

RIIMPO402D

Apply the Principles of Earthworks Construction

Learner Guide Instructions

Who is this document for?

The learner.

What is in this document?

- Course information that matches the PowerPoint presentation.
- Review questions.
- Practical assessment instructions for learners.

What do you need to do before you use it for the first time?

1. Rebrand the document.
2. Review the document as part of your validation process.
3. Set the reading and test time limits that are highlighted in pink at the end of the document.

See the 'Read Me First' document for a complete set of instructions on how to use these resources.

LEARNER GUIDE

RIIMPO402D Apply the Principles of Earthworks Construction

Learner Name:	
Learner ID:	
Learner Contact Number:	
Learner Email Address:	
Date Training Commenced:	

This Book Contains:

- Course Information.
- Review Questions.
- Practical Assessment overview and instructions.

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1.1 Introduction

This course is based on the national unit of competency **RIIMPO402D 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.

You will learn about:

- ◆ Planning and preparing for earthworks construction.
- ◆ Implementing plans for earthworks construction.
- ◆ Monitoring and adjusting the execution of tasks.
- ◆ Completing reports and providing feedback.



1.1.1 Earthworks Construction

Earthworks construction may include tasks such as:

Earthworks Construction Task	Explanation
Land Clearing	Clearing vegetation and other obstructions to prepare for further work. 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.

1.1.2 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.

1.2 Site Policies and Procedures



While supervising others you need to make sure everybody in your team follows the safety rules and instructions when performing their work. You should answer any questions that personnel have towards health and safety or direct them to the right person to speak to.

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

Operations documentation includes:

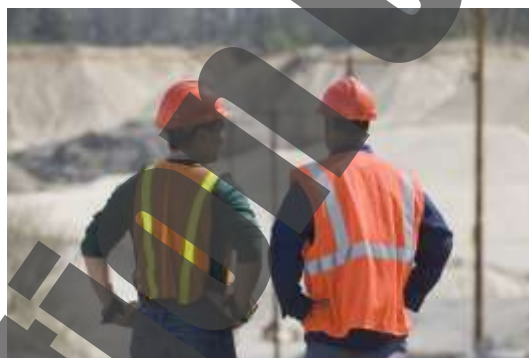
Site Details	The information and safety requirements of the workplace environment.
Hazard Details	Any hazards in the work area or related to the work. This could also include instructions on how to handle dangerous or hazardous materials.
Task Details	Instructions of what the work is (this can include diagrams or plans). Also instructions on how to safely do each component of the project.
Faulty Equipment Procedures	Isolation procedures to follow or forms to fill out.
Signage	Site signage tells you what equipment personnel need to have, or areas where hazards exist.
Emergency Procedures	Instructions on what to do in emergency situations, for example if there is a fire, accident or emergency where evacuation or first aid is needed.
Equipment and Work Instructions	Details of how to operate plant and equipment and the sequence of work to be done.

Review Questions

1.	List 3 things that may be included in 'operations documentation'.	<input type="checkbox"/>
1.		
2.		
3.		

1.3 Working Safely

You must ensure that all personnel that you supervise follow all safety rules and instructions when performing their work.



1.3.1 Health and Safety Rules

Every workplace has to follow laws and rules to keep everyone safe. There are 4 main types:

Law or Rule	Explanation
Acts	These are laws that you have to follow.
Regulations	These explain what the law means.
Codes of Practice	These are instructions on how to follow the law, based on industry standards.
Australian Standards	These tell you what the minimum requirement is for a job, product or hazard e.g. AS 3798 – 2007 guidelines on earthworks for commercial and residential developments.

Some states use OHS laws, and other states use WHS laws. They both talk about the same thing, but use different words or names for people.

1.3.2 How to Keep Everyone Safe



WHS law says that all companies and workers need to keep themselves and other people safe while they work. This is called a duty of care.

To keep everybody safe workers need to:

- ◆ Follow their instructions.
- ◆ Follow all workplace rules.
- ◆ Make sure all equipment is safe to use.
- ◆ Carry out their work safely.
- ◆ Report any problems.

If a member of your team notifies you of an issue or problem you will need to take appropriate action in line with site and organisational requirements. This could include:

- ◆ Stopping, postponing or re-scheduling tasks.
- ◆ Organising for specialists, technical experts or consultants to review the situation.
- ◆ Organising additional resources, personnel, equipment or training before the work continues.
- ◆ Completing forms or reports to document the issue.
- ◆ Assisting personnel to complete documents and forms.
- ◆ Contacting manufacturers or other service providers about the issue.
- ◆ Contacting relevant authorities about the issue.
- ◆ Re-evaluating work plans and making adjustments to manage the issue.



Review Questions

2.	How can workers ensure they are meeting their duty of care responsibilities?	<input type="checkbox"/>

1.4 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.

