





Version: VI-1

Acknowledgements

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This Learner Resource has been developed based on original content provided by Harry Oriander and Eric Pagliarella.

Reviewed for access by incarcerated students

Note: This unit reviewed by ABT, April 2014, for delivery to incarcerated students who have only printed material access.

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Introduction to unit CPCCBC4004A

Welcome to the Learner Resource for *CPCCBC4004A Identify and produce estimated costs for building and construction projects*. This unit forms part of the CPC50210 Diploma of Building and Construction (Building), which is a qualification designed to meet the needs of builders and managers of small to medium-sized building businesses.

The builder may also be the appropriately licensed person with responsibility under the relevant building licensing authority in a particular state or territory. Builder licensing varies across states and territories, so additional requirements may be required to become licensed in the particular state or territory.

Occupational titles may include:

- builder
- construction manager.

This unit of competency specifies the outcomes required to establish the estimated costs associated with the acquisition of materials and labour on building and construction sites, together with the application of relevant overhead costs and margins. Knowledge of physical resource and supplier identification, assessment of the availability of, and requirements for skilled labour and application of appropriate codes, regulations and approvals gaining processes is essential.

This unit of competency supports the needs of estimators, builders, managers and trade contractors within the construction industry responsible for producing estimated costs for labour, materials, overheads and on-costs on various residential and commercial construction projects within their scope of work as a trade contractor or builder.

A copy of the full unit of competency is included in Appendix 3 of this Learner Resource together with a list of all the units required to complete the CPC50210 Diploma of Building and Construction (Building).

Note: The unit of competency in this Learner Resource was current at the time of publication.

References

This Learner Resource is to be used with reference to other texts, such as the Building Code of Australia and Australian Standards. These will be included in the printed materials provided.



About this course

This Learner Resource is one of a set of resources that you will use to complete the CPC50210 Diploma of Building and Construction (Building).

Flexible delivery

This Learner Resource is used to provide you with everything you need to complete this unit. You are about to embark on a type of training that is called flexible learning, which means that you do not need to attend formal classes.

Flexible learning is a good option for this level of learning as it allows you to undertake the course at your own pace and in your own time. When undertaking flexible learning it is important to:

- set and document clear timelines to read and understand a topic and to complete all the learning activities and assessment tasks
- be motivated and don't let distractions impact on your progress
- undertake one topic at a time. You should work through the topics in the order they are presented in this Learner Resource
- submit your assessment tasks on or before the due date and time
- not wait until you finish all the reading and learning activities before you attempt the assessment tasks – undertake them when you feel you are confident about the topics they address
- make sure the assessment task that you send to be assessed is clearly labelled by completing and attaching the assessment task cover sheet with your name, assessment task title, date, etc.



What you will study

This Learner Resource contains six topics that you should work through step by step. The topics are:

1. Building costs and standards
2. Producing estimated costs
3. The process of estimating
4. Preparing a take off
5. Project costs
6. Overheads

There are also learning activities that you should complete before moving on to the next topic. These are provided to help you apply and reinforce what you have learnt in each section. If you have trouble answering any of them you should contact your tutor.

Icons

The following icons are used throughout this Learner Resource.

	Learning activity These activities help you consolidate your learning and may be used to build a portfolio of evidence.
	Assessment task These must be submitted to your tutor and will be used to assess your knowledge and skills in each competency.
	Information Note or key points are used to alert you to additional information or critical points that need to be understood.



Your time commitment

It should take about 60 hours to complete this unit. However, depending on your circumstances or prior knowledge, you may find that it takes a little less or more time to finish the work.

Activities and assessment

Throughout this Learner Resource, there are activities to help reinforce the learning associated with a new topic. Your tutor may require you to forward your responses to these activities to them as part of your formal assessment. If this is required you will be advised by your tutor. The assessment tasks are provided at the back of this Learner Resource.

The assessment tasks can be attempted as you work through the Learner Resource. You don't have to wait until you have completed all the activities before attempting an assessment task.

There are six assessment tasks for this unit that you must submit to your tutor on or before the agreed date and time. The titles of the assessment tasks are:

1. Identify key sections of estimate
2. Prepare take offs
3. Material and plant costs
4. Subcontractor and supplier quotations
5. Labour costs
6. Overall project costs estimate

Make sure that all work you submit is your own and that you appropriately acknowledge and reference source materials. When you have completed an assessment task, send it to your tutor who will assess your work and provide appropriate feedback about whether you have satisfied the requirements of the assessment task. If you have any questions about your assessment results please contact your tutor.



Satisfactory completion of the unit

You will be deemed competent for this unit on the basis that you can provide evidence of:

- identifying materials required for a project
- gathering information about material supply
- interpreting measurements and calculating quantities and costs
- planning and allocating human resources
- identifying and costing other related costs, such as those required to meet statutory and planning approval processes
- producing documentation that meets the timeframes and quality standards established by the organisation
- communicating effectively, both verbally and in writing.

Employability Skills

Employability Skills are the generic skills required not only to gain employment but also to progress within the workplace. These skills help you to achieve your potential and to successfully contribute to the strategic directions of an organisation or your business.

Employability Skills are embedded within every competency and included in all assessments. The Employability Skills within this unit are presented in a table in Appendix 1 of this Learner Resource, mapped against the assessment activity that addresses the skill.

Getting started

It's now time for you to start working through this Learner Resource. We wish you all the best with your study in this unit and all the other units required to complete the CPC50210 Diploma of Building and Construction (Building).

Remember, if you have any questions about your study please contact your tutor for clarification.





1. Building codes and standards

The Building Code of Australia 2008 (BCA) is the primary reference for low and medium rise residential and commercial construction projects.
(Reference: BCA 2008, Volume One, Classes 2 to 9)

1.1 Main goals of the BCA

The BCA has undergone rigorous testing to make sure that the structural safety, fire safety, sustainability and amenity objectives have been clearly stated for all personnel involved in the construction of buildings.

1.2 BCA technical provisions

As the states and territories throughout Australia have a vast array of varying climactic conditions, the BCA makes allowance for these, in addition to geographical and geotechnical differences.

1.3 BCA general provisions

When building design is the preliminary step to the actual building of the project, the drawings and specifications must be in compliance with the BCA parameters.

The BCA index lists four parts and each of these parts need to be studied in detail by all planners, designers, developers and builders:

- **Part one** outlines the application, which includes performance requirements, alternative solutions and assessment methods.
- **Part two** gives an interpretation of referenced standards, with particular relevance to states and territories, and special language used in the text.
- **Part three** outlines material use, fire hazards and overall stability of the building.
- **Part four** refers to changes to a building when buildings are being either united or altered.



The BCA clearly states that there is a difference between the way in which this reference could be used. There is a distinct difference between the guidance levels (in which objectives are identified), and functional statements (which support this guidance level).

The compliance levels allow the BCA user to adopt performance requirements that can be achieved by either complying with a 'Deemed to Satisfy' provision or providing an alternative solution.

1.4 Australian Standards

Within the BCA, there are many Australian and New Zealand Standards. These standards are listed in the BCA as 'Documents adopted by reference'. The schedule of documents lists the number of the standard, the year of the standard and the standard title.

Standards are national benchmarks and all products and services are to some extent covered by a standard. As most building operations move toward a quality assurance (QA) model, the use of referenced standards is mandatory.

You must always refer to the BCA to clarify if the standard is a referenced or regulated standard or an industry guideline.

Example of referenced standards

Minimum design load on structures provided in the following statement are typical of the standards referenced in the BCA:

- AS 1170 Structural design actions
- AS/NZS 1562 Design and installation of sheet roof and wall cladding



Although the BCA and AS/NZS Standards are mandatory, the design and construction of a building will be based on many other documents, including Codes of Practice, manufacturer specifications, trade documentation and feasibility studies. Updates to the BCA take effect on 1 May each year and the BCA is the community's minimum standard for all building work.



2. Producing estimated costs

Estimated costs need to be produced to acquire the correct amount of materials and labour for a building and construction project. The costs need to be as accurate as possible and need to take into account the organisation's overheads and profit or recovery margins. The task of estimating requires detailed knowledge of resources, suppliers and a good understanding of the availability and requirements for skills for a specific project.

Estimators, builders, managers and trade contractors within the construction industry are responsible for producing estimated costs for labour, materials, overheads and on-costs for various residential and commercial building and construction projects.

The general and specific skills and knowledge you require will include:

- the ability to take off the quantities required
- the ability to value both labour and materials and accessories for estimates
- prepare budgets and tenders.

By completing these tasks, you will be able to develop and calculate detailed estimated project costs for inclusion in a tender or bill.

One of the major documents required for estimating, budgeting and tendering is the bill of quantities (BOQ).

2.1 Bill of quantities

The process of measuring and preparing a BOQ is also called a take off. A BOQ is created for:

- an estimate (accurate forecast of costs for any item of work)
- a budget (accurate forecast of costs for a project)
- a tender (an offer to enter into a contract).

A BOQ is nearly the same as ordering materials for a building project for use on-site, except that on-site you need to buy the quantities to build the project, including waste.



The BOQ (take off), or the estimated quantities, are scaled off the drawings for both speed and convenience. This is acceptable as most drawings are being produced using computer aided drawing (CAD) and are very accurate to scale. This is an acceptable industry practice and a percentage factor is applied to cover loss and waste. It is common practice by estimators to include loss or waste of materials into the rates for the cost of labour and materials.

The quantities used to purchase materials are known as:

- the cutting list (for certain elements of work, eg carpentry)
- ordering schedule (for works such as doors/door schedule)
- purchase orders (works where the quantities are numerical, eg 25 toilet basins).

The purchase order quantities must be accurately measured, stated and be exact as they reflect:

- what is to be payed for
- what is required to construct the building for completion.

2.1.1 Units of measurement and quantity

Measurements, quantities and information provided to subcontractors and suppliers when ordering needs to be accurate to avoid excessive waste (but it must provide for reasonable waste).

Certain elements and materials have different levels of accuracy requirements because some are controlled by other influences, while others are controlled by their relationship in the construction of the building relative to their connections to each other.

For example, an excavation (hole) is not generally true to size in either depth, width or length, and therefore, the theoretical volume of concrete required may be subject to a variation of $\pm 5\% - 8\%$ as the final depth which (is arbitrary), is subject to the engineer's inspection of the founding base.

By contrast, the size of window frames, door frames and doors (manufactured items), need to be highly accurate within 1 – 2 mm, to make sure that they will fit into prepared openings and that they will coordinate with themselves and other dependant elements or materials.

Every piece of material, fixing or accessory must be identified and accounted for in the BOQs (take off) and be measured accordingly.



The material, fixing and accessory measurements are expressed as:

- mass or volume, cubic metre symbol (m^3)
- area on a plan or elevation, metre squared symbol (m^2)
- lineal metre, length, symbol (lm)
- numbers of units, symbol (qty).

If there are no units of measurement that apply, then it may be referred to as an item.

2.2 Labour requirements

Every piece of work or material measured will require labour to create, make, modify, or install it for completion. Each unit of measurement will require the labour to be valued to form composite rates, ie labour and materials. This may include all fixings, accessories, or small plant and equipment. Larger plant and equipment would be accounted for separately within the preliminaries.

The building industry in Australia is made up of:

- building contractors
- developer/builder (head contractors)
- subcontractors
- trade contractors (specialist contractors).

Very few builders today have their own in house trades, however they may have carpenters and labourers as support infill workers to carry out works in between the trade packages (as they may not fit into a trade package). Additional reasons for such labour are to:

- support any occupational health and safety (OHS) issues
- keep the site clean and operational
- keep the amenities clean.

The industry subcontracts most of the trade work to subcontractors. The following is an example of what a trade package may include.

In most projects of \$2 million – \$50 million, there are 25 – 30 trade packages that cover:

- demolition
- site works
- bulk excavation
- cut and fill



- roadways
- car parks
- excavation
- concrete
- reinforcement
- formwork
- structural steel work brick/block work
- general metal work, there are many sub-trades within this group
- windows and façade systems
- roofing and fall safety systems
- carpentry
- framing
- fit-out
- joinery fixtures and fittings
- doors and door frames
- door hardware
- plasterboard walls and ceilings and suspended systems
- hard plaster/render
- tiling
- carpets and vinyl
- painting
- plumbing and hydraulics
- air conditioning
- electrical installations
- data
- communications
- security systems
- fire protection systems
- fencing
- landscaping
- signage/graphics
- furniture/soft furnishings.



Additionally, there are other items that clients may contract for separately, but these form part of the building contract as separate contractors (or subcontractors), requiring only supervision coordination or attendance.

The construction industry has evolved into many separate trade groups, thus enabling each trade group to be very efficient and adapt itself to meet market conditions, adopt new materials, technology, safety standards, environmental regulations and so on.

Generally, trade contractors bid or tender for their subcontract packages as a whole, and are usually a self-contained trade element.

The construction industry generally supplies:

- their own shop drawings
- their own set out, measuring and levels (these are checked and agreed)
- all their own labour and supervision
- all materials
- all accessories
- all fixings.

They may also supply:

- hoisting and cranes
- scaffolding, access booms and/or scissor lifts
- excavations
- pumping
- testing
- certifications
- warranties
- guarantees
- OHS safety programs
- Job safety analysis sheets (JSA)
- Safe work method statements (SWMS).

The just mentioned system should work well to make sure of the quality of work and the total success of operations.



I

Activity 1 - Trades and their responsibilities

1. Identify at least four trades a project manager is responsible for.

2. With respect to the trades that you have just identified, describe in point form at least three different tasks/ responsibilities that is expected from each of the four trades.

Check your findings with the correct answer in the back of this Learner Resource under 'Learning activity answers'.

* Retain this learning activity as part of your portfolio of evidence.



3. The process of estimating

In general terms, estimation is the process of calculating the approximation of a result that is usable even if input data may be incomplete or uncertain. More specifically, in the building and construction industry, estimating is the process of calculating the approximate cost of work to be done and associated expenses based on the project scope and specification.

Estimating generally involves working with four elements of the project. These are as follows:

- labour
- materials
- plant and equipment
- time.

3.1 Purpose of estimating

The purpose of producing an estimate is to calculate as close as possible the total cost of the project. According to Misronet Construction Information Services (2011), an estimate is necessary to give the owner a reasonably accurate idea of the cost to help them decide whether the work can be undertaken as proposed, or needs to be modified or abandoned altogether.

3.2 Types of construction estimates

Misronet states that estimating can be grouped into two main categories. These being:

1. *Approximate estimates*

An approximate estimate is an approximate or rough estimate prepared to obtain an approximate cost in a short time. For certain purposes, the use of such methods is justified.

2. *Detailed estimates*

A detailed estimate of the cost of a project is prepared by determining the quantities and costs of everything that a contractor is required to provide and do for the satisfactory completion of the work. It is the best and most reliable form of estimate. A detailed estimate may be prepared in the following two ways:



Unit quantity method

In the unit quantity method, the work is divided into as many operations or items as are required. A unit of measurement is decided. The total quantity of work under each item is taken out in the proper unit of measurement. The total cost per unit quantity of each item is analysed and worked out. Then the total cost for the item is found by multiplying the cost per unit quantity by the number of units. For example, while estimating the cost of a building work, the quantity of brickwork in the building would be measured in cubic meters. The total cost (which includes cost of materials, labour, plant, overheads and profit), per cubic meter of brickwork would be found and then this unit cost multiplied by the number of cubic meters of brickwork in the building, would give the estimated cost of brickwork.

This method has the advantage that the unit costs on various jobs can be readily compared and that the total estimate can easily be corrected for variations in quantities.

Total quantity method

In the total quantity method, an item of work is divided into the following five subdivisions:

- materials
- labour
- plant
- overheads
- profit.

The total quantities of each kind or class of material or labour are found and multiplied by their individual unit cost. Similarly, the cost of plant, overhead expenses and profit are determined. The costs of all the five sub-heads are summed up to give the estimated cost of the item of work.



3.3 When to develop an estimate

According to the National Aeronautics and Space Administration (NASA) (2011), the estimating typically occurs at three stages of a project:

1. **Project inception** – initial estimate before the official project start up.
2. **Major milestones** – at each major milestone the project cost estimates should be refined with the improved data available.
3. **Re-planning events** – whenever a re-planning activity occurs, the relevant cost estimates should be re-evaluated as part of that re-planning.

3.4 Informing estimate development

When developing an estimate, you need to gather information from a range of sources. The following is a list of sources that will provide input for the development of an estimate:

Design information:

- Design drawings
- Requirements
- Operational concepts
- Specifications
- Equipment lists
- Tools lists
- Deliverables list

Planning information:

- All plans
- Schedules
- Documented commitments
- Maintenance agreements
- Work breakdown structure



Cost information:

- Catalogues
- Price lists
- Supplier quotes
- Historical data.

3.5 General principles for estimators

The general principles by which estimators operate are that estimators:

- are not paid to guess anything
- are paid to carefully research all current market prices and information for all elements of tenders
- do not and should never take short cuts
- use the Internet or other sources for reference, for product data sheets and price lists
- share information within an organisation to assist the organisation to achieve its goals
- respect and build relationships with subcontractors and suppliers
- carefully check all quotes for conformity with specifications, scope and content of the cover of their quotations, to make sure that they are quoting only for what is required
- ask qualified and experienced people for assistance
- don't assume anything, as all projects are not the same
- work systematically to win the tender
- don't hide mistakes that they find

Following is an outline of the process of estimating or preparing a BOQ.



3.6 Take offs

A bill of quantities (BOQ) is what contractors sometimes refer to as a take off.

The standard method of measurement (SMM) is used by quantity surveyors as the uniform expression for how and what to measure when preparing a formal BOQ. Builder take offs mostly follow these principles but not with the same formality or the degree of descriptive detail.

3.7 Interpreting plans and specifications

Project plans, drawings and specifications need to be identified, read and clearly understood for the purpose of measuring and calculating both labour and materials for a project. The plans, drawings and specifications provide information regarding levels, heights, gradients and other measurements that need to be interpreted for estimation. They allow measurements to be made and quantities to be identified, and also assist in making sure of conformance with standard industry practices.

3.7.1 The use of drawings for measurement purposes

In most cases, architectural drawings are the major source of all measurements for all parts of the building. The drawings by structural engineers don't usually have the full dimensions. The drawings only show the dimensions for slab thickness, column and beam sizes, and schedules to provide sizes for the structural steel selections.

The architectural drawings generally use scales of: 1 to 100 or 1 to 50, and 1 to 20 for details. Site layout plans often use scales of 1 to 200 or 1 to 500. A scale ruler (manual), scalemaster plan measuring system (digital), or digiboard can be used to measure lengths, widths and heights.

Sufficient accuracy is therefore obtained for estimating, using scaled dimensions off the provided drawings.



Hard copy drawings should be coloured to highlight different parts of the building and its elements. This makes the drawings easier to read. Otherwise, estimators may use their own colour code legend. For example:

- brown for earthworks
- green for concrete
- red for brick
- orange for blockwork
- yellow for timber framing
- blue for metal work.

For clarity, it is useful to make additional copies of the drawings and colour them for concrete, reinforcing, formwork, as this creates a trade copy and avoids the confusion with too many colours on one page. Using colours speeds up the process of checking by others.

