properties.
- Evaluate the stability of natural slopes and man-made soil deposits.



Soil or geological data is the information about the materials and the environment in which the work will take place, for example:

- Defining material types.
- Identifying wet and dry areas.
- Identifying broken ground, faults and joints.
- Locating water tables.
- Showing compaction levels.

Survey and engineering information is used to define work areas and zones, for example:

- Floor heights.
- Bench heights and widths.
- Floor and bench grades.
- Voids and underground situations.
- Road profile requirements.

Application of the correct engineering survey data will ensure compliance within the specified tolerances for the work.

Rock And Soil Types

Identification of the different types of rock and soil is essential to the successful completion of most civil construction projects.

Soil and rock types may include:		
Rock Types:	**Metamorphic**	Rocks are heavy and hard.
	Igneous	Rocks are volcanic and can be hard, but may also be very light
	Sedimentary	Rocks and shales could peel out when cut and removed.
Soil Types:	**Sandy**	Soils will require a lot of stabilisation
	Clay	Soils are harder to work with due to the physical hardness of the soil and the ability of these soils to hold water for long periods of time.

Soil and rock types will have been identified during the site engineering surveys. Interpretation of this data allows for successful planning and preparation on the worksite.

2.1.2.2 HYDROLOGICAL DATA

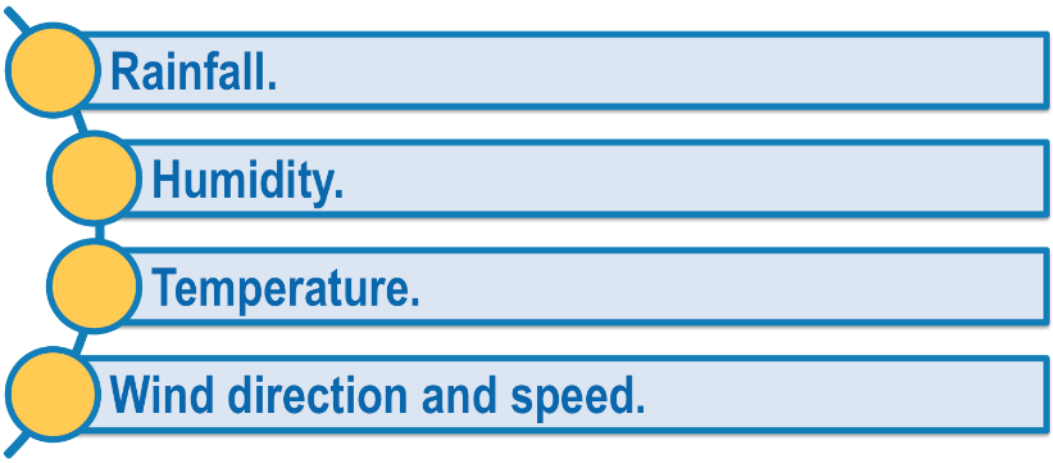
Hydrological data mainly concerns surface water and ground water on the site and it is critical to the success of earthworks operations.

Hydrological data helps to determine the properties, distribution and effects of water, moisture content and exposures on the project/site soil, rocks and atmosphere.

These factors must be known to ensure all tasks are completed using the correct materials and processes.

2.1.2.3 METEOROLOGICAL DATA

Meteorological data is used to determine the weather conditions that will impact how and when tasks will be completed. Meteorological data includes factors such as:



2.1.2.4 TASK DRAWINGS, PLANS AND SPECIFICATIONS

Project plans and drawings provide an overview of the site including, for example:

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

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

You should be familiar with the conventions and symbols used in the plans and drawings so you can understand what the information means.

You also need to be able to interpret, clarify and apply the project and task specifications to ensure all activities are conducted correctly and in compliance with safety and quality requirements.

Project and task specifications list the types and characteristics of particular earthworks tasks to be carried out.

They may be presented in the quality requirements, project drawings, notes and descriptions, or outlined in work instructions.

They also detail how activities will be completed and may include:

- Materials and quality of work – for example, testing, sampling, finished tolerances, and material properties.
- Information about the soil and other materials you will be working with.
- Quality assurance requirements – may be specific to the organisation, job or client, and may have to comply with Australian Standards or relevant codes of practice.

Incorrect plans and drawings or misinterpretation can cause major complications. If you need assistance in interpreting, clarifying or applying drawings and job specifications, speak to your manager or other senior project staff.

2.1.3 IDENTIFYING SITE ISSUES

As a supervisor you need to be aware that various problems or unplanned situations can arise during earthworks projects.

Some of these issues may involve:

- Drainage requirements.
- Unidentified soil and rock types.
- Acid sulphate.

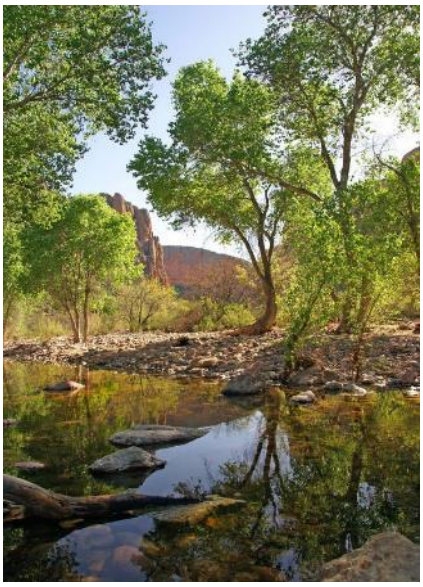
2.1.3.1 DRAINAGE REQUIREMENTS

Drainage and dewatering refers to any activities that move water from the worksite in a controlled manner.

Drainage and dewatering requirements may involve:

- Any form of erosion or sediment controls.
- Pumping out of sumps or pits.
- Shifting water from one location to another using the site controls or water transfer devices such as pumps.

Drainage on a worksite can apply to areas such as:



- Creeks.
- Surface water.
- Bores.
- Coffer dams.
- Springs.
- Wetland water.
- Seepage water in trenches and pits.
- Low lying natural ground where water may not escape.

