

# Contents

<b>Before you begin</b>	<b>v</b>
<b>Introduction: Applying basic levelling procedures</b>	<b>1</b>
<b>Element 1: Planning and preparing</b>	<b>3</b>
Section 1.1: Obtaining, confirming and applying work instructions to prepare for basic levelling activities	4
Section 1.2: Following safety requirements	6
Section 1.3: Identifying and implementing signage and barricade requirements	9
Section 1.4: Selecting tools and equipment consistent with job requirements and checking them for serviceability	12
Section 1.5: Identifying and applying environmental requirements	14
In ACTION	16
Assessment activity 1	18
Record your employability skills	18
<b>Element 2: Setting up and using a levelling device</b>	<b>19</b>
Section 2.1: Identifying heights or levels to be transferred/ established	20
Section 2.2: Setting up and testing levelling devices	22
Section 2.3: Applying levelling staffs accurately	25
Section 2.4: Shooting levels and transferring heights to required location	27
Section 2.5: Documenting results of the levelling procedure	29
In ACTION	32
Assessment activity 2	34
Record your employability skills	35
<b>Element 3: Cleaning up</b>	<b>37</b>
Section 3.1: Clearing work area and re-using, recycling or disposing of materials	38
Section 3.2: Cleaning, checking, maintaining and storing tools and equipment	40
In ACTION	42
Assessment activity 3	44
Record your employability skills	44
<b>Final assessment</b>	<b>45</b>
<b>Employability skills</b>	<b>47</b>

## Section 1.5: Identifying and applying environmental requirements

Legislation and industry codes of practice require that construction tasks be carried out with minimum risk to people at the worksite, the general public and with minimal negative impact on the environment.

While carrying out your work, you should pay attention to unacceptable levels of noise, dust, fumes, or vibration. Limits on acceptable levels have been set by legislation and regulations and are usually imposed by local councils and state environmental protection authorities (EPA).

You also need to ensure waste materials are correctly managed and the site and surrounding areas are cleaned up once the work has been completed. Workplaces are required to have environmental plans or strategies to minimise the environmental impact of their work. These strategies must be established and presented prior to the granting of permits or approvals for the work and implementation must be carefully monitored.



Substantial fines and cancellation of permits may result where the activities continue to exceed the environmental limits.

Strategies to comply with environmental requirements may include:

Environmental issue	Strategies to address the issue
Excessive noise	Limit work to specified hours, use sound-dampening devices, redesign the work procedures to avoid high-noise equipment or tools, regularly check noisy equipment, limit vehicle traffic and site access.
Excessive dust	Keep the traffic area dampened, ensure loads to/from the site are fully covered, erect screens around high-dust areas, use dust collection devices.
Vibration	Place portable equipment or plant on pads, use alternative low-vibration equipment (including hand tools if necessary).
Waste management	Use filter traps for waste water, segregate and store waste, regularly collect and dispose of waste including off-site disposal or re-use and recycle.
Hazardous goods	Identify and segregate hazardous goods, provide secure storage areas, use MSDS to ensure correct handling/storage, limit quantities on-site, provide PPE and specific training.
Spills	Provide on-site spills kits, use bunding, have designated wash-down areas.
Soils	Store or remove contaminated or waste topsoil, use erosion management methods.

## Find out more

Resource	Why it is useful
New South Wales Department of Environment and Climate Change <i>Builders</i> <a href="http://www.environment.nsw.gov.au/sustainbus/builders.htm">www.environment.nsw.gov.au/sustainbus/builders.htm</a>	This webpage provides links to publications and resources for builders in the construction industry about environmental and waste management.
KESAB environmental solutions <i>Environmental checklist</i> <a href="http://www.kesab.asn.au/index.php?page=environmental-checklist">www.kesab.asn.au/index.php?page=environmental-checklist</a>	This web page provides links to building and construction industry environmental checklists that can be downloaded.

### Section task 1.5

Imagine you are working on a project to build a residential dwelling and this requires the removal of the existing house.

A number of environmental issues have arisen. How would you resolve these?

