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Element 1: Planning and preparing

Overview

Planning and preparing for tasks includes confirming instructions, identifying any safety requirements and selecting the correct equipment for measuring and calculating materials.

During the planning and preparation stage of any activity it is essential to consider all aspects of the task. This may include the task requirements, communication requirements, safety requirements, equipment requirements and the material requirements.

Before starting to take measurements or make calculations, you should always check the equipment you will be using for serviceability and suitability for the tasks. During the entire measuring and calculations phase of a task, you should always remember 'measure twice, cut once'. This adage is just as relevant with calculations, 'calculate twice, order once'. This approach ensures you measure, calculate and complete the tasks efficiently and effectively and avoid making mistakes that will lead to wasted time, money or materials.

Learning outcomes

You need to demonstrate competency in the following areas:

Section 1.1 Confirming and applying work instructions

Section 1.2 Obtaining and applying safety requirements

Section 1.3 Checking the serviceability of selected measuring and calculating equipment

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Section 1.1: Confirming and applying work instructions

At the start of any activity or task it is important to confirm the work instructions. Instructions may be given to you verbally or in written form. Checking instructions can be done in a number of ways but questioning the person who has given you the instruction is the easiest. Other ways could include checking workplace procedures, company policies, plans or specifications.

All tasks undertaken in the construction industry should have a variety of documentation that can be used to confirm and apply work instructions, including:

- diagrams, sketches, maps, signs, plans
- instructions from internal or external personnel
- manufacturer specifications and instructions
- safety data sheets (SDSs)
- the organisation's work specifications, procedures and policies
- regulatory and legislative requirements, and Australian standards
- safe work method statements (SWMSs) or procedures, job safety analysis sheets (JSAs)
- work bulletins, memos or schedules.

Copies of these documents can be found in the site office or the organisation's main office. Most of this information will be included in your workplace policies and procedures. Everyone at the worksite needs to read, understand and follow the workplace policies and procedures to ensure all work is done safely and effectively.

Once you have confirmed the instructions and are aware of the requirements for the task, you can then do what has been asked of you.

Find out more

Resource	Why it is useful
Production Machining *The reason for work instructions* www.productionmachining.com/articles/the-reason-for-work-instructions.aspx	This web article explains the purpose of documented work instructions.
Monash University (VIC) *Safe work instructions – workshop safety* www.monash.edu.au/ohs/topics/safe-work.html	This web page provides a simple explanation of safe work procedures and the type of information they contain.

It is necessary to know the units of measure for the worksite. The general practice in construction is to use the metric system and give measurements for length, width, height or depth in millimetres (mm) and metres (m). For example, 2400 mm lengths of timber, 100 mm PVC pipe, or a hole dug to 750 mm deep.

All weights are given as kilograms (kg) or tonnes (t). For example, a 20 kg bag of cement or a 5 kg bag of lime. Litres (l) and millilitres (mL) are the measurements used for liquids such as water, paint, solvents and liquid chemicals.

Sometimes the tool that you use to measure materials will have directions for use from the manufacturer. In other cases, measure methods may be detailed in workplace procedures or instructions. Ask your supervisor if you are in doubt about what tool or method to use and the requirements for the work.

Find out more

Resource	Why it is useful
Lawler, G 2011, *Understanding maths: basic mathematics explained*, 3rd edn, Aber Publishing, Australia.	This book covers basic maths concepts for adults using day-to-day principles.
Centre for Innovation in Mathematics Teaching (UK) *Measuring lengths* www.cimt.plymouth.ac.uk/projects/mepres/book7/bk7i19/bk7_19i1.htm	This is from a UK website – this web page explains the concept of choosing the most appropriate unit of length for measuring particular things, and provides opportunities for practice.

Section task 2.1

Find two methods of measurement used in construction. Briefly describe each one and how it is used.

Method	Description	Purpose

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Section 2.2: Obtaining accurate measurements using a rule or tape

'Measure twice; cut once' is a common phrase used when measurements are being taken. This ensures the accuracy of the measurements and reduces problems such as insufficient materials or excess wastage.