Drainage is essential to the success of any task in earthworks.

Once drainage issues have been identified, they will need to be managed promptly and effectively in line with environmental protection legislation and site requirements.

The most important part about draining and dewatering a construction site is that **no dirty or contaminated water or pollution** must leave the site. If this happens, severe penalties can apply that can be imposed by federal, state and local government authorities.

2.2 PREPARE A JOB PLAN

As most earthworks projects have strict timelines to be met it is important to have a job plan or program of work.

In your role as supervisor or technical specialist you need to ensure the availability of a job plan that makes the most efficient use of the resources on site and meets all task requirements.

2.2.1 SCHEDULING EARTHWORKS ACTIVITIES

Earthworks construction includes a variety of different work activities. It is common for several operations to be occurring at a similar time, for example:

- Clearing and grubbing.
- Removal of unsuitable materials.
- Grading tracks.
- Drainage.

- Removal of topsoil.
- Placement of fill materials (backfilling).
- Other concurrent worksite activities.

Scheduling all of these activities will ensure that processes are conducted in the correct order or sequence and that the appropriate resources are available when they are needed.

In addition to the machinery, plant, equipment and personnel/workers needed for each task, resources also include the correct materials in the correct quantities.

Not all of the resources will be required at the same time.

Generally, there are procedures in place to make sure that workers are on hand, equipment is available and the delivery of materials can be scheduled according to the relevant activities.

To get a clear picture of the activities involved in the project you are supervising, you will need to determine the properties and characteristics of earthworks materials before work is started.

2.2.1.1 CONSTRUCTION MATERIAL PROPERTIES AND TESTS

In most cases, the material properties have been tested through a geotechnical laboratory prior to the start of works.

Sometimes it may also be necessary to conduct tests during work processes as materials or conditions change.

The test results from the materials analysis will provide details of any additional treatments that may be required to meet the specification requirements.

In some cases additives such as lime, cement, fly ash, or other blends may be necessary to ensure the material is stable to use in earthworks construction.

Always follow your organisation's procedures for material sampling and testing and if you are unsure check with the relevant personnel/workers.

Some common civil construction material properties and test results that you may need to interpret include:

Material Properties And Test Results:	Description:
Soil Density/Moisture Relationship	To gain adequate compaction it is necessary to have the density and moisture in balance. If the material moisture is too high then it can become difficult to work or simply turn to mud. If the moisture content is too low the material will not bind and therefore will not compact properly. Density and moisture testing is routinely carried out on all earthworks construction activities.
Plasticity Index	The plasticity index (PI) determines how the materials can be shaped and will relate to the clay content within the material. High clay content material or high PI may be very difficult to work on its own and may require additives to allow suitable construction. Generally construction materials have to fall within a certain PI to be able to be used in the works. In some cases it may be necessary to blend materials so the PI is modified.
Particle Size Distribution	It is important to have the right balance of particle sizes to ensure the correct construction of layers. There must be the correct balance of particle sizes for the materials to meet specification requirements. Particle size distribution is very important when backfilling structures so that no damage occurs to the structure. Particle size distribution becomes more important as earthworks layers are constructed. Seek advice from geotechnical testers if the particle size distribution is incorrect for the work activity.

2.2.1.2 CALCULATING MATERIAL QUANTITIES

Calculating quantities is an important part of any earthworks activity. Knowing how to do this efficiently and effectively helps ensure the job is completed correctly and in line with job requirements.

You should always keep a copy of your calculations to verify your results or if you have to go back and check or change things later.

Accuracy is important as incorrect figures could be costly in terms of materials, resources, scheduling, and potential re-work.

Some common quantity calculations for the execution of earthworks tasks include:

Volume

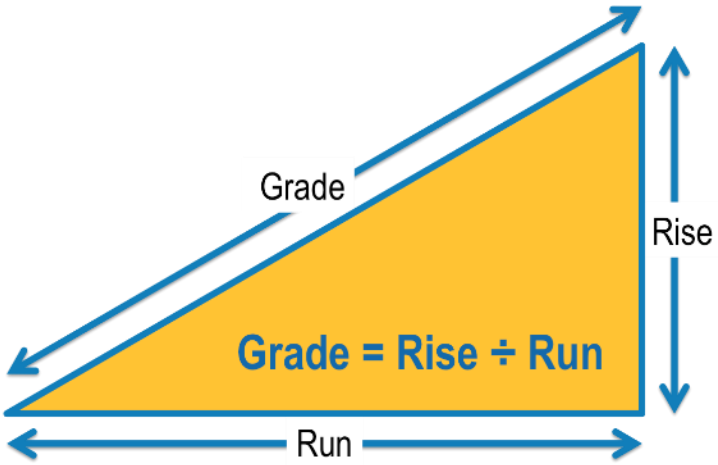
In some cases it may be relevant to know how to convert material weights from tonnes to cubic metres. For this you need to know the relevant densities of the materials. This information can be sourced either from the supplier or from the geotechnical testing technicians. In most cases earthworks quantities are measured in cubic metres of volume, for example, length x width x depth.

Area

This is calculated by multiplying width x length, usually in metres.

Grade

Often calculated as rise divided by run. In some cases it is also known as the slope.



Specific grades will be indicated on the project and site plans and drawings. Where GPS control is used, grade details will be imported into the machine. In some cases it may be necessary for surveyors to mark out the appropriate grade.

Percentages

In some circumstances percentages are also known as cross fall. This is generally the slope placed on earthworks to ensure water can drain off the work area. For example, a 3% cross fall would equate to a 3 metre rise across a 100 metre area.

Some types of earthmoving plant and machinery are able to self adjust to create the appropriate cross fall percentage.

