RIICRC317E

Finish Concrete Pavements

Learner Guide Instructions

Who is this document for?

The learner.

What is in this document?

- Course training content (this matches the PowerPoint Presentation).
- Review questions.

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.

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

LEARNER GUIDE

RIICRC317E Finish Concrete Pavements

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

This Book Contains:

- ☐ Course Information.
- ☐ Review Questions.

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1.1 Introduction

This training course is based on the national unit of competency **RIICRC317E – Finish Concrete Pavements**.

This course will cover the following key aspects of finishing concrete pavements:

- Review of work requirements and documentation.
- Management of work health, safety and environment.
- Selection, use and storage of tools.
- Preparation of work area.
- Finishing of concrete including floating, trowelling, installing control joints and applying texture.
- Management of clean-up activities and tools.

The following terminology will be used throughout this training material:

Terminology	Description
Pavement	A hard surface placed on an area designed to carry vehicular or pedestrian traffic.
Concrete	A composite building material made from fine and coarse aggregates blended with a combination of cement, water and additives that hardens or cures over time.
Batch	The activity of combining and mixing the concrete ingredients to create a mix or load.
Placement	The process of depositing concrete into its final location.
Compaction	The process of expelling air voids or pockets within the concrete to improve strength.
Concrete Bleeding	Free water in the concrete mix rising to the surface.

1.1.1 Confirming Work Requirements

Concrete pavements are hard surfaces designed to carry vehicular or pedestrian traffic. They are able to spread loads over a wide area and resist deformation by the passing traffic.

The performance of concrete pavements once in use is dependent upon three factors:

1. Traffic.
2. Drainage.
3. The environment.

Proper design, preparation and coordination of the placement, and finishing activities are key for achieving the desired result.

Concrete pavement projects can be complex activities to plan. Concrete is a product with a short shelf life from the time it is batched until it is placed and finished. Environmental conditions, the type of finish required, traffic and weather conditions can all impact on the successful outcome of the job.

Communication with suppliers, paving crews and contractors prior to starting any work is critical to ensure that plans are in place and understood.

Plan for a successful concrete pavement finish by understanding the scope of work before the activity commences:

- **Size of the Job** – Number of m^3 of concrete required to be finished.
- **The Job Location** – Location of the job site and customer name.
- **Site Hazards, Control Measures and Rules**.
- **Site License Conditions** – Noise hours, reverse squawkers on trucks.
- **Type of Pavement and Finishing Process** – Screeding, floating, texturing and joint design.
- **Resources Required** – Equipment and personnel required to perform work.
- **Environmental Conditions** – Temperature and wind can cause concrete to set faster than planned.

Many organisations have developed checklists and procedures to ensure that the relevant information is collected and communicated to the relevant stakeholders and details are confirmed prior to concrete placement and finishing.

Speak to your supervisor if you have any questions about current workplace procedures or if you need help identifying specific site requirements.

1.1.2 Accessing and Interpreting Documentation

Construction of each concrete pavement will be accompanied by a set of records. Understanding what information is required and how to interpret that information is essential. Different companies use various templates and terminology, so clarifying what you need ahead of time and how to collate, store and manage the information on the day will ensure that your job occurs without delay.

Design engineers and architects determine the concrete's specifications to meet the structural and design requirements of the task. Specifications such as road, bridge or kerb mixes may be based on standard industry specifications, set by government agencies, or be unique to the site or project.

The concrete specification document may define:

- The required strength to be achieved.
- The surface profile.
- Joint placement, cleaning and sealing requirements.
- Approval for the nominated mix to be used.
- The maximum period of time from batching to placement and compaction.
- Concrete temperature requirements.
- Slump and water/cement ratio requirements.

Project quality plans and inspection and testing plans (ITPs) contain details about the types of checks and hold points that must be completed in order to satisfy the criteria in the specification. Responsibility will be assigned to various workers, including site engineers and supervisors, for ensuring that each of the required checks is performed.

1.1.3 Health and Safety Legislation

Finishers of concrete pavements have a legal responsibility to ensure that their work activities and the resulting concrete pavement are free from hazards which may cause harm.

Laws (or Acts) are broad rules made by governments and courts which apply to everyone. There are consequences for not following the law because they help to keep everyone safe.