When measuring an element or part of the work, mark them off on the drawings by using an **A**, **O** or **X**, or any other symbol you may prefer. This will show what has been measured and what is yet to be measured. Once the drawing has been coloured, measurement of all items has also been completed.

Where several elements are to be measured from the same part of the drawing, you may use all three symbols or more. For example:

Element	Symbol
Excavation	/
Concrete	O
Formwork	X

The purpose is to establish a systematic, routine way of carrying out take offs and to avoid mistakes.

When taking off, you should label or signpost dimensions to record where they came from on the drawings. Use drawings numbers (eg drawing number A/002, section numbers – Section A – A). Also, use elevations (eg north wall, south windows or west roof), as markers so they can be referred to if there are changes at a later stage. Such labels and signposts can also be used for discussion with others who are checking someone's work or using someone's take offs.

Estimated or calculated quantities should be checked against subcontractor quantities or the estimator should provide the subcontractor with information to facilitate the subcontractor's pricing.



Some subcontractors are reluctant to price work at a tender stage without quantities, so providing assistance to subcontractors creates cooperation and goodwill.

Some measurements can be borrowed or lent to use with other trades. For example, blockwork areas can be used for render where these two elements are present together. Also, the painting of that render can use the same areas.

3.7.2 Levels and gradients

A defined reference level from which the heights or depths of surrounding objects or points are measured is known as a datum. Mean sea level (MSL) is referred to as standard datum and is used principally for topographical mapping and surveys conducted on a national scale. Levels related to any datum other than standard datum are known as reduced levels (RL).

Levels should be expressed to the nearest multiple of 5 mm or 0.005 m and the required figured level should be enclosed in a drawn rectangular box. Where the level of an existing feature is to be varied, the existing level should be placed directly above the box containing the required level, thus:

52040
52045

Where there is a possibility that levels might be confused with other figures on a drawing, eg room numbers, linear dimensions or grid references, the use of the prefix RL (reduced level) or FFL (finished floor level), as applicable, is recommended, thus:

RL	52045
----	-------



3.7.3 Levels on plan

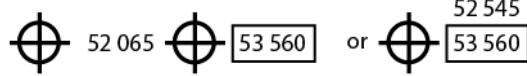
There are three general methods for the indication of reduced levels on plan views and they are as follows:

- **Job datum level:** The job datum level shall be indicated using the following symbol:



100,000

- **Spot levels:** Spot levels are used to indicate the required level for a specific point or limited area and consist of the symbol placed at the exact spot to which the level applies, followed by the RL for the proposed and/or existing level, thus:

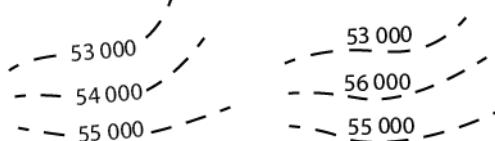


Spot levels

- **Contour lines:** Contour lines used to indicate the slope and shape of existing ground surface shall consist of thin unbroken lines.

Contour lines used to indicate the slope and shape of proposed ground surface shall consist of thin long dash lines.

Contour lines shall be drawn to pass through all points on the site having the same RLs. The RL which it represents is placed at the end of each line at the site boundary, or in the case of large sites, may be placed at intermediate points in or on the line, thus:

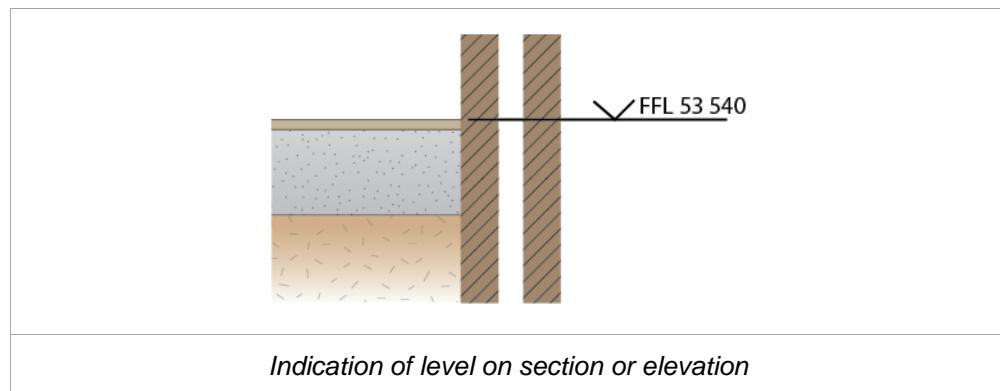


Contour lines



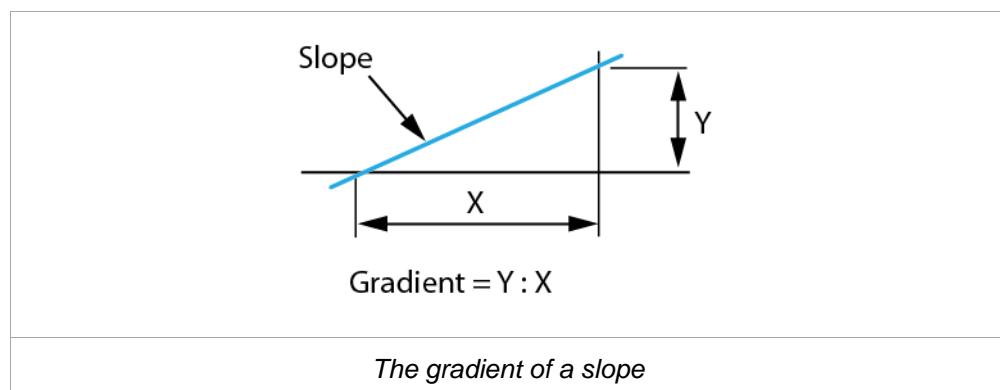
3.7.4 Levels on section or elevation

Levels, existing or proposed, should be projected clear of the detail by means of an extension line and indicated as shown in the following graphic.



3.7.5 Expression of gradient

For the specification of vertical angles which are capable of being established on-site by means of simple measuring devices, the gradient (slope, pitch, fall or incline) of surfaces, such as roofs, gutters, ramps, etc should be expressed in the form of a numerical ratio Y: X. On the following ratio Y is the vertical dimension and X is the horizontal dimension of a right-angled triangle, the hypotenuse of which is the slope.



For convention, the vertical dimension will always form the first part of the ratio.

Thus, for gradients flatter than 1:1, the first number will be unity, eg 1:20, and for gradients steeper than 1:1, the second number will be unity, eg 5:1.

The use of angular measurement for slopes in degrees or radians is still acceptable in certain cases where a higher degree of accuracy is required.



Materials

Materials can be represented on the working drawings by hatching and occasionally by colouring, although if drawings or tracings are to be reproduced, the colouring should not be used.

Materials are listed in a table that shows the following:

- the material name
- the symbolic representation
- the colour.

Recommended methods of indicating materials by hatching, symbolic representation of materials and colouring are given in the table presented on the following pages.

Some of the methods shown may be impossible to draw at smaller scales. Where large areas of symbolic representation of materials need to be indicated (eg concrete, plaster and similar), it is recommended that only a portion of the area be treated.

Where new work and existing work are shown adjacent to one another on a drawing, the new work shall be identified with the appropriate hatching and the existing work shall be left unhatched and shown in thin outline and shaded in grey tone.

To enable uniformity of spacing and direction of hatching, a sheet of squared paper should be placed underneath the drawing sheet.



Material	Symbolic representation
Section Scale 1:20 and greater	
Undisturbed earth	
Fill	
Glass	
Hardcore	
Installation	
Particle board	
Rock	
Structural steel	
Metal cladding	
Reinforcement	
Stud walls	



Material	Symbolic representation
Timber	
Sanitary fittings	
Wall and floor tiles	
Timber floors	
Fibrous or acoustic plaster	
Hard plaster or plasterboard	
Terazzo and artificial stone	
Fibrous cement sheet	
Existing to remain	



3.7.6 Specifications

In parallel with reading the drawings for the dimensions and different materials types, estimators also need to read the notes on the drawings. For example, the engineer's drawings will have many notes, a member schedule or specifications to advise of sizes of footings, (concrete) beams, slabs, columns etc, and will state their respective strengths.

The general project specifications will also need to be read in conjunction with each element and trade to make sure the pick up of any other details that may affect what is measured and therefore, the value as part of the works.

For example, the architect's specification will tell the estimator that the concrete paving is to be an exposed aggregate finish, or that the concrete is to be coloured, and any other issues that could be contained in the general specifications.

Being able to visualise the various parts and elements of a building in third dimensions (3D), from looking at the flat plans (2D), elevations or details is something that an estimator develops over time. To assist with visualisation, estimators draw a simple sketch of the components using a two dimensional or isometric drawing, ie a section through the wall or window showing the components and the connection. It is a necessary attribute to have in order to successfully take off quantities.



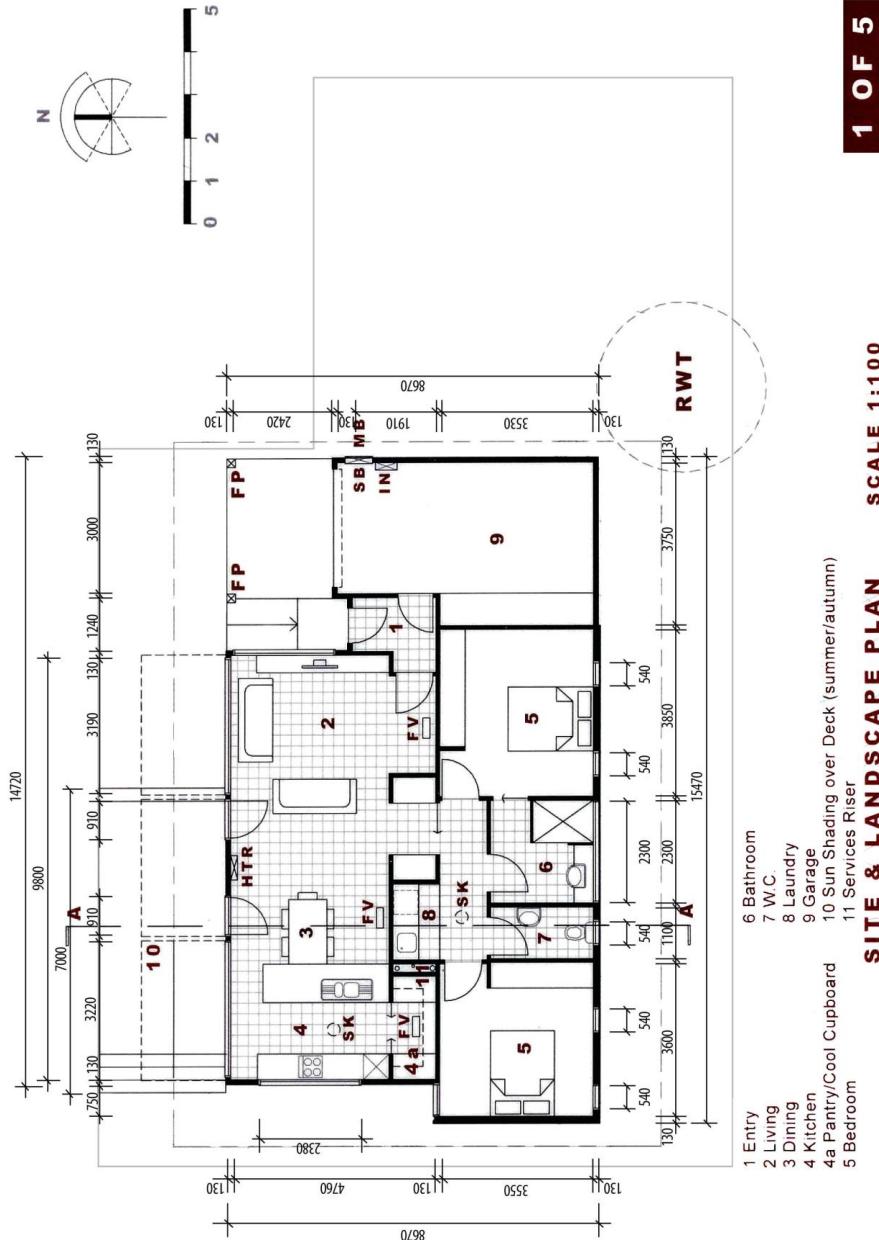
When measuring any element or valuing any quantities, round up to the nearest whole number, ie 51.5 rounds up to 52 and \$10.86 rounds up to \$11.00. This method is used to avoid errors, as whole numbers are clearer to read than those with decimal points. The exception to this is when working with gold or diamonds.



I

Activity 2 - Interpreting plans, drawings and specifications

1. What scale is the scale of this drawing? Highlight the area that shows the scale of the drawing.





2. Using the correct colours, show the following on the drawing:
 - concrete
 - formwork
 - timber framing.
3. Using a manual scale ruler or a scalemaster, measure at least three heights, lengths and widths on the plan. Once you have measured each, mark it off with the correct symbol.

Check your findings with the correct answer in the back of this Learner Resource under 'Learning activity answers'.

* Retain this learning activity as part of your portfolio of evidence.



3.8 Estimating labour

Before addressing the pricing of any task or element of work in a building, it is necessary to consider how many standard working days are available in a calendar year.

One year equals 365 days, but people do not necessarily work every day. Therefore, it is necessary to compile a chart to calculate the days that will actually be worked and charge costs out for the relevant number of days.

Following is a typical chart, which reflects differences in annual leave, public or religious holidays, festivals and other work benefits payable under industrial awards.

3.8.1 Chart 1

Productive time in a calendar year and working days in a standard year:

1.	Calendar weeks in a year (52 weeks x 7 days)	365 days
2.	Potential working days (52 weeks x 5 days less non-working days)	260 days
3.	Subtract: Annual leave (4 weeks x 5 days)	20 days
4.	Public holidays (including picnic day)	11 days
5.	Rostered days off (2 per calendar month plus 2)	26 days
6.	Paid days off total	57 days
7.	Productive days (ie Item 2 less Item 6)	203 days
8.	Productive days available estimated	203 days

Therefore, one year's pay or benefits and other costs need to be recovered over the potential productive working days available of 203 working days.

For example: Sick leave, bereavement leave, compassionate leave, maternity leave and any other types of leave is recovered in the weekly or hourly rate calculation, (refer to following Chart 2). Other days may also be payable on an individual basis.



Using the potential work days available (refer to Chart 1 – Item 2), calculate the number of working days and the number of paid days (refer to Chart 1 – Item 6).

This demonstrates that there are only 203 productive days available with which to recover the cost of the 260 days that is to be paid for.

To calculate the costs, it is necessary to schedule out all the costs/benefits and reduce it from a weekly cost down to a rate per hour against which all the estimating will be calculated, eg multiply number of hours to perform a task at \$64.95 per hour, can round up to \$65.00 per hour, per 36 hour week.

3.8.2 Chart 2

Chart 2 sets out the various items that need to be costed into an hourly rate in order to recover the full costs to employ a person based on an hourly rate, after considering all benefits and statutory compensations.



Labour category carpenter employed under VBIA/Awards:

1.	Wages/hours per week 36 averaged over 4 weeks adjusted to include for RDOs (36 hrs x \$27.94 per hour)	\$1,005.84
2.	Fares and travel allowance (5 days @ \$27.90)	\$139.50
3.	Site allowance (minimum rate per hour) (36 hrs x \$1.90 per hour)	\$68.40
4.	C-Bus super 9% of 1, 2, 3 or \$119.50 per week, whichever is greater	\$119.50
5.	Long service leave/Incolink 2% of 1 and 2	\$22.88
6.	WorkCover and make up 9% of 1	\$84.34
7.	Payroll tax 5% of 1, 2 and 3	\$60.60
8.	Public holidays 11 no. including picnic day 5.5% of 1*	\$55.35
9.	Sick leave 5.39% of 1*	\$54.21
10.	Annual leave and 17.5% leave loading 11.5% of 1	\$115.29
11.	Inclement weather allowance, multistorey allow 5.39% of 1	\$54.21
12.	Loss time allowance, tea break, toilet break etc rated at 1 hour per day of item 1, 2 and 3	\$168.47
	Total cost per week nett	\$1,948.59
	Plus a contractors margin of 20%	\$389.72
	Making a gross weekly rate of (per 36 hours) or An hourly rate of \$65.00 for each hour allowed for in your estimates, budgets or tenders. This rate calculation can be applied to all trades, adjusted only for the differing rates of pay as per awards entitlements etc for each trade award.	\$2,338.31



The recovery of inclement weather cost is applied within the cost rate as it is a reasonable assumption that it will be incurred.



4. Preparing a take off

The next step is to prepare the take off so the budget, estimate or tender can be prepared.

The take off is usually expressed on paper as a standard estimating sheet (usually in pad form). Paper format is generally used as not everyone has day-to-day access to a computer. Such information can be keyed into a computer later from the hard copy.

Other forms of taking off require direct input to the computer and are as follows.

Spreadsheets

Spreadsheet software is inexpensive and widely available. The type of software to use depends on the complexity of your job.

The benefits of electronic spreadsheets are:

- they are inexpensive
- they are easy to use
- you can customise them to your style of business.

Using spreadsheets is the same as doing an estimate by hand. It may take a while to set up, but once you have a template, the rest will come easy. Once your spreadsheet is set up, you only need to enter quantities for materials and labour. Formulas in software packages can set up the labour component to help calculate the other fields. Line items on an estimate can be automatically extended, totals calculated, and summaries given. Price changes can be easily updated on your spreadsheet.

Summary sheets

It is a good idea to set up a summary sheet so you can have an overview of all the costs of the construction. The summary sheet should be broken down into major work categories.

Most summary sheets are divided into project overhead and hard costs. The summary sheets are usually organised according to the sequence of construction.