1. Seepage into stormwater drain
2. High levels of noise during demolition
3. Risk of asbestos release from roofing
4. Damage to shrubs and trees already on the site
5. Damage to roads/footpaths by heavy vehicles

### Example

The temporary benchmark on an elevated site is set at 123.45 metres above a council sea level mark. The backsight reading taken is 2.22 metres, giving an instrument height of 125.67 metres. The location of levels to be determined are marked on the plan (or section string line), the levelling staff is placed on the ground at these points, and height readings are taken (and checked each time). The readings are then reduced by the height of instrument method to find the actual height of the level on the ground.

The field book entries may look like this:

Temp Bench Mark = 123.45m			
Backsight = 2.22m			
Instrument Height = $123.45 + 2.22 = 125.67\text{m}$			
Location	Reading	Reduced	Comments
1	1.67m	$125.67 - 1.67 = 124.0\text{m}$	Actual height in relation to the council datum at sea level.
2	1.15m	$125.67 - 1.15 = 124.52\text{m}$	
3	1.26m	$125.67 - 1.26 = 124.41\text{m}$	
4	1.28m	$125.67 - 1.28 = 124.39\text{m}$	

It is strongly advisable to check each field book entry every time, rather than at the end of the exercise, and to reduce the readings while on-site rather than back in the office.

### Find out more

Resource	Why it is useful
Crawford, W 2002, <i>Construction surveying and layout: a step-by-step field engineering methods manual</i> , 3rd edn, USA	This book provides basic information about surveying.
Wirshing, R & Wirshing J 1985, <i>Schaum's outline of introductory surveying</i> , McGraw-Hill, USA	This book provides basic information about surveying.

## Section task 2.5

The following information has been obtained from recent levelling work. You are required to:

- record the information in the fieldbook table provided below
- determine the instrument height and record it in the table
- determine the reduced level (by height of instrument) at each location and record it in the table.

### **Diamonte Constructions – survey results for 25 Barry Street, Collingwood June 3, 2009**

Temporary bench mark (as on footpath survey marker): 23.45m

Backsite reading: 1.50m

Readings at each location:

1	1.45m	2	1.56m	3	1.67m	4	1.43m
5	1.32m	6	1.40m	7	1.81m	8	1.60m

Temp bench mark:

Backsite:

Instrument height:

Location	Reading	Reduced level
1		
2		
3		
4		
5		
6		
7		
8		

## In ACTION

### Ivan's story

Ivan is assisting in the set out of a proposed residence. He refers to the project drawings and specifications for detailed instructions and checks the Lands Department website to find the location of registered survey marks. The nearest mark is on a power line 50 metres away and he uses a laser level to transfer this height to the site. A painted wooden peg is placed one metre within the northeast corner boundary to mark this as the temporary level or "benchmark".



Ivan uses a series of levelling devices to:

- set out the location for a concrete slab and footings
- indicate the location of drainage, and required depth according to building regulations
- set out for a driveway to slope down to the gutter
- mark the location and height of windows and overhead cupboards.

Ivan considers most of the work can be carried out using an automatic level. He reads through the manufacturer's recommendations and is familiar with the standard workplace practices for use, maintenance and storage of the level. He checks the instrument prior to use and follows standard procedure to set up the tripod and measuring instrument. He applies a two-peg test to verify the line of sight is correct, and does a backsight each time he takes a reading to confirm the reading is accurate. He also checks the levelling staff is in good condition. Where smaller distances are required, such as transferring levels for steps or to check the level of batter boards, he uses a spirit level and checks accuracy by a reversal test.

When setting out the drainage system Ivan checks the specifications and working drawings, as well as the council building regulations. He explains the procedures to his assistant who will be using the levelling staff. He measures from the arbitrary datum level as taken from the registered survey mark, and uses an automatic level to transfer levels to the drainage area. The initial backsight provides "height of instrument" and he will use this to reduce the readings. He ensures the slope for the system is consistent with specifications, and marks these with a series of batter boards. Boning rods are used to even up variations in slope so that the required depth of excavation will be maintained.

Readings are recorded and then checked again before moving on to the next measure. There have been concerns that the tripod might shift during the readings, and the levelling staff might not be checked to be vertical. In this case, Ivan communicates verbally, by hand signals and by hand held walkie-talkie. This will be less of a problem later when Ivan uses a laser level to set out the internal position of the windows and overhead cupboards.