The WHS Act describes the duties of the different workplace parties in relation to their WHS responsibilities.

The WHS Act requires that a Person Conducting Business or Undertaking (PCBU, otherwise known as the employer) has a duty of care for ensuring the health and safety of workers and others at the workplace.

This includes providing:

- A safe place to work.
- Safe plant and structures to work in or on.
- Safe systems of work.
- Safe plant, structures and substances to use, handle and store.
- Adequate facilities for welfare including amenities and break areas.
- Information, training, instruction and supervision.
- Health and workplace monitoring as necessary.

Designers, manufacturers, suppliers, constructors and installers also have health and safety duties under the Act. Finishers of concrete need to ensure that the product that they produce, for example, the footpath, road, drain or bridge, are free from hazards to others.

This includes while the work is taking place as well as afterwards when the concrete is serving its intended use such as highway with traffic driving on it.

The methods used to finish the concrete will have a direct impact on the final product, the quality of the finish and the potential for faults or issues.

Poor finishing practices can increase the likelihood of concrete failure or hazards arising.

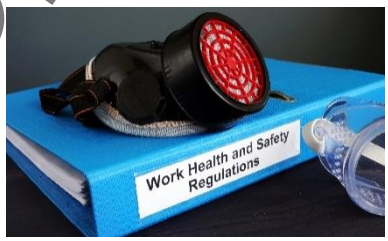
Examples include:

- Not providing adequate texture could lead to skidding or aquaplaning when water is applied.
- Not placing joints correctly could lead to irregular cracking and a poor driving surface.
- Failing to screed the concrete can lead to an uneven surface finish.

Concrete finishers have a legal responsibility to ensure that their practices and procedures prevent hazards arising as a result of their workmanship.

1.1.3.1 Regulations

Regulations support Laws (or Acts) by imposing mandatory requirements for managing WHS.



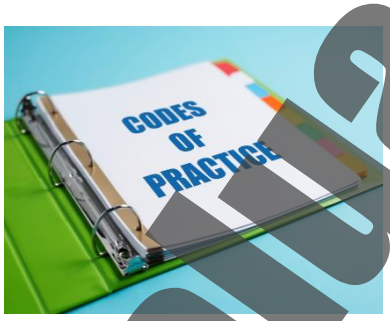
They supplement the Act by providing more detailed information on duties that apply to specific hazards, other procedures and obligations.

The regulations cover general requirements for hazard identification, risk assessment and risk controls for high risk areas.

This means that the worksite, tools, equipment and procedures need to be assessed for risks and have those risks appropriately controlled before work can start to ensure that the activities do not pose risks to any person.

1.1.3.2 Codes of Practice

Codes of Practice provides guidance on ways to eliminate or control known risks. They are seen as the community standard for hazard management.



They may be referred to when seeking information on how to eliminate or control known risks or where there has been a failure of a Duty of Care as an example of what should have been done.

Codes of Practice for construction are legal documents which provide further information and practical guidance about the requirements for construction work including the building of roads, bridges and other civil concreting works. Codes of Practice should be followed unless there is another solution that achieves the same or better standard of health and safety. They can also be used to support a prosecution when a work place has failed in its duty of care.

Codes of Practice for construction include information on:

- The risk management process.
- Duties of persons performing construction work.
- Safe Work Method Statements.
- WHS management plans.

Refer to the website for your local health and safety regulator for more information about Codes of Practice that may apply in your jurisdiction.

1.1.4 Worksite Communication

Good communication with all stakeholders will ensure that the paving operation runs smoothly on the day.

Take the time to put communication processes in place and assign responsibility for communicating all necessary information, updates and changes as they occur.

Stakeholders who may need information include:

- Customers.
- Concrete suppliers.
- Paving crews.
- Engineers and designers.
- Concrete finishers.
- Safety personnel.
- Councils.
- Neighbours.
- Site visitors.

When communicating it is important to be clear and concise with work instructions and important information. Think about the language and literacy needs of the personnel and how you can present your messages. Using a combination of visual cues such as signage, symbols and pictures can help to make the message easier to understand.