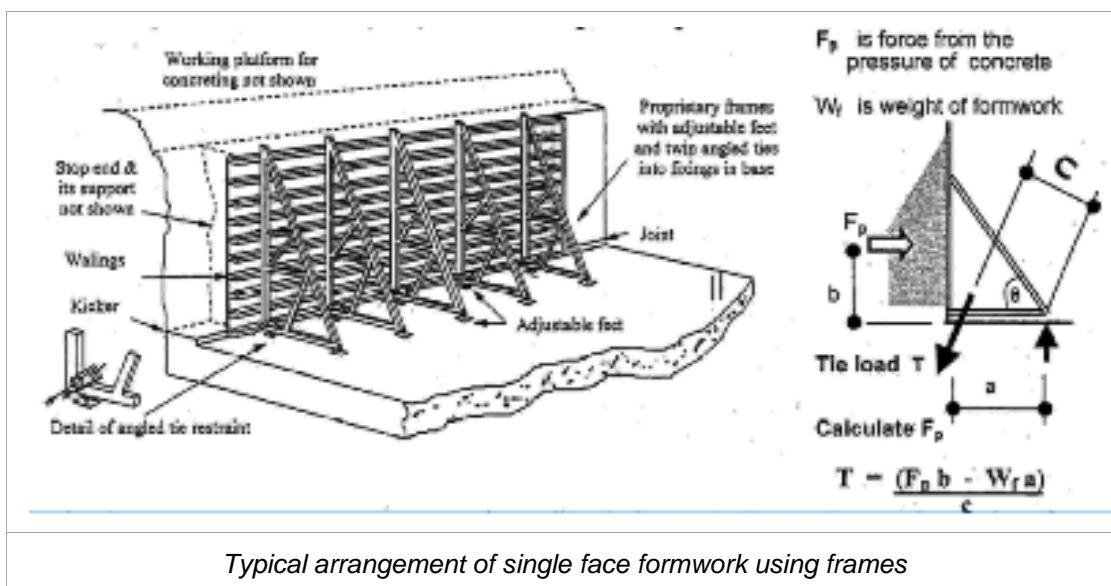
Code	Description	Estimated Cost	Draw 1	Draw 2	Draw 3	Total Cost	Variance
Indirect Costs							
Lot	58,900.00	58,900.00				58,900.00	0.00
Plans	4,700.00	4,725.00				4,725.00	(25.00)
Permits & Fees	6,676.90	6,676.90				6,676.90	0.00
Construction Loan	5,800.00	5,775.93				5,775.93	24.07
Overhead / Builder's Fee	16,684.13					0.00	0.00
Supervision	1,668.41					0.00	0.00
Sub Total - Indirect Costs	94,429.44	76,077.83	0.00	0.00		76,077.83	-0.93
Direct Costs							
Earthwork	1,475.00	1,450.00				1,450.00	25.00
Laterals	1,120.00	1,150.00				1,150.00	(30.00)
Septic Tank & Permit	2,810.00	2,650.00				2,650.00	160.00
Footings & Foundation	11,025.53	5,000.00	5,855.00			10,855.00	170.53
Flatwork	2,398.50		2,420.00			2,420.00	(21.50)
Window Wells	1,300.00		1,226.00			1,226.00	74.00
Damp-proofing	168.00		155.00			155.00	13.00
Termite Treatment	96.00		96.00			96.00	0.00
Gravel	240.00		175.00			175.00	65.00
Framing Material	21,928.10	436.00	11,500.00	9,895.00		21,831.00	97.10
Framing Labor	8,786.25		5,000.00	3,950.00		8,950.00	(163.75)
Exterior Doors	1,286.50			1,286.50		1,286.50	0.00
Windows	762.59			710.73		710.73	51.86
Plumbing	5,200.00			5,120.00		5,120.00	80.00
Whirlpool Tub	2,850.00			2,785.20		2,785.20	64.80

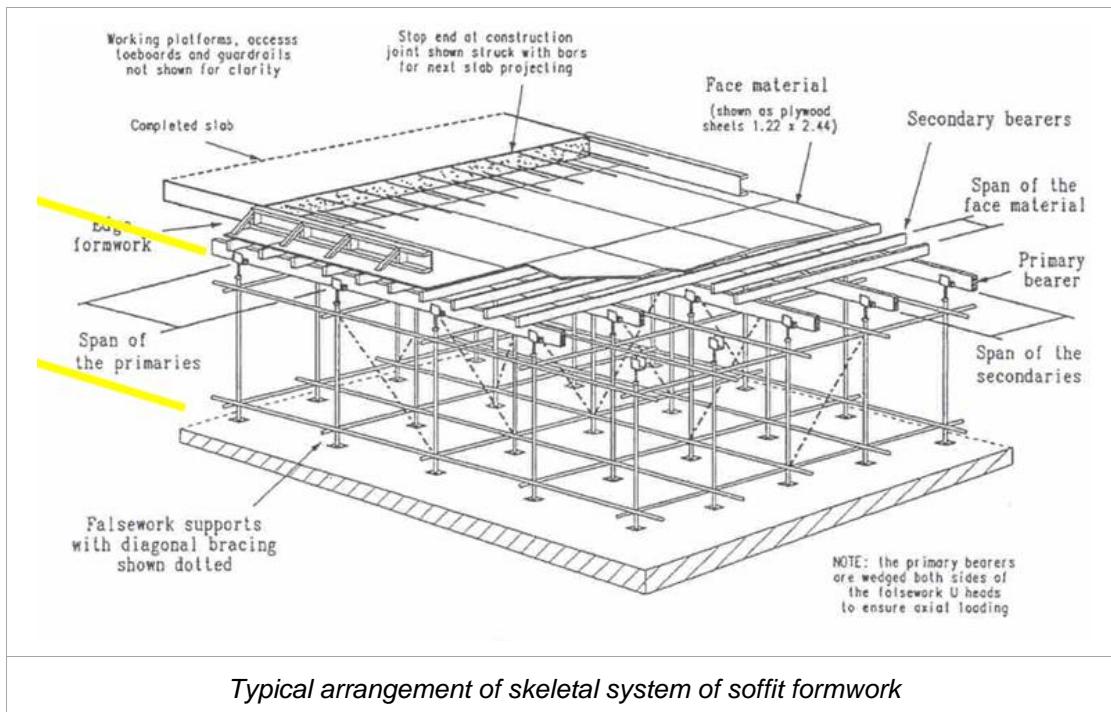
Summary sheet

4.1 Example for preparing the take offs

For the purposes of preparing a take off, we will deal with the manual (paper based) take off. The taking off directly into a computer should be relatively easy once the handwritten method has been achieved.

Using the following information, you will now prepare some take offs based on the following specifications.





What should you do?

Take off the quantities as if you are preparing a tender, and then follow the sequence of construction as if you are building the project. This allows for your understanding of building to help you express the quantities on paper as you measure each trade.

The first step is to set out the information clearly, logically and with sufficient detail in the estimating sheet. This information should include labels and signposts to enable ease of interpretation without reference to the writer by either the reader, or any other end user.

Estimating sheets

The estimating sheet needs to have provision for a filing margin on the left hand side, then space for writing notes, signposts, labels, etc. For example:

- vertical columns for writing in dimensions
- a quantity column
- a unit of measure column
- a rate column
- a cash column.



Refer to the following page for an estimating sheet example, which demonstrates how this information is laid out on paper.

Each page should be numbered at the foot of the page before starting that page to keep track and make sure nothing is lost.

Headings and final quantities should be underlined to make them stand out.

Do not write too much on one page. Space out the necessary information, and remember that presentation is important for all concerned. Your work will be more respected by other users if it is clearly and logically set out and easy to read and follow.



Example estimating sheet

Project title: _____ Trade: _____



PROJECT	FRANKSTON HOSP STGE 2/Tender Name				
APPROX. VALUE		\$35,000,000			
DURATION	66	WEEKS			
	326	WORKING DAYS			
	NIL	PROVISIONAL DELAY			
	326	TOTAL DAYS			
1000 FEES GENERAL					
Building Permit / Certification.	\$	/500 + 500			By Client
	\$	/1000 + 1000			
1010 RETENTION/PERFORMANCE BONDS					
Bank Guarantee with Defects liability of 12 Months (Standard Condition)			5%	to	2.50%
a) Insurance Fee	0.40%	Estab Fee	\$ 7,000		
b) Ongoing Fee (to practical completion)	1.60%	Annual Fee	\$ 35,538	1.27	Years
c) Ongoing Fee (for defects liability period)	1.60%	Defects	\$ 14,000	1	Years
	Total		\$ 56,538		\$ 56,538
1020 INSURANCE		Relevant Clauses Standard Contracts			
ON ALL PROJECTS		NPWC	AS4000	AS2124	JCC
Builders Indemnity Victoria Commercial (Structural)	17,18	16	18.1	8.2	0.158%
Professional Indemnity					0.029%
KANE RESPONSIBLE FOR INSURANCE		DELETE AS REQUIRED			
Contractors All Risk & Public Liability					0.256%
PRINCIPAL RESPONSIBLE FOR INSURANCE		DELETE AS REQUIRED			
Public Liability / 3rd party cover only		17	19.1		0.114%
Other ie Excesses, Plant, Shipping					\$ 39,900
		TOTAL INSURANCES / GUARANTEE			
				\$	105,350
1100 SITE ACCOMMODATION					
Type	No	\$ per Week	Weeks	%	Size (m)
Foreman	A/C, 1 Desk, 1 Chair, 2 Plastic Chairs	3	58	79	25% 3.6 x 2.4
CofW	A/C, 1 Desk, 1 Chair, 2 Plastic Chairs	1	58	79	25% 3.6 x 2.4
Lunch	A/C, Sink, Fridge, Food Warmer, Auto Boil, 5 Tables , 30 x Chairs	6	90	79	25% 9.6 x 3.0
Change	A/C, Bench Seating, Coat Hooks	4	50	79	25% 7.2 x 3.0
First Aid	A/C, 1 Desk, 1 Chair, Stretcher, HW Service	2	65	79	25% 3.6 x 2.4
Toilets	3 WC, 3 Hand Basins, 1 Urinal (2400) , HW Service	3	89	79	25% 4.2 x 2.4
Container		2	23	79	25% 3.0 x 2.4
	Waste pump out per week (Applicable only when connection to sewer is unavailable)	0	250	79	100% Tank included within toilet cost \$ -
MEET		1			
Total		22			
1110 COVERED WAYS TO SITE SHEDS		22	No. Sheds	\$ 460	\$/shed
Crushed rock paths to site sheds	200	m2	\$ 6	FCR	\$ 1,200
Covered way from sheds to Building.	30	m	\$ 200	Per M	\$ 6,000
1650 TRUCK & YARD FOR SHEDS			Hrs per Unit	CTruck	
Deliveries	22	4	\$90	Minimum \$210 per unit one way	\$ 7,920
Returns	22	4	\$90	Minimum \$210 per unit one way	\$ 7,920
	TOTAL SITE AMENITIES				\$ 65,955
1130 TEMPORARY SERVICES WATER					
Water	- tapping	2	150	Taps	\$ 300
	- reticulation, black poly	50	100	Black Poly	\$ 5,000
	- Shed connections	17	55	Per Shed	\$ 935
	- temporary drainage				Discuss with Civil Contractor
Sewer Connection		0	1,000	Easy	\$ -
		3	2,000	Difficult	\$ 6,000
Cut & Seal		3	250	Each	\$ 750
	TOTAL TEMPORARY WATER				\$ 12,985
1140 TEMPORARY SERVICES POWER					
Power	O/H 3 Phase Pole	Epsom Hire Service 9580 5470	4	No.	\$ 722
	Delivery		0	No.	\$ 28
	Pole Rental		20	Months	\$ 55 [Delete if not applicable]
	Shed Connection		20	No. Sheds	\$ 105 \$/shed
	Temp board Connection		5	No. Boards	\$ 105 \$/board Discount
	Temp board Hire	Temp board @ 30 metre radius	30	No. Boards	\$ 50 \$/week 50%
	Temp board Purchase	Temp board @ 30 metre radius	0	No. Boards	\$ 1,500 \$/board 50%
	Electrical Cable		30	Roll	\$ 150 Per 150 Metre Roll
	Certificates & Inspections		17	No.	\$ 170 \$100 Materials / 1 Hour Labour
				T. Boards	Sheds Rate
	Testing & Tagging		20	Months	30 20 \$ 45
	Access Lighting		100	No. Lights	\$ 100 \$/light
	Usage of Power		66	Week	\$ 200 [Delete if not applicable]
	Disconnection of Sheds		20	No. Sheds	\$ 30 \$/shed
	Temporary EWIS System - Sheds		0	Item	\$ -
	Security Alarm System		0	Item	\$ -
	TOTAL TEMPORARY POWER				\$ 146,403

Adjustment sheet 1 of 4 2007 Rev 1 preliminaries



PROJECT		FRANKSTON HOSP STGE 2/Tender Name				
1150	TEMPORARY SERVICES PHONES		Lines			
	Connection, extras	5	250	for Single Line		\$ 1,250
		0	150	per line for Extra Multiple Lines		\$ -
	Rental and Calls		0.18%			\$ 63,000
	Internet / Broadband Connection - 1.5M ADSL - Set-up	3	Item	17 Months	(\$200 Setup + \$80 Month)	\$ 4,680
				TOTAL TEMPORARY PHONES		\$ 68,930
1160	SITE ACCESS					
	Temporary Crossing Timber	0	No.	\$ 884	\$/No	N/R
	Temporary Road	150	m2	\$ 20	\$/m2	\$ 3,000
	Temporary Road removal	0	m2	\$ 6	\$/m2	\$ -
	Temporary paths	250	m2	\$ 8	\$/m2	\$ 2,000
	Make good on completion	0	m2	\$ 10	\$/m2	\$ -
	Temporary drainage				As required	\$ -
	Footpath rental / Deposit	0	m2	\$ 2.20	0	\$/week
	Hoarding / Gantry Permits	0	No.	\$ 100	\$/No.	\$ -
	Crossing Permit / Deposit	0	No.	\$ 100	\$/No.	\$ -
	Scaffold Permits	1	No.	\$ 100	\$/No.	\$ 100
	Construction Zone / Hoisting Zone	6 Month Permit - 4 Parking Bays	0	No.	\$ 3,000	\$/No.
				TOTAL SITE ACCESS		\$ 5,100
TRAFFIC MANAGEMENT / BARRICADES						
	Water barriers	2000 Long Water Filled Coates 80Km TL2 Triton Barrier	0	No.	\$ 15.40	0 Weeks
	Concrete Barriers	0	m	\$ -		\$ -
	Traffic Barriers	0	m	\$ -		\$ -
	Delivery of Water Barriers	0	Item	\$ 200		\$ -
	Traffic Lights / Flashing Lights	1	Item	\$ -		\$ -
	Traffic Management Consultant	0	Item	\$ 150		\$ -
	Temporary Traffic Light	0	No.	\$ -		\$ -
	Hire Equipment	0	Item	\$ -		\$ -
	Day Traffic Management					\$ 30,000
	Monday - Friday (6.00am - 6.00pm) - Labour Only	0	Hrs	\$ 65		\$ -
	Saturday & Sunday (all day) - Labour Only	0	Hrs	\$ 85		\$ -
	Labour, Vehicle & Signage Package	0	Crew	\$ 520	0 Days	\$ -
	*C Class Arrow Board	0	Day	\$ 50		\$ -
	Variable Message Boards	0	Day	\$ 250		\$ -
	Pair Temporary Traffic lights	0	Days	\$ 260	(\$300 per day if less than 7 days)	\$ -
				TOTAL TRAFFIC MANAGEMENT		\$ 30,000
1170	SITE SECURITY					
	Temporary Fence	300	m	\$ 20.00	per m per month	\$ 6,000
	Hoarding	0	m	\$ 20	per m	\$ -
	Gates	0	No.	\$ 250	each	\$ -
	Watching Service	0	No.	\$ 880	per night	\$ -
	Security System	0	No.	\$ 1,000	per set up	\$ -
	Compound Fence	160	m	\$ 15.00	per m per month	\$ 2,400
	Lighting	20	No. Lights	\$ 100	\$/light	\$ 2,000
1180	PROTECT EXIST/ADJ. PROPERTY					
	Tarpaulins	25	No.x Weeks	\$ 250	each	\$ 6,250
	Hoarding	200	m	\$ 150	per m	\$ 30,000
	Direction signs	15	Item	\$ 300		\$ 4,500
	Barricades	0	m	\$ -	per m	\$ -
	Divert Services	0	Item	\$ -		\$ -
	Plot Services	0	item	\$ -		\$ -
				TOTAL SITE SECURITY / PROTECTION		\$ 51,150
1200	Small tools/Sundry Supplies					
	Kane Supply			0.15%		\$ 52,500
	Hire					
	1210 Repairs to Kane plant & equipment.					
1220	First Aid Kit					
	First Aid Kit			\$/month		
	Restock			\$ 150		\$ 3,500
1230	Site issued / Protective / Safety clothing					
				0.05%		\$ 17,500
1240	Site Accom Consumables					
		\$ 300	per Week		\$100 Small Site	\$ 19,800
					\$200 Medium	
					\$300 Large	
1250	Petty cash					
		\$ 150	per Week		\$50 Small Site	\$ 9,900
					\$100 Medium	
					\$150 Large	

Adjustment sheet 2 of 4 2007 Rev 1 preliminaries



PROJECT		FRANKSTON HOSP STGE 2/Tender Name								
1150 TEMPORARY SERVICES PHONES				Lines						
Connection, extras		5		250	for Single Line				\$ 1,250	
		0		150	per line for Extra Multiple Lines				\$ -	
Rental and Cells		0.18%							\$ 63,000	
Internet / Broadband Connection - 1.5M ADSL - Set-up		3		Item	17	Months	(\$200 Setup + \$80 Month)		\$ 4,680	
					TOTAL TEMPORARY PHONES		\$	68,930		
1160 SITE ACCESS										
Temporary Crossing Timber		0		No.	\$ 884	\$/No				N/R
Temporary Road		150		m2	\$ 20	\$/m2			\$ 3,000	
Temporary Road removal		0		m2	\$ 6	\$/m2			\$ -	
Temporary paths		250		m2	\$ 8	\$/m2			\$ 2,000	
Make good on completion		0		m2	\$ 10	\$/m2	As required		\$ -	
Temporary drainage										
Footpath rental / Deposit		0		m2	\$ 2.20	0	\$/week		\$ -	
Hoarding / Gentry Permits		0		No.	\$ 100	\$/No.			\$ -	
Crossing Permit / Deposit		0		No.	\$ 100	\$/No.			\$ -	
Scaffold Permit		1		No.	\$ 100	\$/No.			\$ 100	
Construction Zone / Hoisting Zone		6 Month Permit - 4 Parking Bays		No.	\$ 3,000	\$/No.			\$ -	
					TOTAL SITE ACCESS		\$	5,100		
TRAFFIC MANAGEMENT / BARRICADES										
Water barriers		2000 Long Water Filled Coates 80Km TL2 Triton Barrier		0	No.	\$ 15.40	0	Weeks	\$ -	
Concrete Barriers		0		m	\$ -				\$ -	
Traffic Barriers		0		m	\$ -				\$ -	
Delivery of Water Barriers		0		Item	\$ 200				\$ -	
Traffic Lights / Flashing Lights		1		Item	\$ -				\$ -	
Traffic Management Consultant		0		Item	\$ 150				\$ -	
Temporary Traffic Light		0		No.	\$ -				\$ -	
Hire Equipment		0		Item	\$ -				\$ -	
Day Traffic Management									\$ 30,000	
Monday - Friday (6.00am - 6.00pm) - Labour Only		0		Hrs	\$ 65				\$ -	
Saturday & Sunday (all day) - Labour Only		0		Hrs	\$ 85				\$ -	
Labour, Vehicle & Signage Package		0		Crew	\$ 520	0	Days		\$ -	
"C" Class Arrow Board		0		Day	\$ 50				\$ -	
Variable Message Boards		0		Day	\$ 250				\$ -	
Pair Temporary Traffic lights		0		Days	\$ 260	(\$300 per day if less than 7 days)			\$ -	
					TOTAL TRAFFIC MANAGEMENT		\$	30,000		
1170 SITE SECURITY										
Temporary Fence		300		m	\$ 20.00	per m per month			\$ 6,000	
Hoarding		0		m	\$ 20	per m			\$ -	
Gates		0		No.	\$ 250	each			\$ -	
Watching Service		0		No.	\$ 880	per night			\$ -	
Security System		0		No.	\$ 1,000	per set up			\$ -	
Compound Fence		160		m	\$ 15.00	per m per month			\$ 2,400	
Lighting		20		No. Lights	\$ 100	\$/light			\$ 2,000	
					TOTAL SITE SECURITY / PROTECTION		\$	51,150		
1200 Small tools/Sundry Supplies										
Kane Supply					0.15%				\$ 52,500	
Hire										
1210 Repairs to Kane plant & equipment.										
1220 First Aid Kit										
First Aid Kit					\$/month					
Restock		\$ 150							\$ 3,500	
1230 Site Issued / Protective / Safety clothing					0.05%				\$ 17,500	
1240 Site Accom Consumables					\$ 300	per Week	\$100 Small Site		\$ 19,800	
							\$200 Medium			
							\$300 Large			
1250 Petty cash					\$ 150	per Week	\$50 Small Site		\$ 9,900	
							\$100 Medium			
							\$150 Large			