Resource Consumption

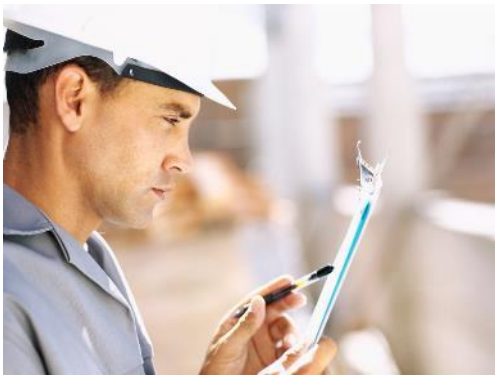
Resource consumption, including required supply rates, refers to how much material is used or consumed and how quickly it can be resupplied, either from another location on the worksite or from an external supplier.

It is important to know supply times from external suppliers as there may be a delay to the works if materials are not available when needed.

Daily production figures will often be used as a guideline to work out consumption rates. Be aware, however, that not all materials are consumed at the same rate and supply rates may differ from worksite to worksite.

If you are unsure about how to correctly calculate any of these quantities or interpret resource consumption figures, your manager will be able to help you.

2.2.1.3 PLANNING AND SEQUENCING OF CIVIL WORKS



As a supervisor you may be involved in planning which civil construction work activities will be completed and in what order. You therefore need to understand the relationship between the different areas of civil works and the sequences of the tasks involved.

Always ensure that all base activities or sub-tasks are completed. These are the things that need to be completed prior to the commencement of other activities. You will need to consider all of the activities and deadlines on the site.

For example, in pouring concrete for a culvert, the planning would cover:

- Measuring the area.
- Creating the plans and drawings.
- Marking out the area and creating formwork.
- Ordering the concrete.
- Completing sub-works to the deadline of the concrete arriving.
- Pouring the concrete.
- Removing the framework or formwork.

Remember that few tasks are completed in one step.

Always factor in the completion of each sub-task when planning work activities.

By breaking the work into smaller component tasks you will have a better chance of completing each task on time and on budget.

Common sequences that you will have to supervise during the earthworks project may include the following:

Earthworks:

1. Mark out the work area.
2. Clear and grub (remove vegetation)
3. Remove the topsoil.
4. Create contours or drains, or carry out the next step in the construction process.

Roadworks Construction:

Construction of roads follows the steps for earthworks and then:

1. Formation of drain lines or contours.
2. Cutting and filling to the required level.
3. Carrying out compaction activities.
4. Finishing pavement layers.

Drainage:

Drainage includes the steps for earthworks then:

1. Forming drain lines.
2. Forming out the work area, that is building the frame to hold the drain system.
3. Laying pipes, box drains or culverts.
4. Backfilling.
5. Landscaping as appropriate.

In scheduling it is important that you are aware of the specific timelines or sequences in which activities need to be completed on your site.

2.2.2 JOB PLAN DRAFTING AND ADMINISTRATION

For the project to run smoothly the job plan must cover all aspects of the tasks and activities being undertaken on the site.

In drafting the plan you also need to allow some flexibility to account for any changes in circumstances while still ensuring that the project targets and objectives are achieved.

The job plan being drafted should include sub-plans that address requirements for:

Job Plan Drafting Requirements:	
Human resources.	Plant and machinery.
Construction materials, including quality and delivery.	Occupational Health & Safety/Work Health & Safety (OHS/WHS).
Sub-contractor support.	Communication and coordination.
Activity scheduling.	Material delivery.
Risk management.	Traffic management.
Quality management, including testing schedules.	Environmental management, including waste disposal.
Task and performance monitoring.	Reporting.

Each one of these smaller plans will contribute to the site management plan and each plan must be adhered to.

All organisations have their own administration procedures and requirements, depending on the scope of operations.

In most cases they will be outlined in company policies and procedures.

Administration procedures and requirements may cover:

- Staff requirements such as leave timesheets, wages or other documentation.
- Reporting achieved targets or productivity.
- Procurement.
- Supply agreements.
- Sub-contractor engagements.
- Accounts procedures.
- Other requirements specific to the project and/or site.

2.2.2.1 CONTRACT MANAGEMENT

The contract is the document that will outline exactly how your organisation will complete all project tasks on time and within the designated budget.

The contract will determine the success or failure of the job and is crucial to the financing of all activities.

Each section of the contract will outline who is responsible for what and at what cost.

It is important to correctly interpret the requirements of the project contract to ensure that all earthworks plans, client requirements and quality standards are known, understood and achieved.

Depending on the structure of your organisation and your role within it, the level of your involvement in contract management can vary.

You may be required to estimate the costs and/or time factors for a job.

The principles of estimation are relatively easy to understand but it can take some time and practice to apply them accurately and effectively.

Basically, to estimate the cost of completing a task you add the cost of production to the cost of materials.

To estimate the completion time of a job, you work out how long each individual activity should take from start to finish.

You then determine how many activities need to be completed. The total of these two figures should give an estimate of the total hours.

Most organisations will have designated contract managers whose sole task is ensuring that all contract requirements are met and procedures are followed.

LEARNER GUIDE 3

APPLY THE PRINCIPLES OF EARTHWORKS CONSTRUCTION

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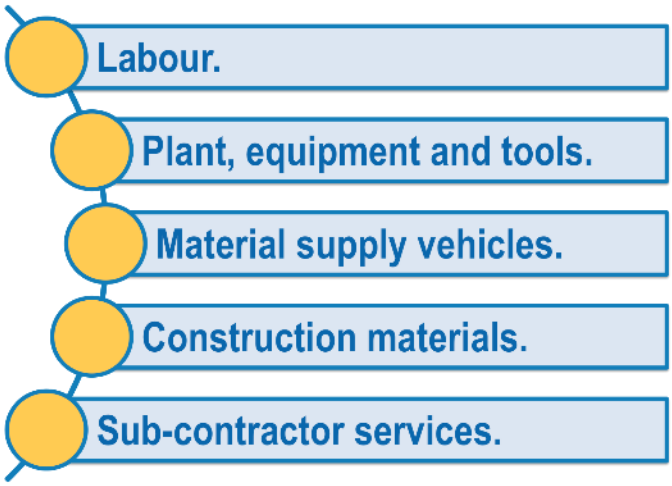
3.1 CONFIRM AVAILABILITY OF RESOURCES

To ensure that earthworks construction tasks can be initiated, it is important to confirm that the correct resources are available.