Measurements taken on construction sites are often done with measuring rules or tapes. These measurements are generally for objects of relatively small dimensions up to only a few metres. It is important to know the correct measurement device to use for the intended purpose that may include measuring out materials, site dimensions or other basic activities.

It is important to make sure that the measuring tool is capable of reading to the appropriate standard. If the job requires measurements in millimetres, make sure the tape or ruler has markings suitable to the task. There is no point using a tape that is marked in metres, if you need a result in millimetres.

In one metre, there are 1000 millimetres (1 m = 1000 mm), so if the wrong measuring device is used in the first place, there is a high margin for error.

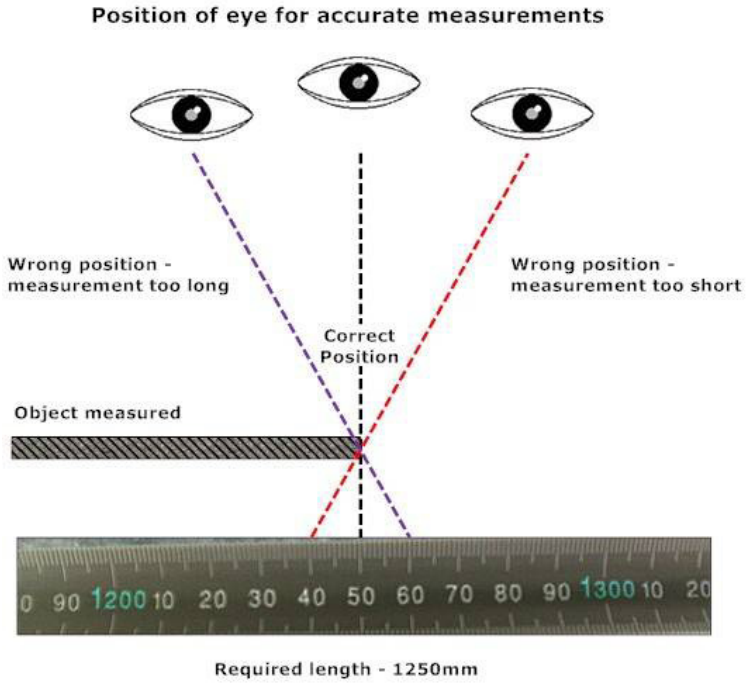
Most modern tapes and rules have markings in millimetres. It is important to check the piece of equipment before you start. Construction standards require metric measurements in line with the job specifications.

Imperial measurements (using feet and inches) are not to be used. If necessary, measurements given in imperial format MUST be converted to metric before starting the task. Various conversion tables are available but in Australia, most measurements are already in metric form.

You have to know how to convert the units to meet the requirements for the tasks you are doing. Some common conversions include the following:

Conversion	Calculation	Example
Metres to millimetres	Multiply the number by 1000	1.5 m × 1000 = 1500 mm
Millimetres to metres	Divide the number by 1000	2750 mm ÷ 1000 = 2.75 m

Accuracy in measuring is important. One way to do this is to reduce the possibility of error when measuring. One of the most common errors is when the eye is not in line with the object being measured. This is shown in the following diagram.



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Once you have one or a series of measurements, these may then need to be used for various calculations for area, volume, quantity, cost or other worksite factors. Some of these calculations are explained in more detail in following sections of this unit.

It is important to get help if you don't understand or need assistance with measurements. You do not have to be an expert at maths to work in construction but you do need to know how to work out measurements and calculations that may apply to your workplace.

Find out more

Resource	Why it is useful
eHow *About metric rulers* www.ehow.com/about_4707326_metric-rulers.html	This is from a US website – this web page describes the use of metric rulers to measure objects.
eHow *How to use a metric tape measure* www.ehow.com/how_2294327_use-metric-tape-measure.html	This is from a US website – this web page describes how to use a metric tape measure.

Section task 2.2

1. Briefly describe why you should use a ruler or tape in millimetres for construction measurements.
2. List two types of errors that can occur when measuring an object.

In ACTION

Phil's story

As a new worker to the construction industry, Phil speaks to his team leader Jake about the various measurements he may be required to do in the worksite. Jake explains what is required and what methods are used on the site. He suggests Phil take some time to practise doing some common measurements to familiarise himself with the procedures and materials.