Adjustment sheet 3 of 4 2007 Rev 1 preliminaries



PROJECT	FRANKSTON HOSP STGE 2/Tender Name					
		Days	Number	\$/day		
MOBILE CRANES						
Mobile Crane-30T		0	0	1,920		\$ -
Mobile Crane-50T		0	0	2,080		\$ -
Mobile Crane-80T		0	0	3,120		\$ -
Kibble/brick cage/plaster cage		0	0	50		\$ -
Road Closure permit		0	0	120		\$ -
PRESTON HIRE LOADING DOCKS		No	Weeks	\$/week		
2.2x9m long fixed deck		0	0	125		\$ -
3.2x9m long fixed deck		0	0	125		\$ -
2.2x9m long retractable		0	0	250		\$ -
3.2x9m long retractable		0	0	250		\$ -
4.2x9m long retractable		0	0	320		\$ -
All of the above formula include float to and from site as well as an installation fee.						
1400 MAINTENANCE						
Post Contract mt		0.05%				\$ 17,500
1600 SUPERVISION						
Type		\$ per Day	Number	Days	Discount	
1600 Project Manager		\$650	1	326	1.00	\$ 211,900
1600 Contract Administrator		\$504	1	326	1.00	\$ 164,304
1610 Site Manager		\$850	1	326	1.00	\$ 277,100
1610 Foreman		\$750	1	326	1.00	\$ 244,500
1620 Leading Hand		\$680	1	326	1.00	\$ 221,680
1620 Labour /Peggy/ OH&S		\$600	2.5	326	1.00	\$ 489,000
1630 Apprentice		\$410	1	326	1.00	\$ 133,660
1640 Out of Hours	SPECIFIC AREAS ON SUNDAYS	0	326	1.00		\$ 50,000
Total Supervision Team		8.5				
				TOTAL SUPERVISION		\$ 1,792,144
						PRELIMINARIES TOTAL \$ 2,699,755
SUMMARY					GUIDE	
Prelims % of the Project		7.71%			Fitout	5.00%
Total Running Cost		2,699,755			Scaffold & Hoist	10.00%
Running Cost per Week		40,905			Average Low	6.50%
					Average High	8.50%
SUBJECT TO DISCUSSIONS WITH BDM / CM						
CALCULATION MAXIMUM DELAY COST						
1) On - Site Delay Cost	Prelim / Working Days	8,281				
2) Off - Site Delay Cost	Overhead Recovery (5%) / Working Days	433				
3) TOTAL DELAY COST		8,714				

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PROJECT	aids pt cook						
APPROX. VALUE	\$800,000						
DURATION	8 40 0 40	WEEKS WORKING DAYS PROVISIONAL DELAY TOTAL DAYS					
1000 FEES GENERAL							
Building Permit / Certification.	\$ \$	/500 + 500 /1000 + 1000					client
1010 RETENTION/PERFORMANCE BONDS							
Cash Retention / Bank Guarantee	Assumed required		5%	to	2.50%	\$	800
1020 INSURANCE		Relevant Clauses Standard Contracts					
ON ALL PROJECTS		NPWC AS4000 AS2124 JCC		Rate			
Builders Indemnity Victoria Commercial (Structural)	17,19	16	18.1	8.2	0.261%	\$	3,393
Professional Indemnity					0.066%	\$	858
RESPONSIBLE FOR INSURANCE		DELETE AS REQUIRED					
Contractors All Risk & Public Liability					0.397%		
PRINCIPAL RESPONSIBLE FOR INSURANCE		DELETE AS REQUIRED					
Public Liability / 3rd party cover only		17	19.1		0.261%		
Other ie Excesses, Plant, Shipping							
TOTAL INSURANCES / GUARANTEE		\$					5,051
1100 SITE ACCOMMODATION							
Type	No	\$ per Week	Weeks	%	Size (m)		
Foreman A/C, 1 Desk, 1 Chair, 2 Plastic Chairs	1	58	10	100%	3.6 x 2.4	\$	580
CoW A/C, 1 Desk, 1 Chair, 2 Plastic Chairs		58		100%	3.6 x 2.4	\$	-
Lunch A/C, Sink, Fridge, Food Warmer, Auto Boil, 5 Tables , 30 x Chairs	1	90	10	100%	9.6 x 3.0	\$	900
Change A/C, Bench Seating, Coat Hooks	1	50	10	100%	7.2 x 3.0		
First Aid A/C, 1 Desk, 1 Chair, Stretcher, HW Service		65		100%	3.6 x 2.4		
Toilets 3 WC, 3 Hand Basins, 1 Urinal (2400), HW Service	1	89	10	100%	4.2 x 2.4	\$	890
Container	1	23	10	100%	3.0 x 2.4	\$	230
Waste pump out per week (Applicable only when connection to sewer is unavailable)	0	600	8	100%	Tank included within toilet cost	\$	-
Total	5						
1110 COVERED WAYS TO SITE SHEDS	5	No. Sheds	\$ 400	\$/shed		\$	3,220
Crushed rock paths to site sheds	0	m2	\$ 6	FCR		\$	-
Covered way from sheds to Building.	0	m	\$ 200	Per M		\$	-
1650 TRUCK & YARD FOR SHEDS		Hrs per Unit	CTtruck				
Deliverys	5	2	\$90	Minimum \$210 per unit one way		\$	900
Returns	5	2	\$90	Minimum \$210 per unit one way		\$	900
TOTAL SITE AMENITIES						\$	7,620
1130 TEMPORARY SERVICES WATER							
Water - tapping	0	150	Taps			\$	300
- reticulation, black poly	0	100	Black Poly			\$	150
- Shed connections	5	55	Per Shed			n/a	
- temporary drainage					Discuss with Civil Contractor		
Sewer Connection	0	1,000	Easy			\$	-
	0	2,000	Difficult			by client	
Cut & Seal	0	250	Each			by client	
TOTAL TEMPORARY WATER						\$	450
1140 TEMPORARY SERVICES POWER							
Power O/H 3 Phase Pole	0	No.	\$ 722	Discuss with Electrician - If applicable		\$	1,000
Delivery	0	No.	\$ 28			\$	-
Pole Rental	3	Months	\$ 55	[Delete if not applicable]			
Shed Connection	9	No. Sheds	\$ 105	\$/shed			
Temp board Connection	6	No. Boards	\$ 105	\$/board			
Temp board Hire	Temp board @ 30 metre radius	6	No. Boards	\$ 50	\$/week		\$ 1,000
Temp board Purchase	Temp board @ 30 metre radius	0	No. Boards	\$ 1,500	\$/board		
Electrical Cable		6	Roll	\$ 150	Per 150 Metre Roll		
Certificates & Inspections		3	No.	\$ 170	\$100 Materials / 1 Hour Labour		
Testing & Tagging		3	Months	\$ 150			\$ 250
Access Lighting		20	No. Lights	\$ 100	\$/light		
Usage of Power		10	Week	\$ 90	[Delete if not applicable]		\$ 900
Disconnection of Sheds		9	No. Sheds	\$ 30	\$/shed		
TOTAL TEMPORARY POWER						\$	3,150
1150 TEMPORARY SERVICES PHONES		Lines					
Connection. extras	1	250	for Single Line			\$	400
	3	150	per line for Extra Multiple Lines			\$	1,440
Rental and Cells		0.18%					
Internet connection		1.5modem-setup					
TOTAL TEMPORARY PHONES						\$	1,840

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PROJECT	aldi pt cook							
1160 SITE ACCESS								
Temporary Crossing Timber	0	No.	\$ 884	\$/No		n/a		
Temporary Road	0	m2	\$ 8	\$/m2		incl		
Temporary Road removal	0	m2	\$ 6	\$/m2		incl		
Temporary paths	0	m2	\$ 8	\$/m2		incl		
Make good on completion	0	m2	\$ 10	\$/m2	As required	\$ -		
Temporary drainage								
Footpath rental / Deposit	0	m2	\$ 2.20	0	\$/week	n/a		
Hoarding / Gantry Permits	0	No.	\$ 100	\$/No.		incl		
Crossing Permit / Deposit	0	No.	\$ 100	\$/No.		incl		
Scaffold Permit	0	No.	\$ 100	\$/No.		incl		
Construction Zone / Hoisting Zone	6 Month Permit - 4 Parking Bays	0	No.	\$ 3,000	\$/No.	incl		
	TOTAL SITE ACCESS							
TRAFFIC MANAGEMENT / BARRICADES								
Water barriers 2000 Long Water Filled Coates 80Km TL2 Triton Barrier	0	No.	\$ 15.40	0	Weeks	n/a		
Concrete Barriers	0	m	\$ -			incl		
Traffic Barriers	0	m	\$ -			incl		
Delivery of Water Barriers	0	Item	\$ 200			incl		
Traffic Lights / Flashing Lights	1	Item	\$ -			incl		
Traffic Management Consultant	0	Item	\$ 150			\$ -		
Temporary Traffic Light	0	No.	\$ -			\$ -		
Hire Equipment	1	Item	\$ -			\$ -		
Day Traffic Management								
Monday - Friday (6.00am - 6.00pm) - Labour Only	0	Hrs	\$ 65			\$ -		
Saturday & Sunday (all day) - Labour Only	0	Hrs	\$ 85			\$ -		
Labour, Vehicle & Signage Package	0	Crew	\$ 520	0	Days	\$ -		
*C Class Arrow Board	0	Day	\$ 50			\$ -		
Variable Message Boards	0	Day	\$ 250			\$ -		
Pair Temporary Traffic lights	0	Days	\$ 260	(\$300 per day if less than 7 days)		\$ -		
	TOTAL TRAFFIC MANAGEMENT							
1170 SITE SECURITY								
Temporary Fence	0	m	\$ 20.00	per m per month		\$ -		
Hoarding	0	m	\$ 50	per m				
Gates	0	No.	\$ 250	each		\$ -		
Watching Service	0	No.	\$ 880	per night		\$ -		
Security System	0	No.	\$ 1,000	per set up		\$ -		
Compound Fence	0	m	\$ 15.00	per m per month		\$ -		
Lighting	0	No. Lights	\$ 100	\$/light		\$ -		
	TOTAL SITE SECURITY / PROTECTION							
1200 Small tools/Sundry Supplies								
Kane Supply			0.15%			\$ 1,200		
Hire								
1210 Repairs to Kane plant & equipment.								
1220 First Aid Kit								
First Aid Kit			\$/month					
Restock			\$ 150			\$ 500		
1230 Site issued / Protective / Safety clothing								
			0.05%			\$ 400		
1240 Site Accom Consumables								
			\$ 200	per Week	\$100 Small Site	\$ 800		
					\$200 Medium			
					\$300 Large			
1250 Petty cash								
				per Week	\$50 Small Site	\$ 400		
					\$100 Medium			
					\$300 Large			

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PROJECT	aldi pt cook					
1260 RUBBISH REMOVAL						
RUBBISH CHUTES		8	1 Per Week	250		\$ 2,000
600X600 Square chute		No	Weeks	L/M	\$/Week	\$ -
500 dia circular chute		0	0	0	\$21.00	\$ -
Assembly fee \$25/m		0	0	0	\$12.00	\$ -
1270 BUILDERS CLEAN						
Final clean on completion including Glass for standard project		1700	m2	3.00	per m2 for Easy	\$ 1,500
				m2	4.50	per m2 for Difficult / Architectural
Clean glass extra if substantial	1 side measured only	0	m2	6.00	Hospitals, clean rooms, labs	\$ -
Access equipment for external cleaning if not from scaffold for project.		0	m2	8.00	per m2 for curtain walls	\$ -
1280 REMOTE SITES						
Cartage						
Accommodation						
Travel expenses/Fuel						
Other Incentives						
Newspaper Advertisements						
1290 Special specification requirements						
Site Notice Board		1	Number	1,400	Each	\$ -
Licensed Surveyor Fees		0	Team	200	per hour	\$ -
Soil tests		0	No	400	per test	\$ -
Hazardous Materials Audit		0	No	3,500	per audit	\$ -
progress photos						
dilapidation report						
Site Allowances / project Benefits						
Newspaper Advertisements						
1300 BUILDING ACCESS COSTS						
		Area (m2)	Cost	Weeks	%	Labour Per m2
Scaffold						
Hire (Can be discounted subject to our scaffold availability)		0	\$ 1.68	1	100%	\$ 1,500
Erect & Dismantle		0			100%	\$ 30.00
Shade cloth		0	\$ 4.00			\$ 4.00
Labor to move Planks		25%	(of Erect & Dismantle Labor)			\$ -
Specials						
Drawings & Design		0	No.	150		\$ -
Mobile Scaffold 3m x 1.5m x 3m		0	\$ 150.00	1	100%	\$ -
Stairs Rates above include one stair access every 500 m2		0	No.	2,000		\$ -
External Handrail		Length (m)				Labour Per m
Labor (Up and Down)		70				\$ 6.80
Hire						
Perimeter handrail to building		0	metres	\$ 15	\$/m	\$ -
Extra over for Roof Perimeter for hire until Mechanical works completed						
Erect & Dismantle		0	metres	\$ 25	\$/m	\$ -
		1		\$ 3.50	100%	Per M Per Month
1650 Truck & Yard for Scaffold		Total Hours	CTruck			
Deliver	10 hours every 500m2	100	\$ 120			\$ -
Return	10 hours every 500m2	0	\$ 120			\$ -
						TOTAL BUILDING ACCESS
Allimack-Quotation from Alimak with the following items to be added						\$ -
Slab/concrete base generally 250 thick if required						\$ -
Concrete pit if required						\$ -
Ramp to Alimak if installed without pit						\$ -
3 phase power						\$ -
Mesh to each landing						\$ -
Crane to unload at installation and load for removal						\$ -
Ramps for each floor if required						\$ -
Make good to walls where Alimak was attached (if attached to existing building)						\$ -
Licensed Operators-allow for under supervision						\$ -
Materials hoist 800kg		0	0	2,792		\$ -
Licensed Operators-allow for under supervision						
Mobile Access		Weeks	Number	\$/week		
Scissor lift hire-15 foot		0	0	280		\$ -
Scissor lift hire-32 foot		0	0	800		\$ -
Scissor lift hire-40 foot		0	0	800		\$ -
Boom Hire-60 foot		0	0	1,300		\$ -
Boom Hire-85 foot		0	0	2,000		\$ -
Boom Hire-125 foot		0	0	3,800		\$ -
Boom Hire-135 foot		0	0	4,000		\$ -
All of the above formula rates include float each way						

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PROJECT	activity	unit	Days	Number	\$/day		
MOBILE CRANES						\$ -	-
Mobile Crane-30T			0	0	1,920	\$ -	-
Mobile Crane-50T			0	0	2,080	\$ -	-
Mobile Crane-80T			50	1	3,120	\$ -	-
Kibble/brick cage/plaster cage			0	0	50	\$ -	-
Road Closure permit			0	0	120	\$ -	-
PRESTON HIRE LOADING DOCKS		No	Weeks		\$/week		
2.2x9m long fixed deck		0	0	125		\$ -	-
3.2x9m long fixed deck		\$	25	125			
2.2x9m long retractable		0	0	250		\$ -	-
3.2x9m long retractable		0	0	250		\$ -	-
4.2x9m long retractable		0	0	320		\$ -	-
All of the above formula include float to and from site as well as an installation fee. aconex subscription/2 copies cd/dvd							
1400 MAINTENANCE							
Post Contract mt				0.05%		\$ 400	
1600 SUPERVISION							
Type		\$ per Day	Number	Days	Discount		
1600 Project Manager		\$650			1.00	\$ -	-
1600 Contract Administrator		\$504		40	1.00		
1610 Site Manager / Foreman		\$700	1	50	1.00	\$ 35,000	
1620 Carpenter / Leading Hand		\$625	0	40	1.00	\$ -	
1620 Labour (Peggy) OH&S		\$600	1	20	0.50	\$ 6,000	
1630 Apprentice		\$410	0	40	1.00	\$ -	
1640 Out of Hours		\$600		100	1.00	\$ -	
Total Supervision Team			2				
TOTAL SUPERVISION					\$ 41,000		
SUMMARY						PRELIMINARIES TOTAL	\$ 68,319
Prelims % of the Project	8.54%					GUIDE	
Total Running Cost	68,311					Fitout	5.00%
Running Cost per Week	8,539					Scaffold & Hoist	10.00%
						Average Low	6.50%
						Average High	8.50%

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4.2 Identify plant and equipment requirements and cost

Plant and equipment requirements are an essential part of most construction projects, therefore, it is important to identify the costs associated with these and include in any estimates or quotations.

The following is a list of some of the types of plant and equipment that could be used on construction projects:

- communications equipment
 - conveyors
 - heavy equipment, such as wheeled and tracked earthmoving equipment, trucks and articulated vehicles
 - hoists
 - mobile and tower cranes
 - scaffold
 - port hole diggers



- on-site equipment, such as:
 - compressors
 - pumps
 - generators
 - portable lighting
 - lifting equipment
- portable compaction equipment.

Most plant and equipment can be hired on a daily basis or some by the hour, therefore, the costs will differ depending on which supplier is used.

The estimate should take into consideration the fuel used for the job, cost of hiring and labour to operate the machine. Even if the organisation owns the machine and it is not hired, it is still important to make sure that the costs are covered for the use of the machine and that the details are provided.

4.3 Unit costs

The estimates of unit costs need to be determined and applied as appropriate. Unit costs include:

- typical concrete floor slab
- plasterboard for walls and ceilings (fixed to timber or steel framing)
- timber wall framing
- door set installation (typical)
- brickwork
- blockwork
- rendering (solid plaster)
- wall tiling
- floor tiling
- typical tiling costs
- drainage installation.

Follow the examples that show each unit and its related calculated costs.



4.3.1 Typical concrete floor slab

A concrete floor slab is where the ground is cut and filled to bench level.

The following specifications are for a typical concrete floor slab.