3.1.1 EARTHWORKS CONSTRUCTION RESOURCES

Necessary resources for earthworks construction may include:



Having the appropriate resources available and ready will allow your team to maintain the required levels of productivity through efficient work practices.

It also means you can be certain that personnel/workers have the right tools and equipment for the job, ensuring safety and effectiveness throughout operations.

3.1.2 RESOURCE REQUIREMENTS AND PROCEDURES

Each project will have its own resource requirements based on the tasks and specifications involved.

You will need to confirm that you have accounted for these by checking the project and task documentation.

You should also confirm that the relevant organisational procedures for procuring the equipment have been followed in the planning and allocating of resources for the task.

In determining the correct resources for the activities, you need to confirm that plant and equipment is suitable for the task.

This will mean checking the intended application or use of each item is in line with its capabilities and limitations.

You may need to refer to the machine specifications and other details listed in the individual operator's manuals or your site documentation.

Prior to work starting, make sure that personnel/workers know how to use each tool and piece of equipment or plant correctly, in line with site and equipment safety requirements.

Also check that the appropriate operational checks have been carried out to ensure all items are serviceable and safe to use.

The resources for the activity should be checked and confirmed with the relevant personnel/workers such as supervisor/managers, engineers or project management staff to ensure that resource requirements and procedures have been adhered to.

This will help to avoid any safety issues or other potential problems.

Be aware that resource requirements may change once earthworks tasks begin as conditions or other factors can differ from when the job was planned.

You may need to procure alternative materials and types of equipment or source additional labour to get the job done.

3.2 PROVIDE INSTRUCTIONS AND LEADERSHIP TO WORK TEAM

In applying the principles of earthworks construction it is vital to make sure that all team members have received clear and timely instructions.

You will therefore need to follow your organisation's requirements and procedures for communication and teamwork, and apply your skills in supervision and leadership.

3.2.1 COMMUNICATING WITH TEAM MEMBERS

Team members and others who may be involved in the earthworks activities under your supervision may include:

- Personnel/Workers directly involved in the task.
- Other members of the organisation's management team.
- Supplier's representatives.
- Sub-contractors representatives.
- Supervisors or managers of other organisations who are involved in related tasks.

- Engineering staff.
- Administrative staff.
- Other people necessary to the operations.

In some cases, a subject matter expert will be brought in to be part of the team and may act as a technical adviser.

Clear and effective communication is essential in any workplace.

Your site will have procedures covering every aspect of communication, including recording and reporting.

Site communication requirements and procedures may detail factors such as:

- Documentation requirements, e.g. verbal or written reports.
- Protocols for using communications equipment.
- Communications equipment and methods to be used on site, including:
  - Two-way radios.
  - Mobile phones.
  - Landline phones.
  - Email.
  - Instant messaging.
  - Message boards.
  - Hand signals and symbols – used due to the high levels of background noise.

To ensure that activities are completed in line with the specific task requirements safely, effectively and on time, clear and timely instructions are given to personnel/workers by the supervisor.

These instructions may be passed down the line from management or other staff overseeing the project.

Instructions and other information may be communicated through:

- **Briefings** – information provided both before the work begins and during the task or operations.

- **Site Meetings** – site meetings are conducted for various reasons. They may be with management, workers, client representatives, or other key staff on the worksite. The meetings may be specific to a particular aspect, inspections, planning, or in response to incidents or actions on the site.

- **Work Orders** – some organisations have a work order process that has to be followed prior to beginning a task. This may include compliance or contractual requirements that must be observed to complete the task.

- **Toolbox Meetings** – these could range from individual work teams to the entire worksite, depending on the information content. On some sites a pre-start toolbox meeting is conducted at the start of each shift or work day, and a weekly toolbox meeting may be held to provide a broader range of information to workers.

- **Handovers** – critical information regarding activities or processes that may be handed over to another crew or work team.

Briefings, handovers and toolbox, and site meetings are vital in aiding communications on the site.

They allow interaction between management, supervisory staff, workers, subcontractors, and any other people involved in the activities.

As a supervisor you need to ensure that thorough preparation goes into these briefings and meetings so that appropriate and relevant information is conveyed to the team.

It's important that the work team or teams are kept informed of issues that may relate to safety, quality, environment, traffic management, or general work activities.

The level of information that is given out will be suitable to work operations and the people involved.

In providing instructions for work teams, you also need to be able to prepare short messages that are clear, concise, and easy to understand.

When preparing messages or instructions, make sure they are appropriate and not confusing for the receiver. It helps to remember the target audience you're aiming your message at.

Always give the receiver the opportunity to confirm the instruction or message and to ask questions if necessary.

3.2.2 DEVELOPING WORKPLACE RELATIONSHIPS

Communication is essential to a successful relationship between team members and supervisors.

A good leader keeps communication channels open to encourage productivity and information sharing.

Effective leaders should be able to understand what each worker actually does. This is achieved by staying in touch with the team and stepping in to operational roles to assist when needed.

Developing and maintaining workplace relationships is an important part of being a leader or supervisor.

It promotes a good work environment and encourages effective interactions between team members, supervisors, management, and any additional people that may be involved with the work activities.

It is important to make sure that everyone observes organisational and site requirements for working and interacting with others.

If you are unsure or require assistance with workplace relationships, talk to your supervisor/manager or other senior staff.

3.2.2.1 LEADERSHIP AND SUPERVISION

Good leadership promotes harmony within the team and enhances productivity.

To be a good leader you have to be able to give instructions and coordinate activities, as well as listen to suggestions or input from your team.

Your style of leadership will depend on your team members, organisational requirements, work procedures, and the type of earthworks construction being undertaken.

The leadership techniques you adopt will depend on the nature and dynamics of the group and also the experience level of the people concerned.