1.4.1 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:

- ◆ Maintaining safe working distances from waterways.
- ◆ Minimising chemical use near waterways.
- ◆ Waste/clean-up management requirements.
- ◆ Levels of acceptable noise, vibration amounts and dust control measures.
- ◆ Boundaries of work activities.
- ◆ Special protection areas.
- ◆ Work footprint.
- ◆ Negating soil runoff through the use of appropriate sediment control techniques.





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 in a particular way.

1.4.2 Waste Management

It is very important that water, air and land are protected from pollution sources. Steps must be taken to either protect the environment or restore it after work is done.

Waste and clean-up management may include taking steps to use environmentally friendly materials (including recycled materials) and implementing methods of sorting waste into categories for recycling and correct disposal.

The plan will outline:

- ◆ Disposal of site waste materials and rubbish.
- ◆ Recycling waste materials.
- ◆ Re-use of waste materials.

On many sites you may also be required to re-use soils from excavations or re-vegetation works. This will reduce the amount of soils being wasted and the amount of new materials that may need to be ordered in.



1.4.3 Dust Management

The objective of dust suppression is to ensure that enough water is distributed to settle the dust in an area without flooding the surface.

Often there will be job-specific requirements for the suppression of dust, as too much water can cause problems such as mud sticking to vehicle parts, or vehicles and equipment getting bogged. Alternatively, insufficient water to settle the dust can cause issues such as poor visibility, or a lack of critical moisture.



Where very fine dust conditions exist it may be necessary to water these areas frequently but lightly so that the fine powdery dust does not potentially form into mud.

In many cases dust suppression requirements will be dependent on the types of work and materials on the site.

Dust suppression is vital on any site and must be performed in line with the job requirements. It is necessary for both safety reasons and to meet environmental legislative requirements.

1.4.4 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.



Sediment and Erosion Control

Erosion is where the soil is moved away from the area by water or wind.



Sediment is the soil products which have been swept into the water during the process of erosion.

Erosion and sediment controls are used to stop any materials leaving the construction site that may cause pollution or damage to the environment.

These controls are particularly important when laying pipes for water mains as you will be working within a narrow band of area surrounded by stormwater drains, mains pipes, people and housing.

Legally all construction sites must have appropriate sediment and erosion controls.

The 2 main methods of control are:

- 1** Slowing the flow of water to allow the sediment to settle out of the water.
- 2** Treating water that is full of sediment to remove the particles within the water.

These controls normally involve the use of:

- ◆ Earthen windrows.
- ◆ Sediment control perimeter banks.
- ◆ Stacked rock and geo-textiles.
- ◆ Dam sediment traps.
- ◆ Geo-fabric filter fabrics.
- ◆ Sandbags.
- ◆ Sediment traps.
- ◆ Gully pit traps.
- ◆ Sediment retention basins.
- ◆ Flocculation systems.



The methods for constructing and maintaining sedimentation control barriers are detailed in the overall environmental management plan.

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 Work Method Statement (WMS) 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 Site Geological and Geotechnical Data

Geological and geotechnical data gives you information about:

- ◆ Rock or material types and characteristics.
- ◆ Wet and dry areas.
- ◆ Water tables or other sources of water.
- ◆ Compaction levels.



Knowing the type of soil and rock you are dealing with allows you to determine the correct machinery, resources and work methods to achieve the required tasks.

Information on geological and geotechnical factors that affect the site also allows for better time management and project management by understanding how long it will take to complete tasks.

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

Soil and rock types may include:

Rock Type	Description
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 Type	Description
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 Site Hydrological Data



This data relates to water on, in, near or under your site. It will include surface water and ground water but could also include rivers, creeks, dams, dry waterbeds, wetlands and other areas where water is or could be.

The hydrological data is used to ensure correct drainage of the site, for protection of the waterways and water dwelling flora and fauna. Having an understanding of what the water on the site is doing allows you to anticipate drainage issues and erect erosion and sediment controls before drainage becomes a problem.

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.
- ◆ Cofferdams.
- ◆ 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.

2.1.2.3 Site Meteorological Data



This data includes rainfall, humidity, temperature, wind and night conditions such as frosts and fogs. Having a good understanding of this data allows you to plan activities more successfully.

On earthworks construction worksites, meteorological data can have a huge impact on the tasks and activities that are undertaken. To access meteorological data use a reputable website, such as www.bom.gov.au.

Rainfall and humidity can effect materials and the way they handle. Heavy or unexpected rainfall can effect site drainage or interrupt works. Fogs or mists may impact on visibility. Very high or very low temperatures can impact on equipment and personnel. These will need to be considered to make sure adequate protective clothing, drinking water and shelters are organised for the project.

2.1.2.4 Engineering Survey Principles and Data

Engineering surveys are a very important aspect of supervising civil works. Without appropriate surveys for setting out works, monitoring progress and for confirming completed components, the job will be made much more difficult.

Survey data covers information about job outcomes including:

- ◆ Bench heights and widths.
- ◆ Floor heights.
- ◆ Floor, ramp and bench grades.
- ◆ Underground working and voids.