- Slab area 360 m² (14 m x 25.71 m).
- 150 mm thick concrete 25 MPa pump mix.
- One layer of sl 92 reinforced mesh (sheet size 6 m x 2.4 m).
- Bar chairs 60 mm high.
- Waterproof membrane 0.0002 um polythene 50 m x 4 m roll, joints taped.
- 50 mm sand bed, packing sand.
- 150 mm high edge board formwork full perimeter, 50 mm thick staked at 600 mm centres.
- Steel trowel finish to slab, no driers to be used, helicopter and steel trowel float finish.
- Construction joint down centre, t and g type left in position with dowel bars at 600 mm centres, 12 mm diameter, cast into edge of slab 300 mm each side (not calculated in this example).
- Saw cut joints across length, two, no. 5 mm cuts by 30 mm deep no filling (not calculated in this example).
- Concrete will be pumped, slump and compression tests will be taken (one from each truck), concrete will be delivered in 6m³ trucks.
- The concrete will be cured by using a chemical spray using knapsack spray type equipment.

These specifications can now be used to estimate quantities and measure nett areas (concrete to floor slab 25 Mpa). This is shown in table 1.

Table 1

1.	150 mm x 14 m x 25.71 m = 54 m ³ @ \$117.00 m ³ delivered labour to place and screed 10 men x 3 hours x \$65.00 hour	\$6,318.00 \$1,950.00
2.	Formwork to edge board (reuse expect 10 – 20 times) 150 mm x 50 mm timber edgeboard 2/14 = 28 lm 2/25.71 = 52 lm Total = 80 lm @ \$1.04 lm	\$83.00



3.	Stakes for edge board (expected reuse 100 times) perimeter of slab: 0.600 plus 4 for the corners = 140 no. @ 0.20 cents each	\$28.00
4.	Labour to install edgeboard and stake into position, including later removal 80 lm (5 men by 4 hours x \$65.00)	\$1,300.00
5.	Sand bed 50 mm x 14 lm x 25.71 lm = 18 m ³ x 2 for compaction = 36 m ³ @ \$35.00 m ³ labour To place spread and compact 36 m ³ (3 men x 4 hours x \$65.00) Hire vibrating plate 1 day @ \$65.00 per day	\$1,260.00 \$780.00 \$65.00
6.	Polythene 1/14 x 25.71 = 360 m ² @ \$0.47 m ² (including tape) Labour to place polythene, laps, tape and hold at perimeter 3 men x 8 hours x \$65.00	\$169.20 \$560.00
7.	Reinforcing mesh sl 92 1/14 x 25.71 = 360 m ² @ \$18.67 m ² Labour to place, lap chair and tie mesh into position 4 men x 9 hours x \$ 65.00 or \$ 6.50 m ² for labour	\$6,721.20 \$2,340.00
8.	Bar chairs and tie wire 1/14 x 25.71 = 360 m @ \$1.21 per m ²	\$435.60
9.	Concrete pump 4 hours minimum hire @ \$170.00 hour Extra charge by concrete supplier for through pump cost 54 m ³ x \$6.00 m ³	\$680.00 \$324.00
10.	Labour 9 men x 8 hours, to receive from pump spread, screed, 9 men x 8 hours @ \$65.00 hour	\$4,680.00
11.	Labour to trowel the surface to finishing standard at the rate of 55 m ² per person per day 360m ² – 50m ² = 6.54 person days x 8 hours x \$65.00	\$3,400.80
12.	Curing costs, chemical spray for 360m ² 2 litres per 8m ² = 52 litres @ \$3.40 litre labour to spray 2 men x 2.4 hours x \$65.00	\$306.00 \$314.00
13.	Testing concrete compression tests 1 per truck = 6m ³ truck loads = 9 no. tests cost to get lab in to conduct test is lab tech 4 hours on job 3 hours in lab written reports 9 no. tests @ \$65.00 each	\$585.00
	Total costs	\$33,299.80
Unit cost per m ² = \$92.50 m ² for future reference		
Or cost per m ³ = \$616.66 m ³ for future reference		



If you were repeatedly building house slabs or factory floors that were the same style of construction, you could make up a standard price by utilising the above information as a template for your business. This way you could simply take off the area of the slab x the rate per metre square, as your costs would be pro rata up or down from this basic area.

Reinforcing fabric/mesh sheet or rolls

Standard size uncut 6 m x 2.4 m area = 14.4 m².

Effective cover after side and end laps of 200 mm = 12.76 m².

Lap factor is 1.64 m² or 11.38% to calculate the number of sheets required area of slab nett 360 m² x 12.76 m² effective cover.

Sheets required 28.2/5.8 m x 2.2 m equals 360 m² with laps included.

Therefore, order would be:

- 28.2/sheets standard size of 6 m x 2.4 m @ \$182.30 each
- bar chairs and tie wire
- 3 bar chairs per m²
- 360 m² x 3 no. per m² = 1080 no. @ 0.40 cents each
- Tie wire: 150 mm length per tie with three per m²
= 360 m² x 3
= 1080 no. x 150 mm each
= 162 metres in 640 metre rolls (10 kgs) @ \$32.86 per roll
= 0.051cents per ml at 6 pieces per metre.

Therefore, the cost for tie wire is 0.0025 cents per m².



Mesh code		Cost m ²	Laps 14%	Chairs Stools Tie wire	Labour 12 m ² per hour	Rate m ²
SI	52	5.61	0.79	0.80	6.50	13.70
SI	62	8.04	1.13	0.80	6.50	16.47
SI	72	10.18	1.43	0.80	6.50	18.91
SI	82	13.18	1.85	0.80	6.50	22.33
SI	92	16.67	2.33	0.80	6.50	26.30
SI	102	21.42	3.00	0.80	6.50	31.72
SI	81	26.75	3.75	0.80	6.50	37.80
		Cost m ²	Laps 14%			
RI	718	16.86	2.36	0.80	6.50	26.52
RI	818	19.77	2.77	0.80	6.50	29.84
RI	918	23.29	3.26	0.80	6.50	33.85
RI	1018	27.62	3.87	0.80	6.50	38.79
RI	1118	33.34	4.67	0.80	6.50	45.31
RI	1218	43.32	6.06	0.80	6.50	56.68
		Cost lm	Laps 10%			
L8tm	4	5.70	0.57	0.60	3.60	10.47
L8tm	5	7.07	0.71	0.60	3.60	11.98
		Cost lm	Laps 10%			
L11tm	3	8.95	0.90	0.60	3.60	14.05
L11tm	4	11.63	1.16	0.60	3.60	16.99
L11tm	5	15.81	1.58	0.60	3.60	21.59
Note: Galvanise extra, ligatures extra						



The gross rate for labour/material rate per m² for reinforcement (reo) is:

Fabric mesh sl 92 material @ \$16.67 m ²	\$16.67 m ²
Laps % 11.36 %	\$2.00 m ²
Bar chairs 3 x 0.40 cents	\$1.20 m ²
Tie wire	0.01 m ²
Labour to place 3 mins per m ² x 2 men or 1.44 hours per sheet of 14.40 m ²	\$6.50 m ²
Total gross rate per m ² labour/material	\$26.38 m ²



This rate is used to estimate the cost of the nett slab area of 360 m² as the laps % has been factored in for both labour and materials.

Bar reinforcement

This product comes in six metre lengths and is available in a variety of bar types (standard round bar and deformed bar and many others), and there is also a large variety of diameters. This exercise is to advise an average bar type. Bar reinforcement is sold by tonnage and priced by the tonne. This example will be for an r16 plain bar (16 mm diameter), as this is a reliable average in buildings.

Cost to buy including delivery per tonne = \$2000.00
Processing cost bending cutting scheduling = \$100.00
Receive on-site as required, place into position and tie off with ligatures
Labour is calculated by productivity of 1 tonne per day per person
Steelfixer: \$70.00 per hour x 8 hours = \$560.00
Cost per tonne is labour and materials = \$2,660.00
Example:
<ul style="list-style-type: none"> • One length of beam, cross section size 400 mm x 600 mm x 60 m long • N16 bars 4 top 4 bottom with ligatures at 0.600 mm centres tied with tie wire • Bar chairs 60 mm will also be used to chair the steel beam (cage) in position at the rate of 2 per lm metre
Beam 60 m long, requires 10 x 6 m units of top/bottom bars
10/2 x 4 x 6 metres = 480 lm, plus 10% lap factor
= 528 lm @ 1.62 kg per lm = 855.36 kg (0.855 tonne)



Ligatures 60: $0.600 = 100 \text{ no.} \times 2 \text{ lm each girth}$ $= 200 \text{ lm} @ 1.62 \text{ kg per lm} = 324 \text{ kg (0.324 tonne)}$
Tie wire at each junction bar to ligature $\times 8 = 800 \text{ no. at 150 mm each}$
For labour and materials, calculate:
Weight per 60 metre run on beams is 1.179 tonnes @ \$2660.00 per tonne = \$3136.14
Plus bar chairs 60 lm x 2 no. per lm + 120 no. @ 0.40 cents each = \$48.00
Tie wire 800 no. units @ 0.008 cents each = \$6.40
Therefore total costs for labour and materials = \$3190.54 or \$2706.14 per tonne
Rates for pricing reinforcement mesh lab/mat
July 08
Average quantities labour @ \$65.00 per hour

Polythene membrane

Polythene comes in 50 m long rolls x 4 m wide 200 m ² per roll
We need to calculate the area required for the job, which includes laps and turn up around the perimeter
Nett width = 14 m plus turn ups for slab thickness, and over the top of edgeboard and out and down, say 0.350 mm
This applies to length as well
Also need to cater for laps at the joints of sheets of 0.200 mm
The calculation becomes:
Length = 25.71 plus 2 x 0.350 mm = 26.41 lm
Width = 14.00 plus 2 x 0.350 mm plus 5% for side laps down length = 15.50 lm
= 0.750
= 410 m ² of material which is just over 2 rolls = 410 m ²
Gross area = 410 m ² nett area of slab is 360 m ² so the lap factor is 14 %, ie 360 m ² x 14%
Also need some duct tape to hold the lap joints in position, say 2/20 metre rolls
Material costs are:
• 2 rolls of polythene @ \$79.00 each = \$158.00
• 3 rolls of tape @ \$4.00 each = \$12.00



Labour to install:	
• three men x 8 hours x \$65.00p/hr	= \$1,560.00
• total labour and materials	= \$1,738.00
Or \$4.83 m ² on the nett slab area of 360 m ²	

Sand bed

50 mm thick after consolidation and compaction, therefore required to buy 100% more than the final design layer.

Therefore, calculate:	
• area 360 m ² x 0.100 mm thick	= 36.00 m ³
• packing sand costs \$35.00 m ³ delivered	
• 36 m ³ x \$35.00 m ³	= \$1,260.00
Labour to place, spread and compact using a vibrating plate machine:	
• two men x 6 hours x \$65.00 hour	= \$780.00
• hire of wacker plate per day	= \$65.00
Total costs	\$2,105.00
Therefore our rate per m ²	5.85 m ²

Formwork

Edgeboard formwork to full perimeter of slab undressed pine, reusable (10 to 15 times) in 2.4 ml with splices of same material each 0.500 mm long nailed to edgeboards.

Steel star picket type stakes 0.600 mm long @ 0.600 mm centres around the perimeter.

Materials:	
• Edgeboards 2/14 = 28 lm 2/26 = 52 lm	= \$77.60
• Splices 2/6 x 0.500 = 6 lm 2/11 x 0.500 = 11 lm	
Total = 97 lm @ \$8.00 lm: 10 uses	



• Stakes (star pickets) 2/25 = 50 no. 2/45 = 90 no. Total 140 no. @ \$1.40 each: 100 uses	= \$1.96
• Nails and fixings 2 per stake and 4 per splice = 416 no. @ 0.002 each	= \$8.32
Labour to cut, splice, stake in position and get into straight line and be horizontal: • two men x 8 hours x \$65.00 Removal on completion: • two men x 2 hours x \$65.00	= \$1,040.00 = \$260.00
Total	\$1,387.88
Therefore the rate per lm (based on the 80 lm perimeter)	17.35

4.3.2 Plasterboard for walls and ceilings (fixed to timber or steel framing)

For this example, refer to the drawing provided on the following page.

Sheet lengths can be purchased to order to a maximum of 5 metres. Standard sheet width is 1.2 metres, thickness 10 mm.

This project has 2.7 ceilings, the sheets will be run vertically. The sheets come with recessed edges for jointing on the 1.2 metre edges.

For this particular example, plasterboard on timber framing will be used. All walls are the same height, and the walls are plastered on both sides.

Some of the measurements from the timber framing can be used to assist in calculating the plasterboard areas.



The total length of the timber framed walls was 58 lineal metres.
Therefore, take off:

2/2.7 x 58 lm = 314 m ² area of plasterboard or 2/58 lm: 1.2 sheet width	= 97 sheets (of 2.7 x 1.2)
Also need to measure the corners, internal and external, as there is significant labour time in preparing these joints as well as the vertical sheet to sheet joints	
Vertical sheet to sheet joints 49/2.7 lm	= 133 lm
Internal corners 27/2.7 lm	= 73 lm
External corners 2/2.7 lm	= 6 lm
Total length of joints and corners	= 212 lm



There are no deductions for door openings as the material is relatively economical to buy. Also, the fewer joints there are, the better, as a lot of the time goes into preparing and filling the joints. It also affects the quality of the work if there are too many joints, so that the little extra waste will pay for itself by reducing labour time.



1	RevNo	Revision note	2	3	4	Date	Signature	Checked																																
<p>ESTIMATION REQUIREMENTS</p> <p>EXISTING PERIMETER WALLS NEW WALLS - INTERNAL NEW DOORS - WALL FRAMES - PLASTERBOARD LINING</p>																																								
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F	1	4	<i>Plasterboard for walls and ceilings</i>																																					



Materials and labour costs

Plasterboard supplied delivered 314 m ² @ \$8.90 m ²	= \$2,795.00
Tape/bandage for corner stopping and joints 212 lm = 3/90 lm rolls @ \$9.00 per roll	= \$27.00
Bedding compound for corners and joints 212 lm @ 0.355 cents	= \$75.36
Finishing compound for all patching/joints 212 lm @ 0.18 cents 314 m ² @ 0.18 cents	= \$38.16 = \$56.52
Adhesive for fixing 3 kg per 100 m ² = 3 kg x 3.14 = 9.42 kg @ \$6.80 per kg	= \$64.05
Nails and or screws 560 per 100 m ² 3.14 x 560 = 1758, 560 nails per kg = 3.13 kg nails @ \$6.50 kg	= \$20.40
Labour to take from stack, carry to work area, cut, fit glue, nail into position, and fill all joints, corners, holes, and sand back to a finished installation Area 314 m ² @ 0.4 hours per m ² x \$65.00	= \$8,164.00
Total costs	= \$11,241.00
This equals a complete supply and fix rate of \$ 35.79 m ²	

It is generally accepted that for every 100 m² of plasterboard work that there is a reliably constant consumption of nails/screws/adhesives/ reinforcing tape/bedding and finishing compounds.

These material constants are listed here for reference:

- nails or screws 560 no. per 100 m² (1 kg)
- adhesive 3 kg per 100 m²
- reinforcing tape 75 lm per 100 m²
- bedding compound 16 kg per 100 m²
- finishing compound 8 kg per 100 m²
- sand paper 4 sheets per 100 m².

If 13 mm or 16 mm was being used to do the same work, the significant differences will be the different cost of the board and the labour, which changes by 5% for 13 mm and 10% for the 16 mm. The other material constants would remain.



Other basic plasterboard rates

	10 mm	13 mm	16 mm
Supply			
Plasterboard m ²	\$8.90	\$12.00	\$15.00
Labour			
To install 0.4 m ² /hr	\$26.00	\$27.30	\$28.60
Sundry			
Materials	\$0.90	\$0.90	\$0.90
Stop finish m ²	\$35.80	\$40.20	\$44.50



- Furring channels/battens add \$10 m²
- Extra for corners where an external corner angle is required
- Reveals/sills
- No openings deducted
- High impact sheets
- Water resistant sheets
- Columns add 110% to the labour
- Bulkheads/beams add 100% to the labour

4.3.3 Timber wall framing

For this example, refer to drawings provided on the following page.

- Typical timber stud wall framing.
- Timber is f5 pine mgp10.
- Walls total length is 58 m in 9 room areas (refer to drawing).
- Wall height (ceiling) 2.7 m.
- Total wall area (elevation) = 157m².
- Studs @ .450 centres nominal size 90 x 38 mm.
- 2 rows of noggings nominal size 90 x 38 mm.



- Plates top and bottom nominal size 90 x 45 mm.
- Bracing speed brace diagonally 11 no. at 45°.
- Door studs nominal size 90 x 45 mm.
- Door heads nominal size 90 x 45 mm.

Schedule of estimated quantities				
Item	Nominal size	Calculations	Material price	Material costs
Top/bot plates	2/58	116 lm	1.95	\$226.20
Studs	129/2.7	349 lm	1.52	\$530.48
Corner studs intersections	7/2.7	19 lm	1.52	\$28.88
Door studs	5/2/2.7	27 lm	1.95	\$52.65
Door heads	5/1	5 lm	1.95	\$9.75
Noggings	2/58	116 lm	1.52	\$176.32
Speed brace	11/5	55 lm	1.13	\$62.15
Nails	75 bh	1258 no.	0.02	\$25.16
Fix to concrete floor soffits	@ 0.600 centres	194 no.	0.35	\$67.90
Total materials costs				\$1,179.49

Other calculations to arrive at the total material costs:

Divide total wall length x 0.450 stud centres to provide total number of studs, plus corners, intersecting walls and door studs, two nails at each junction of timber to timber

Labour to take from stack at working level, measure, cut, fabricate, brace, erect, plumb and straighten

Two person gang, each person averages 50 lm per day

There are 632 lm of timber in the fully constructed wall

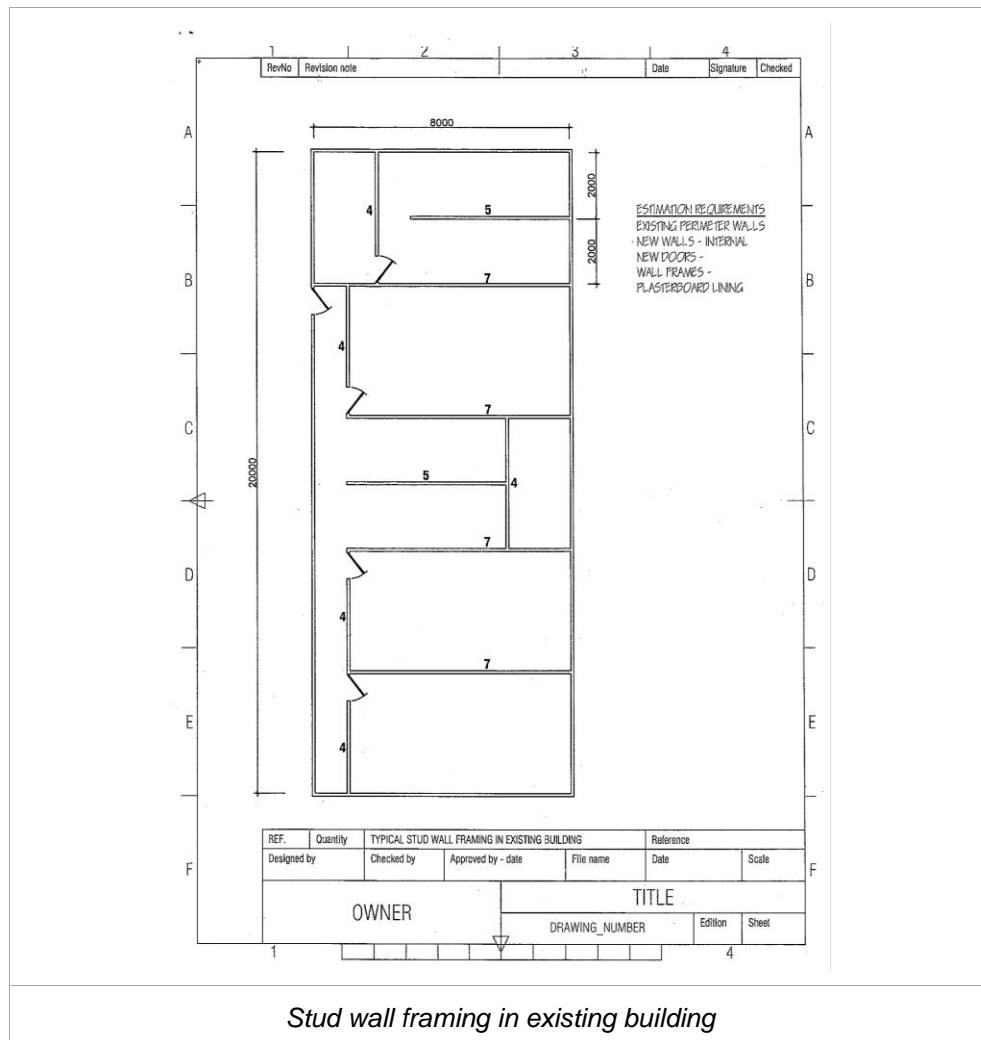
Therefore require 12.64 person days or two people by 6.32 days each

Labour cost is two people x 6.32 days x 8 hours x \$65.00 per hour
= \$6,572.80

Total cost = \$7,752.29

This equals labour and materials of \$49.37 per m²

Or per lineal metre of wall length \$133.66 lm



It has become common practice to convert costs into m^2 rates or lineal metre rates where common work can be calculated to a reliable performance standard (ie housing frames etc).