It is important to make good use of the skills and knowledge within your team and ensure that everybody can contribute when required.

Giving feedback to individuals and the team as a whole is an important part of leadership. It should always be constructive and helpful, where possible.

As a supervisor you are providing leadership. You need to be able to:

- Communicate.
- Organise.
- Plan.
- Manage people and resources.
- Liaise with both management and your work team.

Supervision also involves being able to deal with issues that may be related to work tasks, personnel/workers, subcontractors, suppliers, or other aspects of earthworks operations.

Being a supervisor means trusting in your team and leading by example.

If you are having difficulty with any aspects of your supervisory role, speak to your supervisor/manager or mentor.

Your organisation may be able to provide training or other support.

3.2.2.2 MENTORING

In supervising your work team you may be required to provide guidance and assistance to individuals throughout their tasks, and assist them to take responsibility for their own actions.

You could do this by giving general advice or through the use of mentoring.

By being a mentor you are sharing your skills, knowledge or expertise in order to foster the professional growth of another person. The focus of mentoring is on changing behaviour.

Five techniques commonly used in mentoring are:

Accompanying	**Making a commitment in a caring way. Learning alongside the learner.**
Sowing	**Explaining things to the learner that may not make sense at first, but will become apparent to the learner when the situation arises.**
Catalysing	**Plunging the learner into change, provoking a different way of thinking, a change in identity or re-ordering values.**
Showing	**Making something understood by using your own behaviour to demonstrate a skill or explain something.**
Harvesting	**Creating awareness of what has been learnt, by asking questions and getting the learner to draw conclusions.**

As a supervisor and a mentor you require patience, understanding and the ability to communicate clearly and concisely.

You need to understand what is involved in the process or procedure or be able to consult with subject matter experts to give the appropriate response.

It is always best to work with the skills and experience that you have within your team and in many cases experienced workers or operators can be used to assist in mentoring less experienced people.

Some organisations have mentoring programs or have specific procedures that need to be followed.

3.3 SUPERVISE TASK SET OUT

Setting out tasks is the process of preparing work areas in a manner that ensures effective completion of the required work.

3.3.1 SETTING OUT PROCESSES

While set out principles are the same across the civil construction industry, procedures and requirements for task set out will be determined by the type of earthworks being carried out and the specifications you are working under.

Procedures will be established at the beginning of the project but you may have to adjust or modify them according to the work location or geographical features of the site.

They can also change with the needs of the tasks during the project. Always check the relevant set out requirements and procedures before the job starts.

3.3.1.1 SET OUT REQUIREMENTS AND PROCEDURES

Set out requirements and procedures include:

Requirements And Procedures:	Description:
Establishing Control Lines	Control lines are the base line for measuring from. They vary from site to site but could comprise boundary lines, fences, string lines, defined work areas, or other details as indicated in plans or drawings.
Establishing Cleared Width	The cleared width generally indicates the level of clearing that must be undertaken for the earthworks tasks. It ensures that the work stays within a defined footprint and aims to minimise environmental damage that may occur.
Determining Batters	Batters are the slopes that may be naturally formed as part of the work location, for example in a cut area or embankment fill areas. Batters often have specific set out requirements to meet slope and grade dimensions.
Establishing Construction Offsets	Before any project begins, it is important that the boundaries or clearance zones are determined and marked out.

This is necessary to prevent confusion and to ensure that the earthworks project is marked out in line with relevant plans, specifications, design drawings or other relevant details.

Offsets refer to how far from a control line an activity is to take place or an area is to be cleared.

A negative number means the offset is to the left of the line, a positive number means the offset is to the right of the line.

By varying the amount of movement between the right and left of the line, you are able to establish or create different shapes in the final product.

In establishing construction offsets, quite often survey markers and level pegs are used to define the work area.

In many cases these pegs or markers are placed at an offset value to where the works are being conducted to prevent them from being hit or damaged during the work processes.

Offsets can include a number of factors such as formation width, measurement and survey pegs, benchmarks or other job specific details.

3.3.1.2 ROAD GEOMETRY

For roadwork projects, it is important that set out is completed to ensure the correct road geometry is achieved. Road geometry can include factors such as:

- Grade or slope.
- Curves and curve radius.
- Crests.
- Drainage types and requirements.
- Structures.
- Cuttings or embankments.
- Other relevant factors to the road construction.

The road geometry required for a roadwork project will be defined in site drawings and plans.

The relevant specifications will also outline any factors that may be relevant to the project.

To achieve the required road geometry, procedures must be followed and compliance obtained with relevant survey and compaction tolerances.

3.3.2 SETTING UP AND USING LEVELLING DEVICES

Levelling devices are used in many different aspects of the setting out process, such as:

- Determining drainage grades.
- Determining gradients, batters and benches.
- Measuring offsets.
- Helping with road geometry.

Earthworks and civil construction projects involve the use of several different types of levelling devices.

These may include:

- Laser levelling equipment.
- GPS equipment.

- Spirit levels.
- Dumpy levels.
- Specified survey equipment.
- Level staffs.
- Or other site-specific equipment.

For basic earthworks, it is necessary to have an understanding of how to set up the types of levelling devices appropriate for your worksite.

This will often come with experience or relevant training in the use of the devices.

To ensure effective operation of the levelling equipment and devices it is necessary for all items to be correctly calibrated before use.

Calibration is done in different ways, depending on the brands and models of the equipment so you should refer to the relevant operator's manual, product specifications and/or manufacturer's instructions.

When setting up the levelling device, make sure you have positioned it in accordance with the manufacturer's specifications. Each leg of the tripod should be adjusted to ensure a level platform for the device.

Make sure you read the owner or operator manual that comes with the equipment to ensure you are aware of what you need to do to use the equipment correctly.

If you are having trouble in setting up devices for levelling, seek guidance from your supervisor/manager, the site engineers or other relevant people.

LEARNER GUIDE 4

APPLY THE PRINCIPLES OF EARTHWORKS CONSTRUCTION

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4.1 MONITOR EARTHWORKS CONSTRUCTION TASKS

A major part of a supervisor's job is overseeing the execution of earthworks construction tasks.