Regular communication via site meetings and active supervision can help to make sure that changes on site are addressed and communicated as they occur.

Construction site supervisors often use daily meetings known as pre-start meetings or toolbox talks to communicate the day's plan to the team.

This can include:

- Daily work instructions.
- Equipment assignment.
- Roles and responsibilities.
- Emergency arrangements and nomination of first aiders.
- Any known hazards, site changes and exclusion zones.
- What other activities may be occurring on site.
- Communication of accidents, incidents and safety information.

1.1.5 Identifying and Addressing Hazards

Concrete paving operations have many risks specific to the activity and environment.

Hazards to consider include:

- **Traffic Management Hazards** – Entry/exit, travel to the pour location, turning area, reversing.
- **Overhead Powerlines** – Contact with concrete paving machines and pumps.
- **Ground Conditions** – Soft ground, uneven ground, soft edges, unprotected or unmarked edges.
- **Pedestrian Management** – Persons on foot in trafficked areas including paving crews, finishers, formwork crews and concrete cutters.
- **Contamination and Spills** - Material being tracked onto roads and slurry washing into roadways and waterways, sealants and sprays spilling.
- **Slips, Trips and Falls** – Persons falling from concrete pavers, uneven ground, reo-bar and formwork trip hazards.
- **Manual Handling** – Frequent bending, lifting and dragging of bull floats, mechanical trowels, screeding concrete by hand, removing formwork.

Once you have identified hazards and risks on site it is important that you immediately communicate them to your supervisor and if possible make them safe.

Many sites and organisations require that a hazard report form be completed for all identified hazards.

Hazard report forms may require the following information to be correctly completed:

- A description of the hazard and any risk that it presents.
- A risk rating.
- The date and time the hazard was identified.
- Who reported the hazard.
- Who it was reported to.
- A suggested control measure or fix.
- The location on site or plant number.

Performing a risk assessment prior to work commencing is a good way to prepare for potential hazards and apply control measures. There is a range of information available from regulators and industry groups such as concrete or pumping associations which have been developed for concrete related activities that provide guidance on hazards and suggested controls for this activity.

In performing your risk assessment consider the types of activities being conducted, how those people will perform their tasks and where on the site they will occur.

1.1.6 Implementing Controls

Once you have identified that a hazard exists you will need to manage it through the implementation of controls.

When implementing your control measures consider what is practical for the site to apply and use the hierarchy of control to select the most effective control measures for the circumstances. Try to apply control measures that are higher up the hierarchy wherever practicable to ensure they provide the best level of protection.

Hierarchy Level	Explanation	Example
1. Elimination	Completely remove the hazard. This is the best kind of hazard control.	Animals and pets may be banned from site to prevent accidents.
2. Substitution	Swap a dangerous work method or situation for one that is less dangerous.	Certain chemicals may be replaced with those which are less harmful if contact with the skin occurs. Reversing beepers on trucks may be replaced with squawkers so the sound doesn't carry as far impacting neighbours.
3. Isolation	Isolate or restrict access to the hazard.	Exclusion zones and guard barriers may be established to separate personnel and operating plant. Guards are placed over the concrete paver hopper to prevent access to moving parts. Sediment control fences installed to prevent dirty runoff water from leaving site.

Hierarchy Level	Explanation	Example
4. Engineering Controls	Use equipment to lower the risk level.	Wheel washes may be constructed at the exit to the site to ensure that all trucks have clean wheels before exiting onto public roads and do not contaminate waterways. Ride-on mechanical trowels may be used to engineer out ergonomic issues.
5. Administrative Controls	Site rules and policies attempt to control a hazard.	Traffic control used to manage vehicles entering and exiting. Bins for different types of waste with signage to store and separate waste material.
6. Personal Protective Equipment	The least effective control. Use PPE while you carry out your work.	PPE such as hearing protection, safety glasses or gloves.

1.1.7 Selecting and Wearing PPE

Personal protective equipment (PPE) should be selected and worn in accordance with site requirements. Many sites will define the minimum PPE required in their site induction information and site entry signage. In addition, you should be aware of any hazard specific risks for example, hazardous substances which are being used and apply the PPE appropriate to the situation.