The previous practice speeds up the process of estimating and allows the utilisation of areas and dimensions for other parts of the estimate(s) for other trades.

It is also possible to draw up similar tables for different wall types (eg steel studs), or different wall heights or different stud spacings.

The labour to construct a wall of 2.4 m in height will not be much different to say 2.7 m, so that there is only the need to adjust the material content.

In this example, the labour content can be expressed as \$10.39 lm, based on the total labour of \$6,572.00 by the total lineal metres of timber, ie 632. This gives you \$10.39 per lineal metre, or about 6.25 minutes per lineal metre of timber.



This production rate applies to similar situations where the size of timber being fabricated doesn't heavily influence the production until the size creates less productivity, due to its extra weight and size (ie lengths).

4.3.4 Door set installation (typical)

Door 2040 x 820 x 35 mm thick hollow core	\$83.18
Labour to install: 1.5 hours @ \$65.00 hr	\$97.50
Door jamb kdhw/loose stops	\$32.38
Labour to install: 1.5 hours @ \$65.00 hr	\$97.50
Hinges 2 No. ss lp butt hinges	\$16.18
Labour to install: 0.5 hours @ \$65.00 hr	\$32.50
Lock latch set (mortice) scl	\$84.27
Labour to install: 1.5 hours @ \$65.00 hr	\$97.50
Architraves both sides 67 x 18 mm, 10.4 lm @ \$1.50	\$15.60
Labour to install: 1.5 hours @ \$65.00 hr	\$97.50
Nails/screws/fixings/packers	\$5.00
Total costs to supply, deliver and install	\$659.11

Other items to consider for door installations:

- vision glass panels (these should be by door manufacturer)
- door grilles supplied by air conditioning subcontractor but installed by builder
 - labour to install: 0.5 hour each, opening in door formed by door manufacture
- surface mounted door closers
 - labour to install: 1 hour each.



All the information assumes delivery to site, unloading costs and relocation to work area by others. Refer to preliminary costs for site labourers.



Following is another example of preparing the estimate for doors which lists all the basic options.

Item	Material cost	Labour hours	Labour cost \$65.00 p/hr	Total cost
Door	\$85.00	1.5	\$97.50	\$182.50
Frame pmdf	\$100.00	1.5	\$97.50	\$197.50
Arches	\$16.00	1.5	\$97.50	\$113.50
Lock/furn	\$85.00	1.5	\$97.50	\$182.50
Hinges	\$17.00	0.5	\$32.50	\$49.50
Closer	\$250.00	1.0	\$65.00	\$315.00
Air grill	\$45.00	0.5	\$32.50	\$77.50
Vision panel	\$65.00	0.5	\$32.50	\$97.50
Push plate	\$35.00	0.5	\$32.50	\$67.50
Pull handle	\$45.00	0.5	\$32.50	\$77.50
Panic bolts	\$65.00	1.0	\$65.00	\$130.00
SI door track	\$110.00	1.5	\$97.50	\$207.50
Pelmet	\$30.00	1.5	\$97.50	\$127.50
Door stop	\$30.00	0.5	\$32.50	\$62.50
Buffer h c hook	\$35.00	0.5	\$32.50	\$67.50
Kick plates ss	\$35.00	0.5	\$32.50	\$67.50

Extra for material costs:

- for nails/screws /fixings/packers
- edge strips = \$25.00 set
- solid core = \$120.00 each
- full height doors/frames = \$30.00 each
- special veneers = \$30 – \$40 each
- door frames, other than pmdf's like aluminium = \$30.00
- door protection set between doorstops, acrovyn or similar half height of door \$75.00 each side.

All the information can be kept for future reference when preparing estimates and tenders.



4.3.5 Brickwork

The first part of the brickwork estimating process starts with the build up of a basic rate for supply of all materials and labour for a standard clay brick wall.

Bricks are priced in 1000 brick lots, but you can buy them in 272 – 340 lot packs and 400 lot packs, depending on selection of the bricks
Brick supply price ex yard per thousand \$565.00
Delivery radius from yard applies \$75.00
Standard mortar mix
6-1-1 sand cement limil
0.65 m ³ brick sand per thousand @ \$55.00m ³ \$35.75
Cement 20 kg bags 8 no. @ \$8.00 per bag \$64.00
Limil 25 kg bags 2.4 no. @ \$7.00 per bag \$16.80
Basic material costs per thousand bricks \$756.55
Calculations are based on 50 bricks per m ² , therefore 1,000 bricks covers 20m ² laid in the wall
Our unit rate for bricks supplied with mortar is shown on next page
Bricklaying costs are also rated at costs per thousand
Labour costs are calculated, as labour to receive all materials on-site and relocate to work area, mix the mortar and finally to lay
Using a four person gang, three bricklayers and one labourer
Costs:
<ul style="list-style-type: none"> • three bricklayers x 8 hours @ \$70.00 per hour = \$1,680.00 • one labourer x 8 hours @ 60.00 per hour = \$480.00 • Ratio = 3:1 daily cost = \$2,160.00 per day
Brick size length x width x height = 230 mm x 110 mm x 76 mm
Bed joints and perps are nominal 10 mm
Mortar is standard mix
Accessories or sundries as required

Productivity

Three layers and one labourer must lay 1800 bricks (ie 600 each per day) at a charge out rate of \$1200.00 per thousand. From these two basic calculations, a working rate per m² can be established.



Costs

Bricks/mortar per m ² (\$756.55: 20 m ² per thousand) = \$37.82 m ²
Basic labour to lay: \$1.20 per brick x 50 bricks per m ² = \$60.00 m ²
Base cost for materials/labour, per m ² per skin = \$97.82 m ²
To this sum, you can add all the usual additives/sundries:
Damp proof courses in polythene @ 0.30 cents lm
Coloured mortar \$7 - \$10 m ² (subject to colour)
Cross wall ties: 4 no. per m ² @ 0.50 cents each = \$ 2.00 m ²
Horizontal reinforcing @ 1 piece every 4th course:
2.5 lm per m ² @ 0.25 cents per lm = 0.63 m ²
Cleaning down face work labour and materials @ \$10.00 m ²
The wall used in this example, including all the above costs, now costs \$117.55 m ²

In addition to the above, bricklaying contractors will charge extra for:

- different joints, ie square raked or weathered
- installing termite mesh
- testing mortar
- scaffolding above 2 to 3 lifts
- cutting bricks with a diamond blade
- installing flashings
- sill bricks, sill tiles or capping bricks, parapet cappings
- hoisting over 2 to 3 lifts
- installing lintels
- providing control joints
- cleaning down face work
- bagging brickwork
- caulking against soffits of slabs
- setting up door or window frames
- banding with different colours or different bricks
- feature bricks, corbelling projections etc.

As can be seen from the information provided, brickwork is a costly item, as it is labour intensive and the price for a basic brick wall to an architectural feature can vary greatly.



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Activity 3 - Material and labour costings

Determine a per square metre rate for the following brick wall using the specification and cost information provided.

The wall is 4 m high and 20 m long with two skins of brickwork both faced, with cross wall ties, standard mortar and reinforcing

Area (both sides measured)
@ \$97.82 m²

Cross wall ties (single side measured)
@ \$ 2.00 m²

Horizontal reinforcement (both sides measured)
@ 0.63 m²

Cleaning down face work (both sides measured)
@ \$10.00 m²

Scaffolding to both sides as the wall is over the height limit

Total cost:

Check your findings with the correct answer in the back of this Learner Resource under 'Learning activity answers'.

* Retain this learning activity as part of your portfolio of evidence.



Where there are openings of more than 1 m², it is necessary to deduct the openings from the gross area when preparing quantities, should there be piers and other such items, then these too would be calculated into the take off.

4.3.6 Blockwork

Consider a typical block wall using hollow besser concrete blocks in this section.

Irrespective of block sizes, blocks are measured by m² of wall areas, allowing for single and double skin construction. Extra allowances are made for such items as cavity reinforcement and/or concrete cavity filling as for retaining walls, or core filling of either blockwork or pilaster blocks or piers.

Standard blocks are 290 mm long x 190 mm high x 90 mm thick.

Blocks are supplied in 149 lot pallets. There are no delivery costs when two or more pallets are bought.

There are 18 blocks per m² in the wall but for estimating purposes, use 20 per m² with 10 mm joints are used. Mortar is a standard mix. Accessories or sundries as required.

Block supply per one hundred (solids are \$172.58 per 100)

Delivery radius from yard applies: \$135.98

Standard mortar mix

6-1-1 sand cement limil

0.20 m³ brick sand per hundred @ \$55.00 m³ \$11.00

Cement 20 kg bags 2.70 bags @ \$8.00 per bag \$21.60

Limil 25 kg bags 0.80 bag @ \$7.00 per bag \$5.60

Basic material costs per hundred blocks \$177.18

Base the calculations on 20 blocks per m², therefore 100 blocks covers 5 m² laid in the wall @ \$35.43 per m² for materials

For labour working on a four person gang, three blocklayers and one labourer required

Labour costs are:

- 3 blocklayers x 8 hours @ \$70.00 per hour = \$1,680.00
- 1 labourer x 8 hours @ \$60.00 per hour = \$480.00

Ratio = 3:1 daily cost = \$2,160.00 per day



Productivity

Three blocklayers and one labourer must lay the equivalent of 723 blocks per day to recover their costs. This is for $144 \text{ m}^2 \times 5 \text{ blocks per m}^2$. This translates to \$3.00 per block, or 1 block every 2 minutes per layer.

From these two basic calculations, a working rate per m^2 can be established.

Costs

Blocks and mortar per m^2 (\$177.18: 5 m^2 per hundred) = \$35.43 m^2
Basic labour to lay \$3.00 per block \times 20 blocks per m^2 = \$60.00 m^2
Base cost for materials/labour, per m^2 per skin = \$95.43 m^2
To this sum you can add all the usual additives/sundries in the same ratios as for brickwork

All the additional costs advised previously also apply to blockwork as for brickwork.

4.3.7 Rendering (solid plaster)

This material is widely used throughout the world and the building industry in general.

The materials are universally available and the skilled labour to apply it is also available in most countries.

Materials

- Plastering sand
- Cement
- Limil

Admixtures, plasticisers, colour additives using liquids or oxides (powder form), are also used for colour and decorative finishes as well as to provide a durable, even, semi-textured finish self-coloured, or ready for painting.



Render is applied to brickwork/blockwork, concrete and to cfc or fc sheet or other wallboards. Where this occurs, preparation to provide extra adhesion is required and this must be measured when preparing quantities.

This is known as dash coat or surface picking, or a bonding agent is applied to make sure of the correct adhesion for surfaces other than brick or blockwork.

Subject to the background material, render is applied at a nominal thickness of 20 mm.

Materials for a 50 m² area:

Mix ratio 10-1-1

Sand 2 m³ @ \$65.00 = \$130.00

Cement 20 kg bags 2 no. @ \$8.00 = \$16.00

Lime 25 kg bags 1 no. @ \$7.00 = \$ 7.00

Total \$153.00

Or \$3.06 per m² for materials

Labour:

Usually a three person gang, ie two plasterers and one labourer, would apply and finish 15 m² per plasterer per day

Calculate:

Materials 50 m² @ \$3.06 = \$153.00

Labour 3 people x 8 hrs x \$65.00 per hr = \$1560.00

Nett costs = \$1713.00

Allow a contractor's margin of 10%: \$171.00

Total costs to apply 30 mm² per day \$1884.00

This then converts to a rate per m² of 62.80 m²

This would be a typical cost for a 2.7 m high wall, work done from trestles at ground level, or with all materials landed at the working level for multi-level work



Additional costs would be incurred for:

- special corners
- window reveals/sills
- colour additives
- plasticisers
- reinforcing mesh/k-lath
- forming recesses or projections
- dash coating, splash coating, picking over the surface
- bond coating
- external scaffolding over 2 m.

4.3.8 Wall tiling

Ceramic wall tiling is available in a variety of tiles, types and sizes, including mosaic tiles.

Tiles can be bedded in mortar or fixed by adhesives and can be applied to a variety of substrates, fc, cfc sheet, brick and blockwork, concrete, wall boards and rendered walls.

Materials and labour are priced in m^2 .

This example will be based on applying wall tiles to render.

Materials

Wall tiles 150 mm x150 mm x 8 mm thick
Tiles are purchased in carton boxes and are priced by m^2
Wall tiles, supply and delivered: 1 m^2 @ \$ 35.00 m^2 = \$35.00
Adhesives or bedding material:
5 kg can covers 3 m^2 @ \$ 25.00 per can: 1 m^2 = \$8.33
Bonding agent:
5 kg can covers 10 m^2 @ \$ 30.00 per can: = \$ 3.00
Grout pre-mixed:
10 kg bag covers 10 m^2 @ \$ 15.00 per bag = \$ 1.50
Cleaning down included in labour rate
Total materials \$47.83



Labour to install

Productivity areas 12 – 15 m²

Labour is based on 1 person preparing, laying, grouting and cleaning down, at the rate of 12 m² per day complete

Cost = \$65.00 per hour x 8 hours:

13 m² per day equals labour rate of = \$40.00 m²

Total cost labour and materials per m² = \$87.83 m²

4.3.9 Floor tiling

Typical floor tiling installations:

- on concrete floors, with or without graded screeds
- also on fc and cfc sheets or underlays over timber floors
- materials are purchased in cartons or on pallets for bigger projects
- materials and labour are priced in m².

In this example, tiles are laid in a thick bed adhesive on concrete floor slab with a bonding agent applied before adhesive

Floor tiles:

200 mm x 200 mm x 12 mm thick @ \$40.00 per m² = \$40.00

Bonding agent: \$1.50

Adhesive or bedding material:

5 kg can covers 2 m² @ \$25.00 per can, 1 m² = \$12.50

Grout pre-mixed:

10 kg bag covers 8 m² @ \$15.00 per bag, 1 m² = \$1.88

Labour to clean up is included in labour rate

Productivity areas 15 – 20 m²

Labour is based on one person preparing, laying, grouting, cleaning up at the rate of 18 m² per day complete

Calculate:

One person x 8 hrs x \$65.00 per hr: by 18 m² per day = \$28.89 m² labour

Total costs, labour and materials per m² = \$ 84.77 m²



Additional costs for:

- soap shells
- coved skirtings
- coloured borders
- mixed sizes
- mixed colours
- control joints
- silicone sealants
- epoxy grouting
- diamond hole coring
- inlaid features



Graded floor installations require a floor screed. This may be done separately but will cost more. Also, the cost to cut tiles to grade will cost more and will require careful laying to get the desired grades. This can increase the labour component of these areas by up to 150%.

The following chart shows how the costs may be defined after the base calculations have been set up from the information provided.

4.3.10 Typical tiling costs

Item	Mosaic 300 x300 sheets	Tiles 100 x 100	Tiles 150 x 150	Tiles 300 x 200
Tiles	\$30.00	\$28.00	\$35.00	\$40.00
Bedding adhesives	\$8.33	\$8.33	\$8.33	\$8.33
Bonding agent	\$1.50	\$1.50	\$1.50	\$1.50
Grout	\$6.00	\$4.00	\$3.00	\$3.00
Labour	\$60.00	\$40.00	\$40.00	\$40.00
Total:	\$105.83	\$81.83	\$87.83	\$92.83



There are significant discounts available on the supply price of tiles. This exercise has not factored in any waste for breakages or cutting, which on average is in the range of 8 - 10% for cutting when commencing with a full tile and cut to fit to walls etc.

As quantities are measured, it will become obvious as to whether the wall/floor areas work to full tiles. If the area does not work to full tiles, each calculation will provide the guide as to the likely wastage.

4.3.11 Drainage installation

The process of installing drainage systems is essentially the same for stormwater and sewer drainage systems.

To provide estimating guidance for drainage systems, the example used here is a typical stormwater drain PVC 100 mm diameter, made in 6 m lengths, and a variety of diameters. It should be noted that if using anything above a 300 mm diameter, it is cheaper to use concrete pipes.

Irrespective of pipe sizes, all pipes are generally available with accessories for:

- jointing
- pipe to pipe
- bends of 45 to 90°
- branches 45 to 90° (singles and doubles)
- T-sections
- inspection openings
- end caps.

Reducers are also available to allow transition from one diameter to another as pipe sizes increase.

Pipes run of diameters and these need to be measured. It is also necessary to count the number and type of branches and any other accessories required. These are stated as 'extra over', ie this is extra to the pipe that has already been measured.



For the following example, a run of pipe of 100 m in length has been used.

The fall is one metre over the 100 m distance, commencing at the high point with 200 mm cover over the pipe, down to 1200 mm at the outfall. Therefore, the excavation will be 300 mm plus the bedding material of 75 mm (fine crushed rock), making a total of 375 mm at the highest point. Lowest point is 1.3 m plus bedding of 75 mm. The average of these two dimensions is 880 mm.