Overseeing involves the monitoring and inspection of the performance of work being done and the safety of all personnel/workers on the site.

Consistent monitoring and inspection allows you to ensure that all tasks are carried out safely and efficiently and that the required outcomes are achieved.

4.1.1 PROJECT AND TASK MONITORING

The monitoring process you need to follow is generally outlined in the project and task specifications as well as organisational procedures. Monitoring includes the following aspects:

- Ongoing risk assessment and management.
- Engineering survey.
- Sampling and testing.
- General supervision, observation and recording.

4.1.1.1 ONGOING RISK ASSESSMENT AND MANAGEMENT

Risk assessment and management is an important part of any earthworks activity. The complexity of tasks and other work going on in the area can determine the level of risk that may exist.

Risk on a worksite can relate to a number of factors including:

- Health and safety.
- Environmental management.
- Quality assurance.
- Financial cost.
- Legal obligations.
- Business reputation.
- Contractual liability.
- Other relevant aspects.

Each area of the worksite requires constant risk assessment based on the activities being undertaken.

Conditions and circumstances may change as the work progresses so it is important to continually assess risks to safety, quality and environment and anything that may have an impact on the works or people on site.

The level of risk should be analysed on a holistic basis for the project as well as on a work activity basis.

While the basics of risk management apply to all workplaces, each organisation and/or site will have different risk management processes to suit their specific situation.

It is therefore very important that you familiarise yourself with the relevant procedures and requirements before you start work on a new site and prior to the commencement of each earthworks construction task.

4.1.1.2 ENGINEERING SURVEY

All earthworks projects are set out to required tolerances and standards.

These are generally based on engineering survey principles to ensure earthworks construction is being done correctly, with correct layer formation and within the specified tolerances.

It is important that all earthworks operators are aware of the relevant engineering survey principles that apply.

The principles may be relatively simple or quite complex depending on the tasks being undertaken. They will be defined in the project specifications and organisational procedures.

Remember that not all work will be set out by surveyors, and in some cases it will be the supervisor or the operators of plant and machinery who will have to get compliance with specified tolerances for the earthworks.

At the completion of earthworks layers a final survey must be done to ensure compliance.

4.1.1.3 SAMPLING AND TESTING

Sampling and testing will occur in every level of earthworks construction from the foundation to the top of sub-grade material. Conformance details regarding sampling and testing will be contained in the specifications and standards relevant to the job.

Material properties and test results

Before starting any earthworks project it is important to understand the material properties that you are working with.

In the initial stages of the job, testing should be undertaken so that the properties are known and understood to allow for additional treatments when necessary.

The soil and rock types and characteristics will determine the construction methods to be used and the degree of compaction required.

The testing results will indicate material variances throughout the works. Test results are also used to ensure levels of compaction are achieved based on specifications.

4.1.1.4 GENERAL SUPERVISION, OBSERVATION AND RECORDING

Supervision of any project is necessary to ensure that all tasks are carried out in compliance with safety, quality and environmental requirements.

As a general rule, you will make observations and record details in the field using various guidelines, checklists, data sheets, registers, and other relevant organisation documents.

Some projects require a high level of monitoring while others may be smaller, with less overseeing and fewer inspections necessary.

Check the contract documents and task specifications for the guidelines you need to follow.

4.1.2 REQUIRED OUTCOMES AND MONITORING

It is important with any earthworks project to know and understand the required objectives and outcomes so that you and your team can work towards them.

Required outcomes for projects and tasks may include:

- Task specifications requirements.
- Task drawings requirements.
- Activity scheduling requirements.

- Waste management requirements.
- Coordination requirements.
- Unit cost requirements.
- Overall task cost requirements.

Other objectives and outcomes may also include:

- Health and safety targets.
- Environmental management targets or requirements.
- Quality assurance objectives.
- Performance indicators.
- Organisational objectives.
- Other project-specific targets or objectives as required.

4.1.2.1 MONITORING METHODS

Every earthworks job has some form of performance task monitoring that will be undertaken.

Often this will be based on the specification requirements or contract documentation.

Monitoring requirements can vary between organisations, worksites and individual contracts so it is important to know what procedures and processes you need to follow prior to the commencement of each task.

Monitoring the performance of tasks will relate to certain criteria, such as:

- Compaction.
- Layer thickness.
- Particle size.
- Clay content.
- Homogenous lot area (completed using the same production technique and using similar materials).
- Other site-specific requirements.

Some methods for monitoring may include:

- Field checklists.
- Inspection and test plans.
- Site inspections that may be daily, weekly, or based on a particular work area.
- Survey and level checks.
- Geotechnical testing.
- Material analysis.
- Other methods suitable to the site or work activities.

4.1.2.2 INSPECTION REQUIREMENTS

Earthworks operations involve routine inspections to ensure compliance with Occupational Health & Safety/Work Health & Safety (OHS/WHS) legislation, contractual obligations and requirements specific to the project and the worksite.

In some cases it may also be necessary to refer to relevant national and industry standards to ensure compliance.

The inspection requirements for each work task will be outlined in the specifications for the project and should also be in line with organisational procedures for the work activity.

Inspections may be in the form of observations, formal inspections, testing, survey, or other appropriate measures.

The timeframe for these inspections will be dependent on the works in progress and your organisation's procedures.

4.2 ADJUST EARTHWORKS PRACTICE OR JOB PLAN

During the performance of the earthworks tasks you may find that an aspect of the job plan is not appropriate or that some adjustments to certain construction methods are necessary.

4.2.1 EARTHWORKS CONSTRUCTION PRACTICE

Earthworks construction practice may include methods and operational techniques for the following:

- Site preparation.
- Extraction.
- Load and haulage.
- Placement.
- Distribution.
- Surface finishing.
- Line, grade and level control.
- Compaction.
- Water application.
- Sedimentation control.
- Other methods or techniques appropriate to the work activity or site location.