Common PPE may include:

- Safety glasses.
- Hearing protection.
- Gloves.
- Respirators.
- Hard hats.
- Hi-visibility clothing.
- Safety footwear.

Site procedures often require hearing protection and safety glasses to work in close proximity to concrete slipform paving machines and agitator trucks due to the high noise and potential for foreign substances such as concrete slurry to enter the eyes as the paving machine receives and draws in the concrete.

Gloves are also commonly used to prevent contact with concrete.

When selecting gloves, it is important to:

- Choose the type of gloves appropriate for the task.
- Make sure that they have a sufficient protection rating.
- Make sure that they fit well.

Australian Standards can give gloves a rating on four categories of hand protection against mechanical risks such as:

- Abrasion resistance.
- Blade cut resistance.
- Tear resistance.
- Puncture resistance.

If you are selecting gloves to provide resistance to permeation by chemicals, a different standard and rating system is applied.

Tight-fitting gloves will prevent concrete from entering the glove and reduce the likelihood of skin reactions or burns. Inspect the gloves prior to wear to identify any tears or openings to ensure that the glove provides the best protection possible.

Consult the manufacturer's instructions for information on how PPE should be cleaned and maintained, especially when you are dealing with contact with chemicals such as concrete which can reduce the lifespan of the PPE if it is not cleaned and stored properly.

In order for PPE to be effective you must check that it is in good condition, without damage and be worn in the manner prescribed by the manufacturer. Remember PPE is the very last means of defence so it's important that it is applied correctly.

1.1.8 Identifying and Implementing Signage Requirements

Signage can be used to display important information and communicate messages quickly and efficiently.

Construction sites can be busy places. Sometimes many things are being completed at once. Having appropriate signage helps to keep everyone on site safe. In addition, signs with pictures can make information easier to understand, especially for those with language or literacy barriers.

You may see the following signs, decals and stickers in use on concrete pavement project sites:

- Site entry.
- Site office.
- Sign-in.
- Parking.
- Wheel wash.
- PPE must be worn.
- Traffic management signage.
- Overhead powerlines.
- Pinch or crush point.
- Danger – Vehicle reversing.

The use of signage is an essential tool for communicating critical health, safety and environmental information about hazards, control measures and site rules to ensure the safety of all persons entering the site.

They can be placed at the location of a hazard as a warning and be used to directly communicate with anyone in the vicinity. Certain colours such as red and yellow are commonly used in barricading, warning tape and signage to indicate that danger is present and caution is required.

You may locate details of where to position signage using site checklists, risk assessments, safety and environmental management plans and safety and environmental procedures. If you are unsure of the signage requirements for your task speak to your supervisor.

The signage on site must not obstruct any paths of movement and needs to be of an appropriate size to be easily understood.

1.1.8.1 Signage, Barriers and Exclusion Zones

If the concrete pour is to be carried out on a road or in a public area for example, pouring footpaths direct from the chute of the agitator truck adjacent to a road, you are required to protect the public and provide a safe route around the work space. In some cases you may need to isolate the work area.

Set up barricades and signage to warn others that you are working in the area and that it is dangerous for them to come too close. This may include:

- Closing or partially closing access to roads or footpaths.
- Barricading the work area to protect pedestrians and prevent vehicle entry.
- Setting up warning signs and caution lighting where necessary.
- Organising for traffic to be re-directed.
- Providing directions to any foot or vehicle traffic along a safe, alternate path.

Signs and barriers you may use to make your work area safe include:

- Danger signs – Red danger signs such as "Prepare to Stop".
- Warning signs – e.g. "Roadwork ahead".
- Flashing lights.
- Barricades, fences and cones.
- Flashing multi-message signs.
- Arrow boards.
- Bollards.
- Portable traffic lights and signals.
- Hazard markers.

Although there are a number of signs that will be used across most sites, signage and barrier requirements will differ depending on the type of work and location. If you are unsure of the signage and barrier requirements for your task speak to your supervisor.

1.1.9 Selecting Plant, Tools and Equipment

The type of plant and equipment used to perform the concrete paving job will depend on the type of pavement, size and complexity of the task.