The material may vary in grades, types and strengths. The appropriate building regulations and codes will also apply.

The estimating quantities are:

Excavation 1/0.88 x 0.600 x 100 lm	52.80 m ³
Bedding material 75 mm fcr 1/0.075 x 0.600 x 100 lm	4.50 m ³
Backfilling on completion using excavated soil Excavated volume = 52.80 m ³ less bedding volume of 4.50 m ³	48.30 m ³
Cart away volume	4.50 m ³
90 mm diameter PVC pipe	100 lm
Branches 45° bends	2 no.
Inspection openings	4 no.
One 5 kg can of adhesive	1 no.

Costs for labour, materials and plant

Hire of backhoe digger with variable buckets (driver included).

One day hire = 8 hours x \$95.00 per hr = \$760.00 per day.

Rating: excavate to stockpile beside trench @ 6.25 m³ per hour.

Therefore, the cost per m³ is \$95.00 per hour:
6.25 m³ per hour = \$15.20 m³.

Cost the drain in lineal metres (lm), then all calculations should be converted to lineal metres.



Bedding material: fine crushed rock (FCR) @ \$35.00 per m³ delivered.

100 lm of PVC pipe at \$30.00 per 6 metre length – delivered pipe is \$5.00 per lm.

One can of adhesive glue for jointing costs is \$15.00. As there are 17 joints over the run of pipe, plus 6 branches or ions, the entire can of glue will be used. The cost of adhesive is therefore \$15.00 divided by 100 lm of pipe gives 0.15 cents per lm for adhesive.

Excavate/dig trench	\$7.60 lm
Bedding material \$35.00: 0.075 x 0.600	\$1.75 lm
PVC pipe \$30.00: x 6 lm	\$5.00 lm
Labour to install \$65.00: 6 lm	\$10.83 lm
Jointing adhesive	\$0.15 lm
Backfilling trench/compact	\$7.60 lm
Total costs	\$32.93 lm

Remember to add the extra costs for the bends and inspection openings.

The installation will therefore cost \$3,293.00 for 100 lm.



I

Activity 4 - Estimating an excavation

Imagine you are an estimator required to estimate the cost of a foundation excavation for a commercial building, which is composed of clay and rock. Geological information is limited and probably about 40% to 60% accurate. The client says that the contingency value must be kept within 15% of the final excavation cost. As an estimator, how would you meet the client's request? Outline your reasons for your answer.

Check your findings with the correct answer in the back of this Learner Resource under 'Learning activity answers'.

* Retain this learning activity as part of your portfolio of evidence.





5. Project costs

Project costs represent the costs that will be incurred as a consequence of running the project. The items of cost are scheduled in a logical format to cater for most average projects. Where a project differs from the average, it is adjusted to accommodate the difference. Most organisations identify their own schedule of items, but generally, they cover much the same information and are a very important part of making up a budget/tender or estimate.

It can be said that the builder's risk is reduced in this area if all other pricing and trade quotations are reliable and accurate.

The estimated project costs include:

- appropriate labour rates for all trade works and other associated project works
- material costs (including plant and equipment costs)
- unit costs for labour and materials where applicable
- costs to the project regarding workers' compensation, environmental protection agency requirements, building approvals, waste management site fees and other statutory or additional costs
- the organisation's overhead recovery and margins.

The content of the documented estimated project costs (ie the preliminary costs) include:

- project title
- approximate value
- time to construct
- provisional period for delay
- building permit fees/certifications
- retention/performance bank guarantees
- insurances
- contractors all risk policy
- public risk and third party policy
- professional indemnity insurance
- plant and equipment
- any structural warranty insurances
- site accommodation
- site offices



- toilets
- lunch rooms
- change rooms
- first aid rooms
- meeting rooms
- sample rooms
- containers for storage
- covered ways to protect workers
- crushed rock or concrete pathways
- transport for site accommodation to and from site
- temporary services for site accommodation and for the building under construction
 - water
 - power
 - lighting
 - sewer
 - phones/data
 - connection costs for the above services
 - ongoing running costs
 - disconnection costs.



6. Overheads

Overheads are the cost of operations used by organisations in their daily production of goods and services. Overheads are needed to keep the organisation's production facilities open each day, for items such as utilities, rent and equipment leases.

These costs are incurred whether or not an organisation has any ongoing work or major contracts.

Overheads are calculated through the organisation's cost accounting function, allowing the construction manager to determine the overhead cost that should be applied to each produced good or service, via the organisation's costing system.

Common overhead costing systems include activity based costing (ABC), job order costing and batch costing. Each method takes the total business overhead amount and adds a portion to produced product or service. This makes sure that each product or service receives an equal share of the business overhead.

Overhead recovery is the amount of overhead recovered in relation to the direct costs of production. For example, if the overhead recovery rate is 20%, then for every \$1 of direct costs, the organisation will have an additional \$0.20 incurred in overheads.

Let's assume the organisation's overhead costs are 32% of the total revenue, and the construction manager wants a 10% profit. This means the average job costs are 58% of the total revenue (100% – 42%).

A job comes in with a total job cost of \$1,000. Overheads and profit are added to the job costs:

- $\$1,000 + 32\% \text{ overheads } (\$1,000 \times 0.32 = \$320) = \$1,320$
- $\$1,320 + 10\% \text{ profit } (\$1,320 \times 0.10 = \$132) = \$1,452$

To calculate the sales price, add the markup as follows:

- Markup of 1.72: $\$1000 \times 1.72 = \$1,720$
- Margin of 42%: $\$1000 / (1 - 0.42) = 1000/0.58 = \$1,724$

This shows for the same job, there is now an additional \$270, or \$270 per thousand dollars of job costs ($\$1,724 - \$1,452 = \$272$).



There are many more potential cost items that you may come across that are specific to each job. The potential cost items generally have no quantities. It takes considerable judgement and experience on the estimator's part to accurately calculate exactly what items are necessary. This process should be treated as an internal trade package for which the contractor needs to be accurate and thorough, as it is here that the risk is greatest.

The cost of electricity will generally be related to the time on the project. Researching historical records from the accounts department for similar projects can help calculate many cost items, such as electricity, phone and cleaning the building.

Having listed all the most common items that should be included, it should be noted that on-site based costs could be somewhat arbitrary. This is because each contractor will view the content/items in different ways, according to their own style of operations. A contractor may subcontract as much of the project as possible, sometimes up to 85%, and can ask the subcontractors to do their own scaffolding, hoisting, craneage, plant and equipment. This has the advantage of the risk then being with the subcontractor(s), but it can also mean that trade prices will be more expensive.

Alternatively, the contractor may have their own in house capacity to do much of the trade work and this can be significantly more economical than subcontracting. However, the contractor who employs their own staff and tradespeople and provides all the equipment, takes on a higher level of risk compared with subcontracting the work.



Activity 5 - Complete estimated project costs for a tender/bill

Use the project in the learner resource under section 4.3. Look up the tender /estimating documentation and answer the following questions:

1. Look up the carpentry section and explain how the labour rate and material costs were calculated.

2. How are unit costs for doors calculated? Refer to section 4.3.4

3. In project preliminaries, identify how the following costs were accounted for:

- WorkCover
- EPA requirements
- planning permit
- building permits
- waste management
- site fees
- fencing.

Check your findings with the correct answer in the back of this Learner Resource under 'Learning activity answers'.

* Retain this learning activity as part of your portfolio of evidence.





Learning activity answers

Your answers should include reference to the following key information. You may have included extra detail based on personal experience or further research into the topic however as a minimum the key information should be included in your answers.

If you are having difficulties with any of the learning activities you should contact your tutor for guidance.

Activity 1 - Trades and their responsibilities

Carpentry

- Set out wall framing bottom plate locations
- Cut studs to size
- Place framing elements in place
- Provide bracing

Roof plumbing

- Install guttering
- Install flashing
- Connect downpipes to gutter
- Connect downpipes to stormwater drain

Joinery

- Install cabinets
- Install vanity units
- Install cabinet doors
- Install benchtops

Concreting

- Pouring of footings
- Curing of concrete
- Levelling of slabs



Activity 2 - Interpreting plans, drawings and specifications

1. Scale 1:100 and 1:50
2. Roof insulation R 7.0 polyesther batts
Wall insulation R 2.0 polyesther batts
Wall cladding horizontal colorbond and vertical timber
Windows double glazed timber
Floor coverings tiles and carpet
Floor joists 290 mm hybeam
3. Bedroom size 3.5 m x 3.8 m
Door height 2.1 m
Ceiling height 2.7 m

Activity 3 - Material and labour costings

Labour and materials using rate a charge out rate:
Area (both sides measured) $2 \times 4 \text{ m} \times 20 \text{ m} = 160 \text{ m}^2 @ \$97.82 \text{ m}^2 = \$15,651.20$
Cross wall ties (single side measured) $1 \times 4 \text{ m} \times 20 \text{ m} = 80 \text{ m}^2 @ \$2.00 \text{ m}^2 = \$160.00$
Horizontal reinforcement (both sides measured) $2 \times 4 \text{ m} \times 20 \text{ m} = 160 \text{ m}^2 @ 0.63 \text{ m}^2 = \100.80
Cleaning down face work (both sides measured) $2 \times 4 \text{ m} \times 20 \text{ m} = 160 \text{ m}^2 @ \$10.00 \text{ m}^2 = \$160.00$
Scaffolding to both sides as the wall is over the height limit $2 \times 3 \text{ m} \times 20 \text{ mm} = 120 \text{ m}^2 @ \$60.00 \text{ m}^2 \text{ lab/scaffold} = \$7,200.00$
Total cost \$23,272.00

The above converts to a rate per m^2 of \$145.45 m^2 for a complete wall, for each skin of brickwork measured, ie one brick thick.



Activity 4 - Estimating an excavation

Two options

Either request more information, ie more tests done on-site (to enable you to provide a more accurate estimate), or overestimate initial price (to avoid later problems due to cost blowout).

Activity 5 - Complete estimated project costs for a tender/bill

Answer will vary based on organisation's operational structure and project.

Example:

1. Detailed quantities of timber, connection materials were taken and costed based on XYZ timberyard's pricelist. Labour team was lead carpenter, two others and one apprentice. Estimated time required and the different charge-out rates and calculated total labour costs.
2. Doors were specified on the plans. A table with quantities and types was produced and was quoted for by two suppliers. Quotations were used to determine unit cost.
3. WorkCover was a percentage of yearly WorkCover premium, based on the fact that this project produced 20% of the business cash flow this year.
 - EPA requirements were based on asbestos removal quote.
 - Planning and building permits were already provided by client, not included in preliminary costs.
 - Waste management fee based on similar project.
 - Temporary services for site including water, power, lighting, sewer, phone/data.
 - Fence length calculated, multiplied with standard rate.





Appendices

Appendix 1 – Employability Skills

Appendix 2 – Qualification structure

Appendix 3 – Unit of competency

Appendix 4 – Project documentation





Appendix 1 - Employability Skills

The following table shows the Employability Skills embedded within this unit together with the appropriate assessment task that assess these skills. Note that not all the Employability Skills in the qualification are assessed in this unit. Assessments for other units will cover the remaining Employability Skills.

Employability Skills	Evidenced by	Assessment task
Communication	Oral and written communication skills that contribute to productive and harmonious working relations between co-workers, customers and other stakeholders	Task 3
Teamwork	Skills that through cooperation and collaboration contribute to productive working relationships with others to achieve the desired outcomes of the project	Task 3 Task 4
Problem solving	Appropriate analytical skills that contribute to timely completion of tasks and productive outcomes	Task 2 Task 5 Task 6
Initiative and enterprise	Skills that contribute to innovative outcomes, within scope of responsibility	Task 1 Task 2 Task 3 Task 4 Task 5 Task 6
Planning and organising	Task management skills that support the attainment of project goals and objectives and the strategic planning of the organisation	Task 1 Task 4 Task 6
Self management	Skills to manage personal reactions to responsibilities and challenges in the workplace and contribute to self-satisfaction and growth	Task 1 Task 2 Task 3 Task 4 Task 5 Task 6
Learning	Skills that contribute to ongoing professional development	Task 1 Task 2 Task 3 Task 4 Task 5 Task 6
Technology	Skills that contribute to effective execution of tasks using a range of appropriate technological options and a willingness to embrace emerging technologies	Task 1 Task 2 Task 3 Task 4 Task 5 Task 6



Appendix 2 - Qualification structure

This Learner Resource, *CPCCBC4004A Identify and produce estimated costs for building and construction projects* forms part of the CPC50210 Diploma of Building and Construction (Building) qualification.

- BSBOHS504B Apply principles of OHS risk management
- BSBPMG404A Apply quality management techniques
- BSBPMG505A Manage project quality
- BSBPMG508A Manage project risk
- BSBPMG510A Manage projects
- CPCCBC4001A Apply building codes and standards to the construction process for low rise building projects
- CPCCBC4003A Select and prepare a construction contract
- CPCCBC4004A Identify and produce estimated costs for building and construction projects
- CPCCBC4010A Apply structural principles to residential low rise construction
- CPCCBC4013A Prepare and evaluate tender documentation
- CPCCBC5001B Apply building codes and standards to the construction process for medium rise building projects
- CPCCBC5002A Monitor costing systems on medium rise building and construction projects
- CPCCBC5003A Supervise the planning of on-site medium rise building or construction work
- CPCCBC5007A Administer the legal obligations of a building or construction contract
- CPCCBC5008A Apply structural principles to the construction of medium rise buildings
- CPCCBC5009A Identify services layout and connection methods to medium rise construction projects
- CPCCBC5010A Manage construction work
- CPCCBC5011A Manage environmental management practices and processes in building or construction
- CPCCBC5018A Apply structural principles to the construction of medium rise buildings



Appendix 3 - Unit of competency

CPCCBC4004A: Identify and produce estimated costs for building and construction projects

Unit descriptor

This unit of competency specifies the outcomes required to establish the estimated costs associated with the acquisition of materials and labour on building and construction sites, together with the application of relevant overhead costs and margins. Knowledge of physical resource and supplier identification, assessment of the availability of and requirements for skilled labour and application of appropriate codes, regulations and approvals gaining processes is essential.

Employability Skills

This unit contains employability skills.

Application of unit

This unit of competency supports the needs of estimators, builders, managers and trade contractors within the construction industry responsible for producing estimated costs for labour, materials, overheads and on-costs on various residential and commercial construction projects within their scope of work as a trade contractor or builder.

Sector

Construction



Element	Performance Criteria
Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where <i>bold italicised</i> text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.
1. Read and interpret plans and specifications	1.1 Appropriate plans and drawings are correctly identified. 1.2 Project <i>plans and specifications</i> are read and understood. 1.3 Levels, heights, gradients and other measurements are interpreted. 1.4 Measurements are made and quantities Identified from plans and specifications that conform to standard industry practice.
2. Identify and calculate labour costs	2.1 Types and numbers of appropriate on-site personnel are identified and the time required on-site is estimated. 2.2 Labour hours for non-contract elements of on-site work are calculated. 2.3 Costs or rates for required on-site work are calculated.
3. Identify and establish physical resource requirements	3.1 Physical resource requirements are identified. 3.2 Lists of materials are produced and quantities calculated. 3.3 Quantities are established against project or standard construction contracts. 3.4 Supplier prices for materials and consumables are obtained. 3.5 <i>Plant or equipment requirements</i> are identified and costed.
4. Develop estimated project costs	4.1 Appropriate labour rates and material costs are selected and applied. 4.2 Estimates of <i>unit costs</i> are determined and applied as appropriate. 4.3 Costs to the project of WorkCover, Environmental Protection Agency (EPA) requirements, seeking approvals, waste management site fees and other statutory or additional costs are identified and applied. 4.4 Company overhead recovery and margins are applied. 4.5 Completed estimated <i>project costs</i> are calculated for inclusion in a tender or bill.



Required skills and knowledge

This section describes the skills and knowledge, and their level, essential for this unit.

Required skills

Required skills for this unit are:

- communication skills to:
 - enable clear and direct communication, using questioning to identify and confirm requirements, share information, listen and understand
 - read and interpret drawings and specifications
 - use language and concepts appropriate to cultural differences
 - use and interpret non-verbal communication
- contractual arrangement problem solving
- estimate labour and materials costs from written information
- numeracy skills to calculate labour hours and costs, material quantities and costs
- use appropriate costing software programs.

Required knowledge

Required knowledge for this unit is:

- how to access and interpret:
 - national codes, including Building Code of Australia (BCA) and the Plumbing Code of Australia
 - Australian Standards relevant to the industry sector
- includes state or territory and local government building and construction codes, standards and government regulations relevant to the form of building or construction being undertaken (eg WorkCover and EPA)
- types of building and construction drawings and specifications
- types, scope and usage of labour through the employee and subcontractor systems
- operation and structure of the organisation's costing and contracting system.



Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording in the performance criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Plans and specifications
include:

- building codes
- materials lists and quantity schedules
- materials specifications
- sketches or drawings
- statements of requirements.

Plant or equipment requirements include:

- communications equipment
- conveyors
- heavy equipment, such as wheeled and tracked earthmoving equipment, trucks and articulated vehicles
- hoists
- mobile and tower cranes
- on-site equipment, such as:
 - compressors
 - pumps
 - generators
 - portable lighting
 - lifting equipment
 - portable compaction equipment.

Unit costs may include the cost of:

- construction cost per square metre
- installation of pipes per metre
- installation of sanitary ware per unit
- laying of foundation per metre
- laying of slabs per square metre
- laying of steel tray roofing per square metre
- masonry walls per square metre
- pain ling per square metre
- tiling per square metre.



Project costs include

- building or construction materials
- communications costs
- cost of meeting statutory requirements, eg EPA
- fuels, lubricants and consumables
- organisational and subcontract labour hours
- overheads
- project administration costs
- site facilities, such as:
 - offices
 - toilets
 - lunch rooms
- waste removal fees.

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for this Training Package.

Overview of assessment

This unit of competency could be assessed by the preparation of a detailed estimate of labour, materials and other project costs as part of the preparation of a tender or bill for a residential or commercial construction project relevant to the specific trade or sector.

This unit of competency can be assessed in the workplace or a close simulation of the workplace environment, provided that simulated or project-based assessment techniques fully replicate construction workplace conditions, materials, activities, responsibilities and procedures.



Critical aspects for assessment and evidence required to demonstrate competency in this unit

A person who demonstrates competency in this unit must be able to provide evidence of the ability to:

- identify materials required for a project
- gather information about material supply
- interpret measurements and calculate quantities and costs
- plan and allocate human resources
- identify and cost other related costs, such as those required to meet statutory and planning approval processes
- produce documentation that meets the timeframes and quality
- standards established by the organisation
- communicate effectively, both verbally and in writing.

Context of and specific resources for assessment

This competency is to be assessed using standard and authorised work practices, safety requirements and environmental constraints.

Assessment of essential underpinning knowledge will usually be conducted in an off-site context.

Assessment is to comply with relevant regulatory or Australian Standards' requirements.