Industry standards usually apply across all earthworks construction sites, however some organisations require different operational techniques to be used in certain cases.

4.2.1.1 OPERATIONAL TECHNIQUES

The operational techniques for the earthworks construction project you are working on will be outlined in the relevant procedures for the work activity.

The project and task specifications should also indicate what operational techniques apply to the various types of tools, plant and equipment to be used.

Whatever earthworks construction practices are engaged, it is important that they allow for safe and effective production with appropriate use of available resources.

Sometimes it may be necessary to initiate changes to a technique or to develop new procedures based on changing conditions or circumstances.

In the application or adjustment of operational techniques always make sure that the safety of personnel/workers is maintained at the highest level and that no damage is caused to equipment or the environment.

4.2.1.2 GROUND SURFACE TREATMENTS

The job plan may include treating and finishing the ground surface. Ground surface treatments can include but are not limited to:

Ground Surface Treatment:	Description
Proof Rolling	A plant item such as a roller, loaded truck, or other nominated item may be used to see if there is any movement in the ground underneath. Movement under the wheels could indicate unsuitable or insufficiently compacted material in lower layers. In some cases further testing such as deflection monitoring may need to be carried out or unsuitable material removed before continuing.
Stabilisation	Additional materials, mixes or other appropriate measures may be placed into the earthworks to improve the quality of product or to meet specifications.
Blending	Different materials are combined together to give a better quality product. Blending in some cases also allows for more efficient construction techniques.

Usually ground surface treatments will be outlined in the geotechnical information for the project as well as task specifications.

4.2.2 INITIATING CHANGES

Before initiating any changes to the job plan or relevant earthworks construction practice you should consult with the operators and other personnel/workers involved in the task.

Getting their input and putting useful ideas forward will assist in giving ownership to the task.

If you do have to go ahead and make adjustments, make sure that you inform the relevant people. Also, make sure they understand what has been changed and why.

This can be done through:

- Written communication – plans, sketches and drawings, work instructions or other documentation.

- Oral communication – briefings, toolbox meetings, verbal instructions, discussions with operators, team meetings, or relevant conversations based on the activity.

Always follow the communication requirements and procedures for the project and for your site.

4.3 OVERSEE PLANT, EQUIPMENT AND TOOL MAINTENANCE

As a supervisor it is your responsibility to ensure that maintenance activities on plant, tools and equipment are conducted and all associated records are completed.

4.3.1 MAINTENANCE ACTIVITIES

Maintenance activities on a worksite will vary depending on the:

- Type of plant, machinery, tool or equipment.
- Manufacturer's specifications and instructions.
- Servicing requirements.
- Level of maintenance training required.

It is not uncommon for earthworks construction operators to undertake basic operator maintenance tasks on the tools, plant and equipment they have used.

Maintenance tasks may include:

- Servicing and monitoring, e.g. changing filters, topping up oils and hydraulic fluids.
- Cleaning and checking for damage before and after use.

- Fitting and removing attachments.
- Minor repairs, e.g. replacing ripping teeth or boots.
- Helping the mechanics with maintenance and repairs.
- Recording and reporting of damage, defects or faults.

Make sure your team members conduct all of these maintenance activities according to site procedures and the manufacturer's specifications for each item.

You may need to create a schedule to ensure that regular times are allocated to your team for cleaning, checking, repairing and carrying out other maintenance tasks.

Keeping equipment in the best possible condition prolongs its working life and ensures it is safe to use.

4.4 COMPLETE AND SUBMIT REPORTS

Reports and records are used extensively in earthworks construction for many reasons including:

4.4.1 TYPES OF RECORDS AND REPORTS

Some earthworks construction projects have a large number of reports that need to be created and submitted at regular intervals.

To find out the relevant requirements, procedures and reporting intervals, check your site documents, policies and procedures regarding documentation and reporting.

The types of records that may need to be kept will vary depending on the nature of the earthworks being completed but they could include:

- Logs, logbooks and diaries – used to track daily and weekly activities. Logbooks are often used to verify the number of hours an operator has worked on a machine, training that has been completed or other task-related information.
- Job reports.
- Completion reports.

- Checklists, e.g. for tasks, OHS/WHS, environmental management, quality assurance (QA), training.
- Shift documentation, e.g. end of shift, end of process, despatch dockets, delivery dockets, activity reports.
- Resource reports – used to track the quantities of resources being used on the site, e.g. fuel, chemicals, concrete, soil, bitumen or any other product or material being used.

- Incident reports, e.g. accident forms, records of environmental incidents, OHS/WHS investigation reports.
- Planning and activity documentation, e.g. specifications, activity plans, job plans, diaries, QA reports, environmental management policies and procedures, OHS/WHS plans, policies and procedures.

Organisational and/or site reporting requirements and procedures will outline:

- How and when reports are to be completed.
- Who completes the reports.
- What supporting documentation is required for each report.
- How the report is presented and submitted.

By following these requirements you will also ensure that the correct report is submitted to the right person within the designated timeframes.

Normally workplace documents and reports will be completed and then paper-based copies will be scanned into the site computer system.

Reports may also need to be submitted to one person or to multiple personnel/workers.

4.4.2 PREPARING AND PRESENTING JOB REPORTS

When preparing and presenting job reports the primary focus is to give clear and concise information as succinctly as possible.

4.4.2.1 REPORT PREPARATION

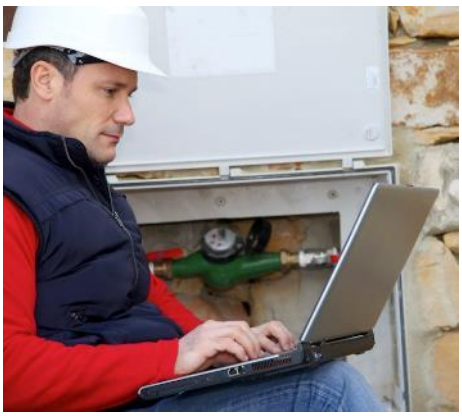
Reports are written to convey information and the requirements of the information will determine the length and style of the report.