Phil uses a tape measure to take some simple measurements, then uses his measurements in various formulas that are relevant to the construction activities. He then confirms his results with Jake to ensure that he has completed the tasks correctly. Jake shows Phil how to record the results on the job sheet.

Revision

- The correct method for measurement must be selected and then applied to the relevant workplace activities.
- Measurements using a tape measure or ruler are common in construction activities.
- Measurements must be accurate, in metric format, and in line with the requirements of the work. A tool that has the correct measurement markings (for example, in millimetres) is required, and workers must be able to read the measurements to the nearest millimetre.
- Measurements should be confirmed, checked and then recorded using the appropriate workplace procedures.

Are you ready?

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

I understand how to:

- ❑ Select and apply the measurement method
- ❑ Obtain accurate measurements using a rule or tape
- ❑ Confirm and record measurements

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Assessment activity 2
Obtaining measurements

The following table maps the assessment activity for this chapter against the element and performance criteria of Element 2 in *CPCCCM1015A Carry out measurements and calculations*.

Part	Element	Performance criteria
Whole activity	2	2.1, 2.2, 2.3

1. Briefly describe why it is necessary to use the correct measurement method for construction activities.
2. List two errors that could occur with measurements.
3. Briefly explain how you could overcome these errors.
4. List two types of measurements that may be found on a construction site.
5. Write a sentence to explain why it is important to confirm and record measurements.
6. List the formulas that you would use to calculate the following:

Object	Formula
Area of a rectangle	
Area of a circle	
Volume of a cylinder	
Volume of a rectangular prism or cube	
Area of a triangle	

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 learner guide. Keep copies of material you have prepared as further evidence of your skills.

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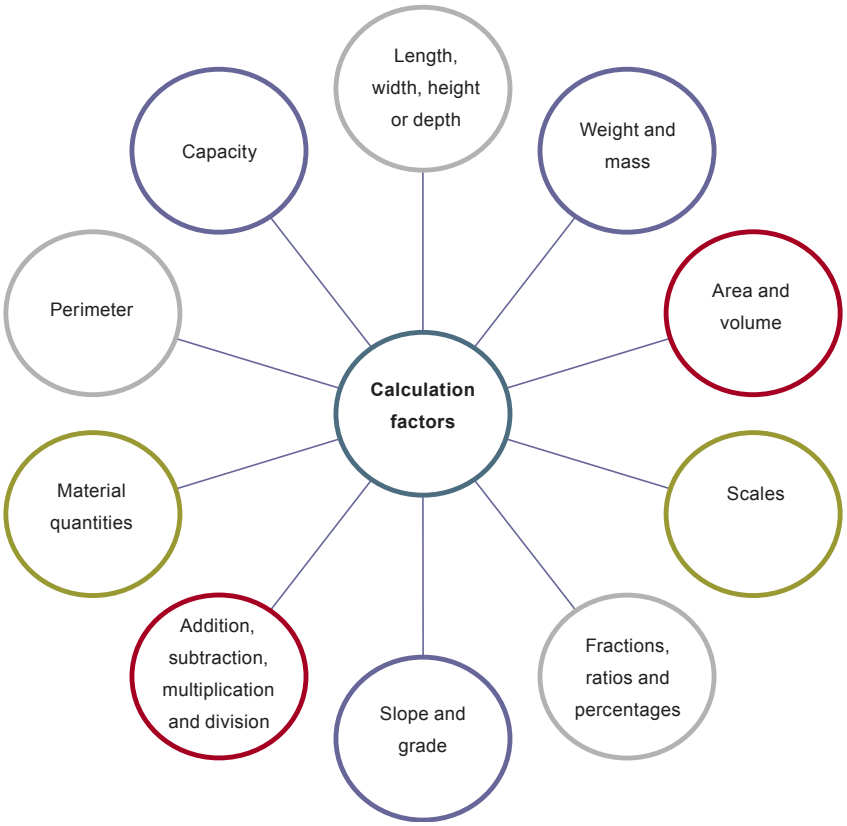
Section 3.1: Determining calculation factors and selecting the correct method

Once the measurements have been taken and recorded, it may be necessary to include these in formulas to carry out a further process. The methods and calculation factors involved often depend on the work procedures and processes used.