Resource implications for assessment include:

- documentation that should normally be available in either a building or construction office
- relevant codes, standards and government regulations
- office equipment, including calculators, photocopiers and telephone systems
- computers with appropriate software to view 2-D CAD drawings, run costing programs and print copies
- a technical reference library with current publications on measurement, design, building construction and manufacturers' product literature
- a suitable work area appropriate to the construction process.

Reasonable adjustments for people with disabilities must be made to assessment processes where required. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support.



Method of assessment

Assessment methods must:

- satisfy the endorsed Assessment Guidelines of the Construction, Plumbing and Services Integrated Framework Training Package
- include direct observation of tasks in real or simulated work conditions, with questioning to confirm the ability to consistently identify and correctly interpret the essential underpinning knowledge required for practical application
- reinforce the integration of employability skills with workplace tasks and job roles
- confirm that competency is verified and able to be transferred to other circumstances and environments.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances
- assessed at different points in time and separated by further learning and practice, with a decision on competency only taken at the point when the assessor has complete confidence in the person's demonstrated ability and applied knowledge
- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence.

Assessment processes and techniques should as far as is practical take into account the language, literacy and numeracy capacity of the candidate in relation to the competency being assessed.

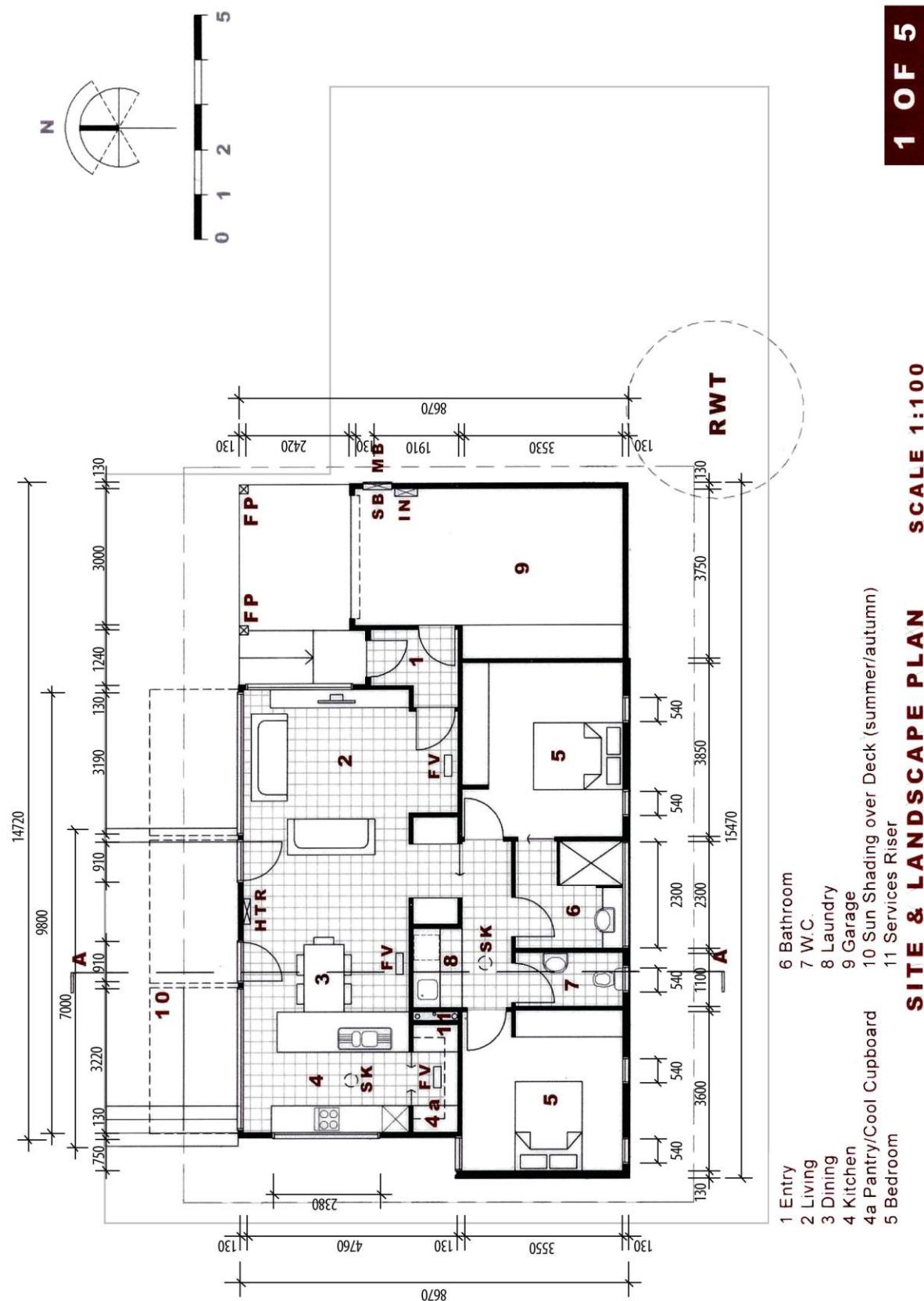
Supplementary evidence of competency may be obtained from relevant authenticated documentation from third parties, such as existing supervisors, team leaders or specialist training staff.

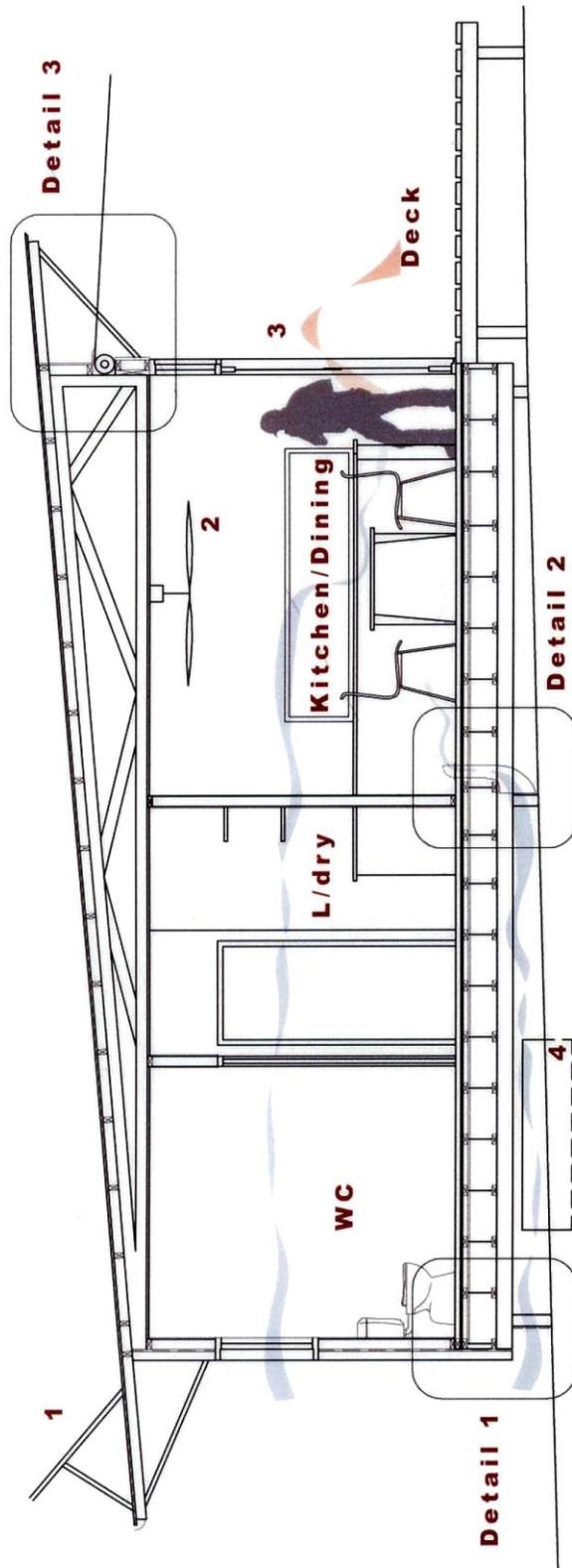


Appendix 4 - Project documentation



1 OF 5



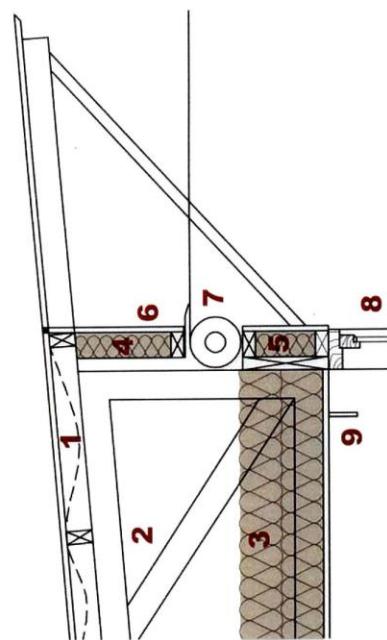


2 OF 5

SECTION A-A SCALE 1:50

- 1 Grid Connected PV System
- 2 Reversible Ceiling Fans (Dining, Living, Bedrooms)
- 3 Low 'E' double glazed windows and doors. Casement and Sashless openings to maximise ventilation
- 4 Grey Water system for bathroom, kitchen waste water (Laundry direct to landscape)

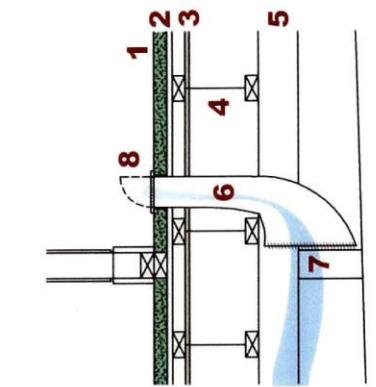
Refer also Details 1-3



DETAIL 3
SCALE 1:20 @ A3

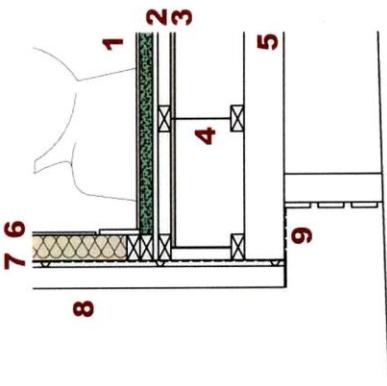
- 1 Reflective foil under roofing
- 2 Pinus roof trusses
- 3 R7 (2xR3.5) polyester ceiling batts
- 4 R2 polyester wall batts
- 5 Reflective foil over wall studs
- 6 Vertical Radial Sawn Cladding
- 7 Retractable roller blind system
- 8 Low 'E' Double Glazed Windows and Doors (12mm air space)
- 9 Pelmet to prevent air movement behind internal window coverings

3 OF 5



DETAIL 2
SCALE 1:20

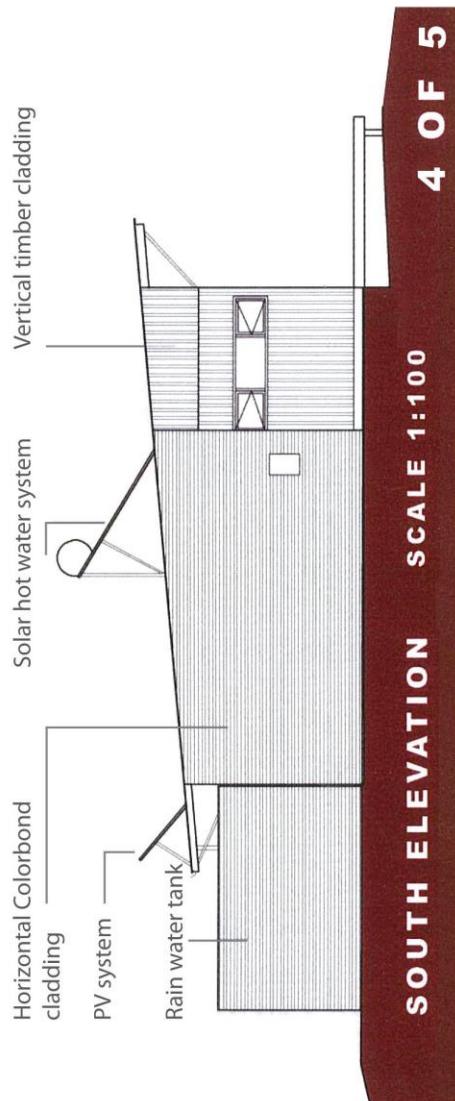
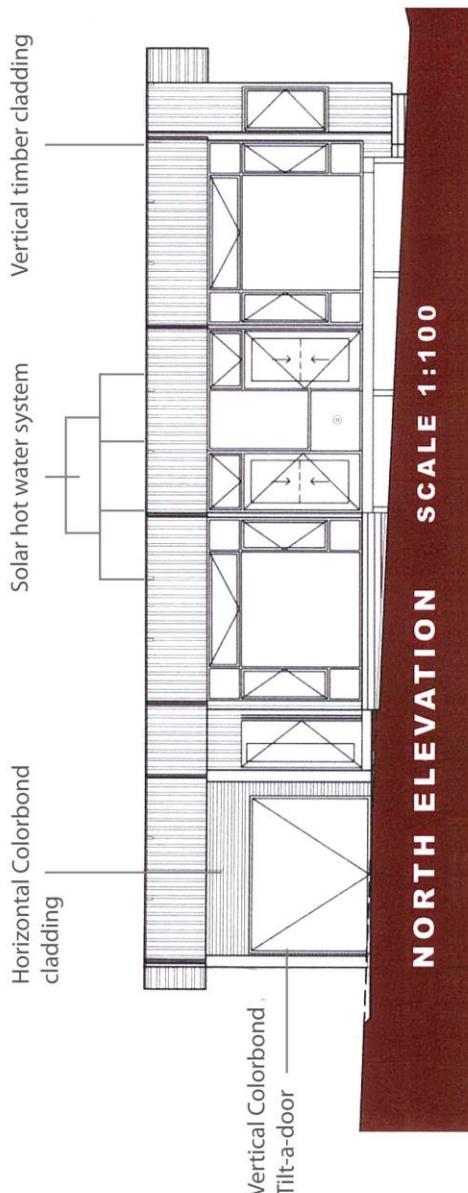
- 1 Tiles on 45mm concrete screed
- 2 19mm plywood flooring
- 3 15mm 'Foilboard' insulation
- 4 290mm 'Hybeam' floor joists
- 5 140mm bearers
- 6 Operable floor vent system
- 7 Large mesh covered inlet 'scoop'
- 8 Operable floor register with deflector
- 9 R2 polyester wall batts

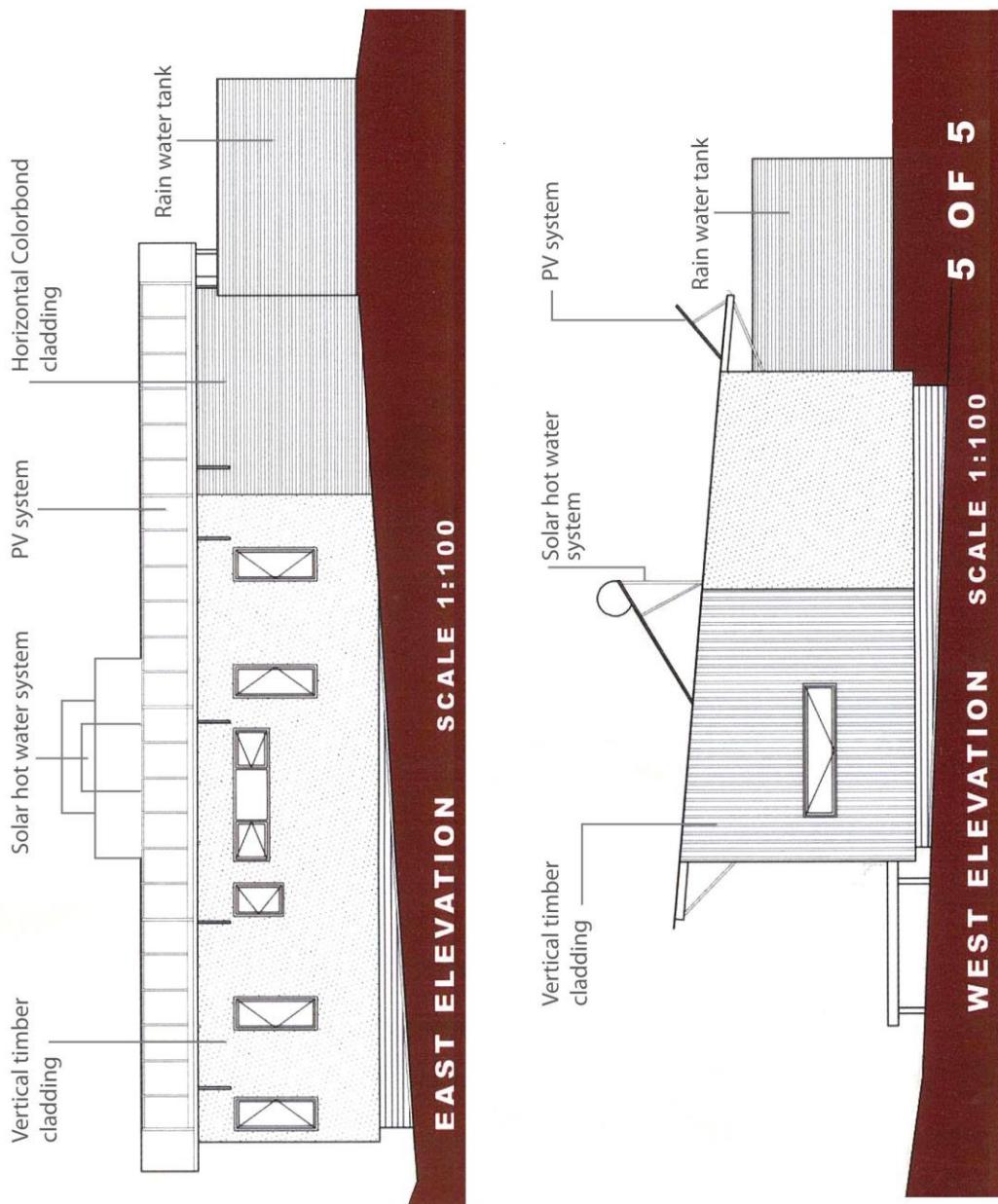


DETAIL 1
SCALE 1:20

- 1 Tiles on 45mm concrete screed
- 2 19mm plywood flooring
- 3 15mm 'Foilboard' insulation
- 4 290mm 'Hybeam' floor joists
- 5 140mm bearers
- 6 R2 polyester wall batts
- 7 Reflective foil over wall studs
- 8 75mm AAC 'Powerpanel'
- 9 Mesh to allow air flow to floor vent cooling system

Details 1-3









References

- AS 1170 Structural design actions
- AS/NZS 1562 Design of installation of sheet roof and wall cladding
- Building Code of Australia (BCA) 2008, Volume One, Classes 2 to 9
- Misronet Construction Information Services (2011) Construction Estimating Techniques, available at:
www.misronet.com/estimating.htm
- National Aeronautics and Space Administration (NASA) (2011) Estimation Process available at:
www.nasa.gov