These requirements will generally include:

- Objectives of the report.
- Overview of the situation.
- Research and information collection methodology used and why this methodology was chosen.

- Analytical criteria used during the investigation.
- Findings – will be in two categories: essential findings and contributing factors.
- Any recommendations.
- Required or suggested follow up actions.
- Appendices, which detail and examine relevant evidence, if applicable.

When preparing your report, particularly a technical one, it is important to remember the following simple guidelines:



• Keep it clear and concise – use a style of language that is simple enough to be read quickly but technical enough to meet the needs of the audience.

• Pay attention to your grammar and make sure the information is clear.

• Proofread it – errors in your report reduce your credibility as well as that of your organisation.

- Check for errors, e.g. spelling, typing, information inconsistencies, formatting or simply illogical placement of graphic or other information.
- Remember that your computer spell checker won't pick up misused words, incorrect words, technical jargon that is badly used or sentence structure and construction problems.
- Include any significant risks and explain how you are dealing with them.
- Present the most important information first.
- Present the least important information at the end of the report.
- Use basic report formats.

Most organisations have templates for the job reports you will be required to complete. These will guide you in what information needs to be included and where in the report it should go. The basic format of a report should include:

Basic Report Format:	
Title Page	Stating the name of the report, name of the person creating the report and other essential details.
Summary Or Executive Summary	This summarises the entire report. An executive should be able to read the summary and get enough information to make judgements on the usefulness of the information. An executive summary should comprise 10% of the final report.
Table Of Contents And Diagrams	In digital documents these should be hyperlinked to allow skipping through the document to the required heading.
Introduction	This can also be called the scope statement or the terms of reference statements. Again it should be no more than 10% of the final document and give exact reasons for the document. Reports for readers who are unfamiliar with the topic may require a longer introduction to give adequate background information for the report to make sense.
Main Body	This is where the information you need to convey will be included. You should use tables, graphs, diagrams, photos and graphics if they enhance your report and make it easier to read. Do not include them just for the sake of decoration.
Findings/ Recommendations	This is where you say what options are available to respond to the problems or situations discussed.
Conclusion	This is another summary of the report but with a different focus. It is your last opportunity to 'sell' your findings, recommendations and to urge prompt action. The conclusion should also comprise approximately 10% of the final report.
References, Thanks, Acknowledgements And Bibliography	These should be organised in a logical order with as much detail as possible to allow the readers to confirm your information with your sources.
Appendices	This is the most underused area of a report. Appendices make your report easier to read, more logical and allow for a better flow of information. They can include information that is a requirement for a specific group of readers, or additional information that doesn't fit the report but is useful in making decisions.

While reports are the most common form of documents that you will be expected to create, it is difficult to apply a single, rigid formula to the process.

This is because reports contain many different types of information and are required to meet the needs of a wide range of readers.

Communicating in writing should not be considered a difficult task. It is the form of communication that allows you to take the time to say the correct thing in the right way to achieve the best result.

4.4.2.2 REPORT PRESENTATION

Each organisation will have standards for presenting documents and reports.

These requirements reflect current industry and enterprise practices as well as the needs of the people working with the documentation.

The presentation conventions and requirements for your site will be found in your organisational style guide, documentation policies or reporting procedures.

Well-designed presentations can be used in group situations and can also be put on CDs and provided to employees/workers working shifts or in different locations.

You can contract a professional to create your presentation, or you can create it in-house.

When preparing a presentation yourself, there are some basic principles to keep in mind.

- Keep the presentation relevant and lively.
- Create notes and hand these out at the end. Inform attendees at the start that they will receive notes. This way they can stay focused on what you are saying rather than taking notes.

- Explain at the beginning how you will take and respond to questions, either as they come up at the end of topics or at the end of the presentation.
- Don't create overheads or PowerPoint slides that simply repeat what you are saying.
- Use graphics that illustrate what you are saying. Use any knowledge of screen design and apply this to your slides. This includes knowing appropriate colours, fonts and letter sizes to fit the audience.

- Watch the reaction of the attendees during your presentation and react by slowing down if they look confused or speeding up if they look bored.

You should make your presentation in accordance with your plan but be prepared to deviate if necessary to answer questions from the audience or respond to feedback. Your presentation plan is the framework you are working within, but it should be a flexible framework that is able to adapt and change to meet the needs of the audience and the situation you are facing.

4.5 RECOMMEND CHANGES AND IMPROVEMENTS

During the execution of earthworks construction tasks, you and your team might see some room for changes or improvements in terms of safety, effectiveness or efficiency.

4.5.1 PROVIDING RECOMMENDATIONS

Most organisations encourage staff to come up with suggestions or recommendations for improving the way operations are carried out.

If you or a member of your team can see a better, safer, more efficient, more effective method of completing an earthworks construction task, you need to speak up.

Improvements could relate to:

- Processes or procedures.
- Plant or equipment being used.
- Operator competency and skill level.
- Construction methods.
- Material suggestions.
- Any other suggestion or recommendation that makes the task safer and easier.

Discuss it with the team and determine if the suggestion will work on your current site.

Often what has been done in one location may not translate well to another site. For example, a method of doing something in one state may not be accepted in another state.

This is often a good time to develop individual workers or the team as a whole. Team building exercises can be created in any situation where change is needed.

By listening and considering ideas and suggestions, you as a supervisor are building and developing the individuals and teams in your charge.

If you are approachable and open to suggestions, your team will function at a higher level and team morale will be enhanced.

When recommending changes to senior management for improving the safety and effectiveness of the tasks being undertaken you need to:

- Summarise the situation.
- Clarify why you are providing advice.
- Outline all the considerations.
- Explain the risks or hazards.
- Provide details as to how the risks or hazards could be controlled.
- If possible, provide options.
- Give a final preferred option.

You should also check with someone that the recommended change complies with legal and quality requirements.

Recommendations or suggestions from your work team could then be submitted through formal reports and presentations, at planning meetings or site meetings.