The type of work you are involved in determines the type of calculation that is required. These calculations may include:



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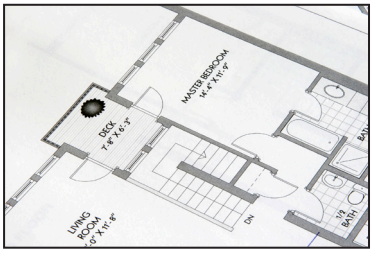
Often these may be worked out using a calculator or through the use of manual methods. You need to understand the following important terms to help you determine measurements and calculations.

Scale

Scale is used to interpret dimensions from plans or drawings to full distance. For example, plans may be drawn to scale 1:100. This means that every 1 cm measured on the plan equates to 100 cm measurement in reality.

Percentages



Percentage means out of one hundred. Percentages are used on construction sites to:

- calculate and estimate quantities
- calculate wastage
- work with customer invoices, quotations and accounts
- determine discounts
- work out goods and services tax (GST).

Percentages can be worked out manually or with a calculator. Consider the following example.

Example

1. Manually calculating a percentage:
   - Find the 10% discount on timber that costs $20.00
   - First you need to find 10% of $20.00, which is also expressed as 10% x $20.00; the calculation is:

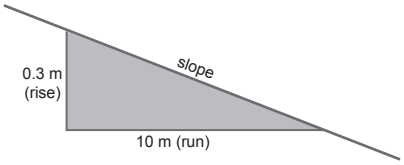
     $\frac{10}{100} \times \frac{20}{1}$, which is the same as $= \frac{200}{100}$, which equals $2.00.
   - Therefore, there is a $2.00 discount.
   - So, $20.00 – $2.00 is $18.00, which is the discounted price of the timber.
2. Using a calculator:
   - You can simply use the percentage button on the calculator:

     20 – 10%
   - The answer is 18.

Slope or grade

In some construction jobs it is necessary to calculate the slope of the ground or drainage lines. Slope can be defined as *Rise ÷ Run*. For example, if a site required slope to drain the water away over a 10 m distance with a height of 300 mm (0.3 m).

$$\text{Slope} = \frac{0.3 \text{ m}}{10 \text{ m}} = 0.03, \text{ this equates to a 3\% slope for the ground}$$



Capacity

Capacity is similar to volume but it is generally used to determine the size of the container. For example, a 200 litre fuel drum, a 10 tonne tipping truck, 2 cubic metre bin. The term is used to indicate the maximum holding capacity of the object.

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Section 4.2: Selecting appropriate formulas for calculating quantities

Formulas are used to calculate quantities or material requirements on construction sites. Different worksites may use different formulas depending on the type of activities being undertaken. For example, a plumber may use slightly different formulas to a bricklayer or a carpenter.

Formulas may be used for areas, volumes, quantities, costs, quotations or other workplace functions. It is important that the correct formula is used for the intended function. Refer to Elements 2 and 3 for related formulas and information.

Using the appropriate workplace checklists, forms or record sheets often makes the task easier. Workers should make themselves familiar with the relevant workplace procedures and systems where these relate to calculations and formulas. Using the right formula makes the job easier and more effective. It may also save the organisation time and money with reduced waste and the supply of the required material quantities.

Selecting the correct formula is often gained with practise. The more you use the formulas, the easier it becomes to apply the formulas to other tasks. If you are not sure about the correct formula to use, speak to your supervisor for assistance. If this is an area that you have difficulty in, consider completing a training course to improve your skills.

Find out more

Resource	Why it is useful
Commonwealth of Australia *Construction, utilities and telecommunications numeracy program* www.dest.gov.au/archive/ty/litnet/numeracy/ncut.htm	This website provides information on measuring, calculating and using formulas. It also provides exercises for the learner to complete.
Means, RS 1999, *Means illustrated construction dictionary*, RS Means Company, Massachusetts, USA.	This book provides information on construction terms, phrases, symbols, weights, measures, calculations and formulas.

Section task 4.2

1. List three formulas used in a construction workplace.
2. Write a sentence to describe why it is important to use formulas to give the correct results.