## Revision

- Levelling is a process to measure and transfer a known height at one location to another location. To do this accurately, it is necessary to identify the precise heights or levels to be established or transferred, using information from project plans or work instructions.
- Levelling devices vary in effectiveness according to the required task, and the most appropriate device needs to be selected and checked for accuracy before use.
- Faults which are not detected will lead to incorrect readings and difficulty in achieving the required project results.

- While levelling devices can provide a high level of accuracy and precision in reading, they must be maintained carefully and used in accordance with manufacturer's specifications. This includes holding the staff steady and at a fully vertical position when readings are being taken.
- Once levels are determined accurately (in relation to a known datum) these can be transferred to another location, either at the same level, or at a specific higher or lower height. The end location point must be clearly marked and recorded according to the job requirements. It is essential that the readings are checked carefully before the final position is marked.
- The process of levelling requires a methodical approach and accurate records for each reading are essential when reducing the readings and to back track to determine where any errors may have occurred.

## **Are you ready?**

Use this checklist to assess if you are ready for assessment activity 2.

I understand how to:

- ☐ Identify heights or levels to be transferred/established
- ☐ Set up and test levelling devices
- ☐ Apply levelling staffs accurately
- ☐ Shoot levels and transfer heights to required location
- ☐ Document results of the levelling procedure

## Assessment activity 3

### Cleaning up

The following table maps the assessment activity for this chapter against the element and performance criteria of Element 3 in *CPCCCM2006A Apply basic levelling procedures*. The activity has been designed for all learners to complete.

Part	Element	Performance criteria
Whole activity	3	All

- Imagine you have been engaged in the construction of an office building and the site now has to be cleaned up. Write a brief answer for each of the following questions.
  - Where would you expect clean-up requirements to come from?
  - List three things that may happen if the site is not adequately cleaned up.
  - List three types of materials that may be re-used or recycled.
- Write a sentence to explain what cleaning checks you would recommend for the following items:
  - Levelling staff
  - Automatic level
  - Tape measure
  - Spirit level
- Write a brief explanation of the procedures (used in your workplace or one that you are familiar with) to ensure levelling tools and devices are cleaned, checked, maintained and stored. Select two of the following items to explain how this is to be done.

Task/item	Cleaning	Checks	Maintenance	Storage
EXAMPLE Measuring tape	Remove dust, dirt, rust	Clear readings, not stretched or frayed (fabric tape), no splits or kinks (metal tape)	Clean surface, apply light oil (metal tape) Avoid damage to tag or clip at end of tape	Away from moisture
Spirit level				
Automatic level (optical)				
Levelling staff				

### Record your employability skills

When you have completed the assessment activity, make sure you record the employability skills you have developed in the table at the end of the workbook. Keep copies of material you have prepared as further evidence of your skills.



# Final assessment

To be assessed as competent in *CPCCCM2006A Apply basic levelling procedures*, you must provide evidence of:

- the underpinning skills and knowledge
- relevant legislation and workplace procedures
- other relevant aspects of the range statement.

## Assessment mapping

The following table maps this final assessment activity against the elements and performance criteria of *CPCCCM2006A Apply basic levelling procedures*.

Part	Element	Performance criteria
A	All	All
B	All	All
C	All	All

For detailed mapping of this workbook against the methods of assessment, the elements, the performance criteria and required skills and knowledge, refer to the *Aspire Trainer's and assessor's guide* for this unit.

The following activity has been designed for all learners to complete.

## Part A: Demonstrating essential skills

Your trainer or assessor needs to **observe** you demonstrating the following essential skills in your workplace or in a simulated environment.

### Essential skills

Demonstrate to your trainer or assessor how you:

- use communication skills to:
  - determine requirements
  - enable clear and direct communication, using questioning to identify and confirm requirements, share information, listen and understand
  - follow instructions
  - read and interpret:
    - documentation from a variety of sources
    - drawings and specifications
  - report faults
  - use language and concepts appropriate to cultural differences
  - use and interpret nonverbal communication, such as hand signals

*continued ...*