Consider the following examples:

- Multi-lane highway – Large slipform paving machines supplied by high capacity tipper trucks.
- Single lane roads – Small, single-lane paving machines supplied by agitator trucks.
- Intersections, joins and footpaths – Fixed formwork supplied directly by agitator trucks off the chute.

The type of paving project will also have a direct impact on the finishing techniques used and the tools and equipment required to perform the work. Certain pavements may require a specific texture, edge or screed to ensure that it meets the design.

Select plant, tools and equipment in accordance with the type of project and finish required, the time available, number of persons in the team and their level of expertise.

Consider the safe handling, ergonomics of design and weight when selecting tools that will be used frequently and for long durations to ensure that personnel do not fatigue or risk injury as a result of poor tool choices. You may need to try more than one type of tool to find the one that works best for you or use different designs depending on the application (such as long and short handled shovels).

Consult manufacturers specifications to properly understand the capabilities and limitations of the equipment before use.

Manufacturers specifications include a range of essential information such as operating limits, setup instructions and health and safety warnings.

Speak to your supervisor if you have any questions or concerns about plant or equipment.

1.1.9.1 Slipform Paving Machines

One of the most common types of equipment used in paving is a slipform paving machine.

A typical slipform paving machine has the following elements:

An Auger	Distributes concrete across the width of the paver using a rotating screwlike metal shaft.
Striker Plate	Screeds the concrete to a uniform height into the compaction area.
Vibrators	Vibrates and consolidates the concrete.
Conforming Plate or Pan	Shapes the concrete to the correct profile.
Trailing Vibrating Float	Smooths and finishes the concrete surface.

Slipform paving machines use low-slump concrete with limited flow and uniform consistency to feed the concrete paving machine producing the pavement.

There are many types of slipform paving machines which have adjustable height, width and automation settings. Machines are able to accommodate the various finishing bars or equipment to achieve the desired surface result such as burlap or hessian material attached and dragged behind the machine to texture the surface.

When using slipform pavers the entire paving process is mechanised and replaces the need for placement crews to manually place large runs of concrete where the paving machine can be used continuously. They are not however able to be used for irregular or small spaces where it is more practical to use traditional formwork and placement crews.

Large items of plant such as slipform pavers often come with their own pre-start equipment inspections which are completed by the plant operator who has been trained in what faults and damage to look for. Ensure that you have discussed the site inspection requirements, minimum safety hardware and key hazards with plant suppliers so that plant arrives in a safe condition and ready to use.

1.1.9.2 Tools

During concrete placement and finishing the following specialist tools may be utilised depending on the type and size of the concrete pour:

- Floats – Wood, magnesium, aluminium and steel tools used to smooth and flatten the concrete surface.
- Bull floats - Consist of a long-handle attached to a float to allow the operator to reach out far onto the slab without the need to stand or sit on the slab itself.
- A mechanical trowel, power float or helicopter - Large powered tool used for large areas to smooth and flatten the concrete.
- Edging tools – Small hand tools designed to smooth and finish the concrete slab edge.
- Steel trowels – Small flat hand tools used after floating to finish concrete.
- Groovers – Small handles with a handle and one or more ridges along the base to create a groove in the concrete as they move across the surface.
- Straight edges – A long straight rectangular tool used to screed or strike off concrete to create a smooth and level surface.
- Concrete rakes – Lightweight tools formed to easily pull and spread concrete.
- Vibrators – Used to remove air pockets and consolidate the concrete after placement.
- Levels – Used to measure and check the level and fall of the concrete.

When selecting the tools for the job it is important to understand the characteristics of the tool and what it is designed to do. Each type of tool will have its own application and limitations.

The type of float you select for example may either assist to bring moisture to the surface or seal it into the concrete as it is used. Using a float with straight ends as opposed to curved ends may make smoothing out the surface more challenging due to the sharp corners of the tool digging into the concrete as it is pulled and pushed. Selecting a tool made from wood and aluminium will create a different finish due to the weight, thickness and smoothness of the surface of the tool. Understanding these differences will help you to select the right tool for the job.

Always inspect your tools and equipment for faults and damage before use. Look for things like frayed leads, loose handles, cracked welds, deformation in supports and missing guarding.

The appropriate tools should be used wherever possible, and the use of home-made hand-tools should be avoided.